Diversifying Shellfish Aquaculture in Coastal New Hampshire

(Project 6—New Hampshire 2008 Federal Red Tide Disaster Relief Funding)

FINAL REPORT

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To: New Hampshire Department of Environmental Services, Shellfish Program

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EXECUTIVE SUMMARY

Red tide blooms severely affected New England's marine and estuarine waters in 2005 and 2008, with toxicity levels sufficient to cause shellfish harvesting closures in many areas. Federal relief funds appropriated for the region were used for projects that would: assess the economic and social effects of the commercial fishery failure, restore the fishery, or prevent a similar failure in the future. The New Hampshire Department of Environmental Services, in collaboration with other state agencies and the University of New Hampshire, submitted a seven-project proposal (approved in May 2009) to utilize the funds. The present project focusing on expansion of estuarine shellfish aquaculture was among the seven. The rationale was that because red tide blooms mainly occur in coastal or offshore waters, further development of estuarine shellfish aquaculture could offset the effects of shellfish closures in these areas.

The 3-year project, which included four major objectives consisted largely of the production of maps showing the spatial distributions of environmental and social issues relevant to shellfish aquaculture: red tide toxin data, shellfish harvesting area classifications, location/size of existing aquaculture sites, eelgrass beds, mooring fields and other boating activities, bathymetry, water flow, bottom types, and potential shellfish aquaculture species (eastern oyster, softshell clam, blue mussel, hard clam). When the project was initiated there were three offshore mussel farms but only two productive oyster farms in the state's estuarine waters. A major goal of the project was to identify one or more aquaculturists and one or more suitable aquaculture sites for development.

The overall result of the mapping efforts, as well as communications with a variety of stakeholders, was that expansion of estuarine shellfish aquaculture in New Hampshire in the near-term probably would occur in the Little Bay area and would likely focus on the eastern oyster (*Crassostrea virginica*). However, the potential for expansion into other geographic areas and involving other species was also recognized.

During the first year of the project, several individuals expressed an interest in oyster farming, and by the end of the project (July 2012) four new licenses for oyster farms had been issued. During the process, two potential obstacles to the expansion of the shellfish industry were identified: the relationship between state permitting agencies in issuing licenses, and existing state policy of issuing licenses for the duration of only 1 year. During 2011, the relationship between the two major agencies involved in permitting was clarified via policy change. In August 2012, a new law came into effect enabling issuance of 5-year licenses.

Shellfish aquaculture is now a rapidly expanding industry in New Hampshire but there is still much to be accomplished to manage this growth in a comprehensive fashion. Existing regulatory programs are functioning well but even in the short duration of this project important changes were made in the permitting process and additional issues that need attention were identified. If the shellfish industry is to continue to grow, it must become better incorporated into existing management efforts. Our understanding of how to best take care of the state's highly valued coastal and estuarine resources is constantly evolving. The future of shellfish farming will depend in large measure on how well it becomes integrated into the overall management process.

INTRODUCTION

In November 2008 the United States Department of Commerce informed the State of New Hampshire that $1 million in federal funds was available to the State to compensate for a recent commercial fishery failure from the effects of “red tide.” The recent red tide events (also referred to as “harmful algal blooms” [HAB]) in New England coastal waters have been caused by blooms (excessive numbers) of the microscopic alga *Alexandrium fundyense*. During bloom conditions, filter feeding molluscan shellfish such as mussels, clams and oysters can accumulate potent neurotoxins produced by the alga sufficient to cause paralytic shellfish poisoning (PSP). Thus, management agencies carefully monitor coastal waters for the toxic effects of red tide blooms, and when they occur affected waters are closed for all shellfish harvesting. The resulting closures and consumption advisories can have significant social and economic impacts on shellfish farmers. The 2008 relief funds were the result of a massive (high algal densities and widespread) red tide in spring 2005 followed by significant blooms the following two years.

The Department of Commerce advised that the available disaster relief funds should be used for projects that will assess the economic and social effects of the commercial fishery failure, restore the fishery, or prevent a similar failure in the future. In February 2009, the New Hampshire Department of Environmental Services, in collaboration with several state agencies and the University of New Hampshire, submitted a seven-project proposal (which was approved in May 2009) to the Department of Commerce to utilize the funds. The present project focusing on expansion of inshore (estuarine) shellfish aquaculture was among the seven, and was designed to address the third topic mentioned above: “prevent a similar failure in the future.”

When the red tide relief funding was received, there were three licensed blue mussel (*Mytilus edulis*) farms in offshore waters and two eastern oyster (*Crassostrea virginica*) farms in estuarine waters in New Hampshire. Since red tide blooms typically develop and have the most severe impacts in coastal waters, expanding shellfish aquaculture facilities into estuarine waters may well buffer the industry from the economic impacts of future bloom events. Red tide organisms, however, can be transported and dispersed substantial distances upstream into estuarine waters. Therefore, knowledge of the distributions of toxins within the estuary when red tide blooms occur would be needed to fully assess the potential for the expansion of shellfish aquaculture.

Red tide toxin distributions, however, are only one of a variety of environmental and social factors that would have to be considered in order to expand and possibly diversify shellfish farming in New Hampshire. The shellfish project was designed to characterize all major factors potentially affecting molluscan shellfish farming in New Hampshire’s estuarine waters, with a focus on making shellfish farming more accessible to offshore mussel farmers who are typically more affected by red tide events, or to others interested in developing or expanding shellfish culture operations in estuarine waters. It was a collaborative effort involving appropriate state regulatory and management agencies, local governments, scientists at the University of New Hampshire, and existing and prospective shellfish farmers (see below).

Principal collaborators

Raymond Grizzle (lead investigator), Research Professor, Department of Biological Sciences and Jackson Estuarine Laboratory, University of New Hampshire, 85 Adams Point Road, Durham, NH 03824

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Doug Grout, Marine Fisheries Division Chief, New Hampshire Fish and Game Department, Region 3 Office, Durham, NH 03824

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METHODS

In order to attain the overall project goal—expanding and diversifying estuarine shellfish aquaculture—four objectives were established. The first three consisted of multiple work tasks, and the following general approaches were used to accomplish the tasks. The fourth objective, which was designed around issues that emerged as the project proceeded, consisted mainly of work on several key management and regulatory issues.

Objective 1: Characterize spatial distributions of red tide toxin and other environmental factors potentially affecting molluscan shellfish aquaculture in coastal and estuarine waters.

Task 1-1. Develop ArcGIS maps (shape files) showing the spatial distributions in NH coastal waters for: NHDES toxin data and shellfish harvesting area classifications; location/size of existing aquaculture sites; existing commercial (e.g. lobsters) and recreational (e.g. striped bass) fishing activities; mooring fields and other boating activities; distribution data for potential aquaculture species (eastern oyster, softshell clam, blue mussel, hard clam)

Task 1-2. Develop ArcGIS maps (shape files) showing the spatial distributions in *selected areas of* NH coastal waters for: bathymetry; general water flow patterns; and bottom type based on dominant sediments.

Task 1-3. Develop metadata and text descriptions for each map from 1) and 2). Metadata to be FGDC compliant.

Task 1-4. Identify and generally characterize areas with high potential for molluscan shellfish aquaculture.

The major aim of this objective was to assess environmental factors relevant to shellfish aquaculture (see Objective 2 for social factors). ArcGIS software was used to produce maps showing the spatial distributions of factors that are important in determining the potential extent of molluscan shellfish aquaculture in New Hampshire estuarine waters. It mainly was based on existing data but some new data were collected. Existing information on the following factors was assembled and mapped: red tide toxin monitoring data, classifications of estuarine waters with respect to shellfish harvesting, existing and planned aquaculture facilities, distribution data on major bivalve species with aquaculture potential, bathymetry and bottom characteristics, and water flow patterns.

Objective 2: Determine the potential (including environmental and social factors) for expanding and diversifying molluscan shellfish aquaculture in coastal and estuarine waters.

Task 2-1. Document all interviews and meetings involving state regulatory and management personnel, existing shellfish farmers, potential shellfish farmers, local government planners and other officials, and others.
Task 2-2. Assess and synthesize interviews and meetings in the context of existing applicable State laws and rules (RSA 211:62e and Fis 807), New Hampshire Fish and Game Department's "New Hampshire Marine Aquaculture Strategic Plan" (December, 1996; revised in 2012), and other relevant state and local planning and management documents.
Task 2-3. Synthesize and expand the information provided by Objectives 1 and 2 to provide a comprehensive understanding (i.e., involving all relevant social and ecological factors) of where and how to move forward with expanding and possibly diversifying shellfish aquaculture in New Hampshire's estuarine waters.

Objective 2 consisted of a synthesis and expansion of the information provided by Objective 1, particularly in the context of social aspects. It involved interviews with state regulatory and management personnel, existing shellfish farmers, potential shellfish farmers, local government officials, and others. Thus, the overall result of Objectives 1 and 2 was intended as a comprehensive understanding of where and how to move forward with expanding and possibly diversifying shellfish aquaculture in New Hampshire's estuarine waters.

Objective 3: Initiate appropriate efforts to expand and diversify molluscan shellfish aquaculture in estuarine waters.

Task 3-1. Describe all informational materials; develop business planning and marketing information; and provide for technical support in the development of appropriate and sustainable production techniques.
Task 3-2. Document the contributions provided by all collaborative agencies, including UNH Cooperative Extension, NH Fish and Game Department, NH Department of Health and Human Services, NH Department of Environmental Services, Piscataqua Region Estuaries Partnership, and others.

Task 3-3. Identify one or more aquaculturists and one or more suitable aquaculture sites for development.
Task 3-4. Consult with National Marine Fisheries Service and initiate evaluations and assessments that would be needed to comply with the National Environmental Policy Act.

Objective 3 consisted of tasks ranging from development and distribution of informational materials on permitting to providing technical support in the development of appropriate and sustainable production techniques. It involved several of the principal collaborators (see list above), and included informal as well as public meetings. Note that Task 3-3 is printed in bold because it represented a major initial goal of the overall process: **to expand the licensed shellfish aquaculture sites in New Hampshire by one new farm site**.

Objective 4: Address possible obstacles identified in Objectives 1 – 3 to expansion of shellfish aquaculture in New Hampshire.

Objectives 1 – 3 were aimed at identifying those areas potentially suitable for shellfish aquaculture, and to start the process of expansion by adding one new aquaculture site. It was anticipated that issues representing obstacles to expansion would emerge as the first three objectives were addressed. Thus, Objective 4 was aimed at public meetings, workshops and other activities that would facilitate the expansion process.

RESULTS AND DISCUSSION

Objective 1: Characterize spatial distributions of red tide toxin and other environmental factors potentially affecting molluscan shellfish aquaculture in coastal and estuarine waters.

Maps (with associated metadata) that satisfy all four tasks in this objective (see above) were constructed (see Appendix A for list of all ArcGIS shapefiles). Of the environmental factors investigated, four emerged as those with major importance in determining where farm sites potentially could be located and for which sufficient spatial data were available: red tide toxicity, classification of waters relative to shellfish harvest, bathymetry, and eelgrass distribution patterns.

PSP toxicity data have been collected in New Hampshire since 1991 (Appendix B). Most years during this interval were “non-bloom” years for the red tide alga *Alexandrium*. During 2005 and 2008, however, bloom conditions occurred in many areas of New England with dangerous PSP toxicity levels in coastal and estuarine waters. In New Hampshire, only areas downstream of Dover Point in the Piscataqua River, Hampton Harbor, and adjacent coastal areas had high PSP levels (Fig. 1). Thus, when considered alone, the historic PSP data suggested that expansion and further development of shellfish aquaculture should be limited to Little Bay and areas up-estuary if closures from PSP toxicity were to be minimized.

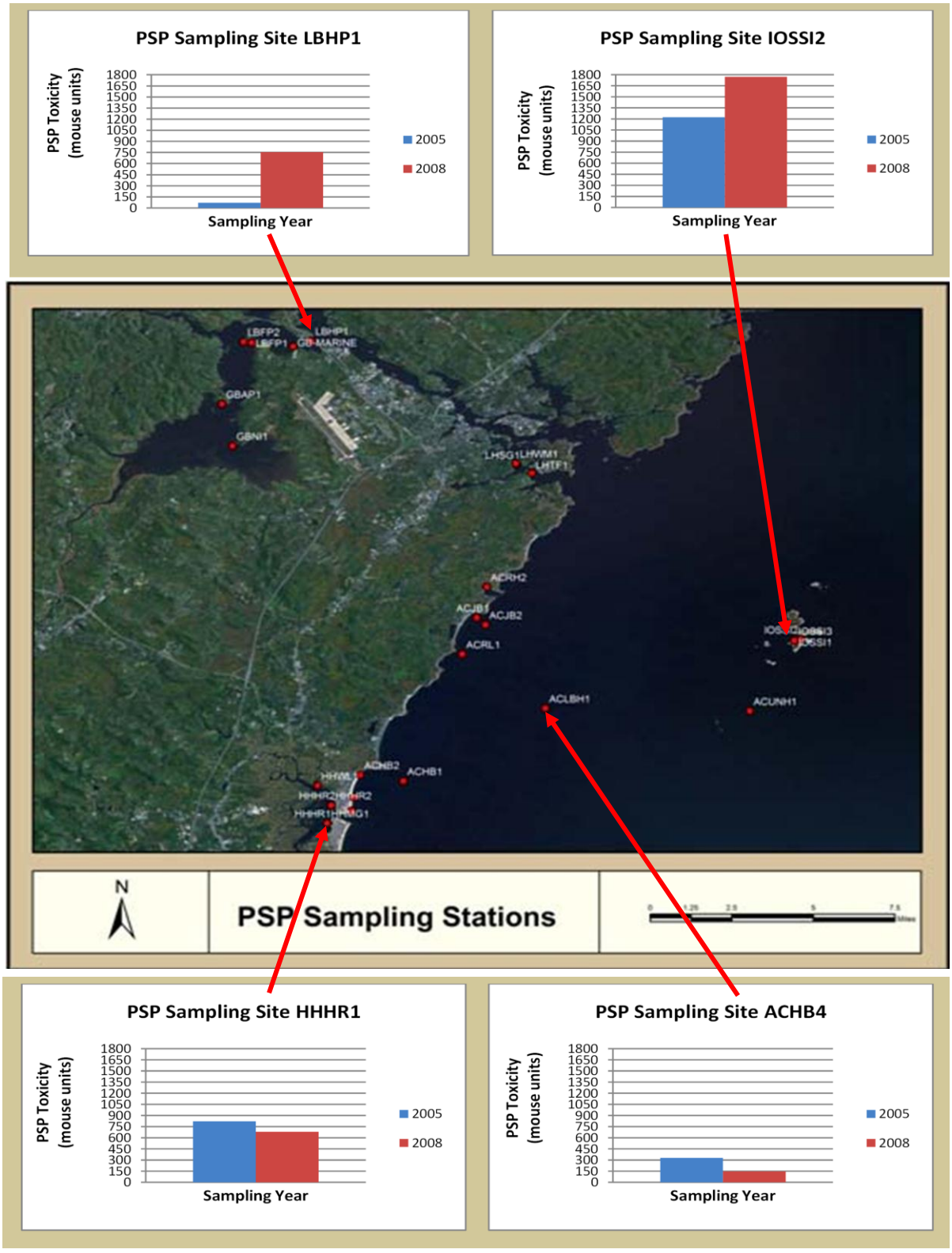


Fig. 1. Locations of PSP sampling stations in New Hampshire's estuarine and coastal waters; bar charts give maximum PSP toxicity levels measured during 2005 and 2008 red tide blooms (see text for details).

Existing water classifications relative to shellfish harvesting further restricted the potential for shellfish farming (Fig. 2). Most of Little Bay is open (but subject to temporary closures due to excessive rainfall or other conditions) for shellfish harvesting, but most of the Bellamy and Oyster Rivers are closed and there are two closures because of marinas and boat mooring fields.

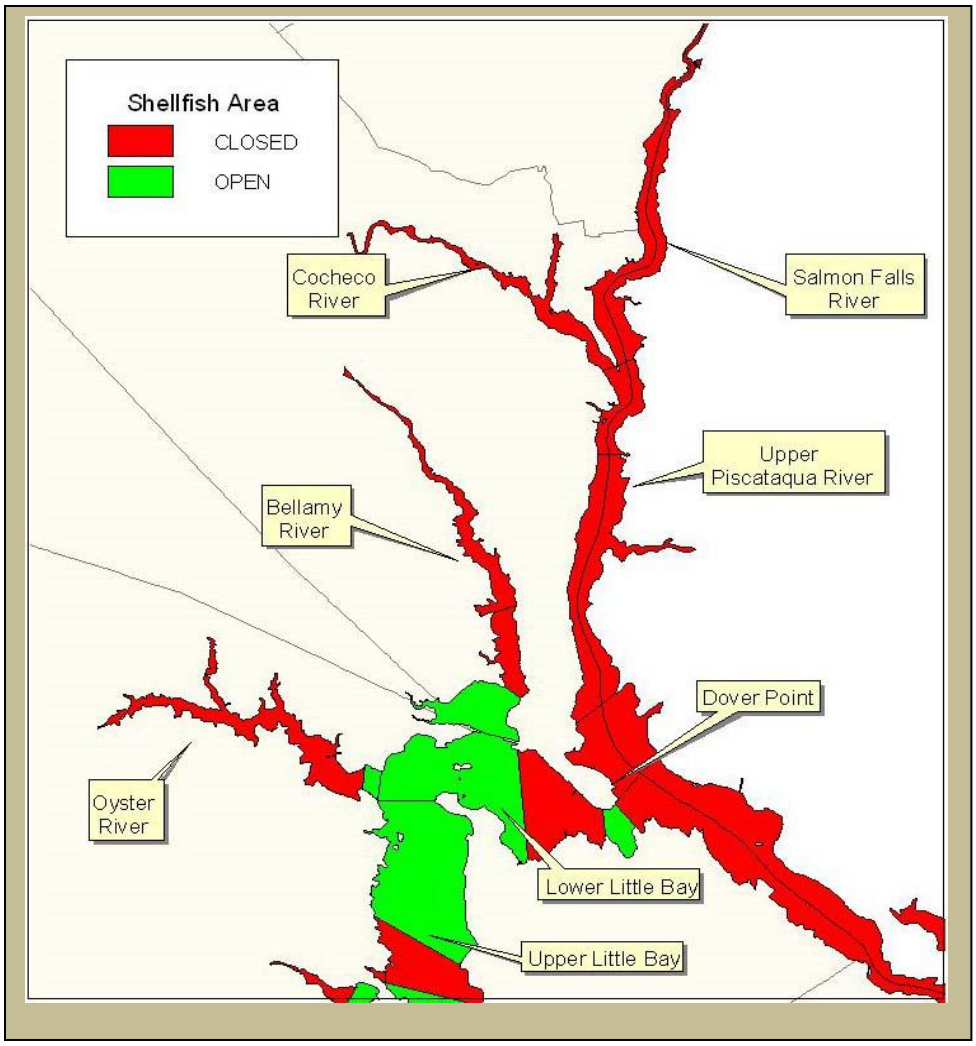


Fig. 2. Water classification relative to shellfish harvesting the Piscataqua River/Little Bay area (source: NHDES Shellfish Program).

Although PSP toxicity (Fig. 1) and water classifications (Fig. 2) were of major concern, other environmental factors were also assessed with respect to expansion of shellfish aquaculture (see Appendix A for complete list). Of these additional factors, water depth and historic extent of eelgrass distributions were the two most important. Water depth determines the types of gear that can be used and no farm sites can be located in navigation channels. Farm sites also are not permitted in eelgrass beds. Figure 3 below represents a synthesis of the information for PSP data (Fig. 1), water classifications

(Fig. 2), bathymetry, and historic eelgrass distributions in the context of identifying areas with highest potential for shellfish aquaculture (Task 1-4). Waters shallow enough for existing bottom culture methods range from mean low water to 5 m below; this depth range also eliminates the major navigation channels. Eelgrass beds mainly occur in Great Bay proper, with only small and dynamic occurrences in Little Bay. Considered collectively, these four environmental factors indicate that there is a total of approximately 500 acres *potentially suitable* for shellfish aquaculture (=areas shown in yellow) in Little Bay (Fig. 3).

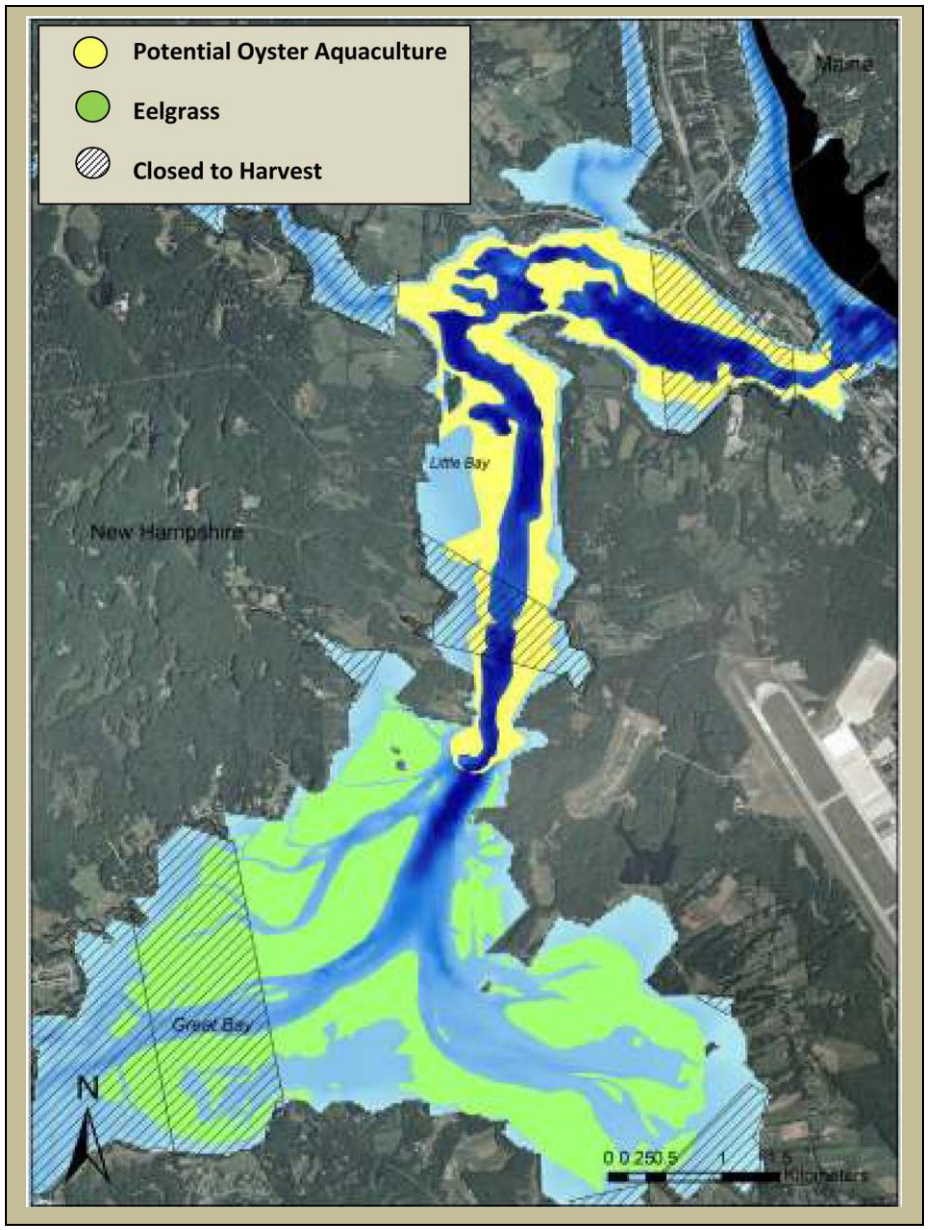


Figure 3. Potential shellfish (mainly oysters) aquaculture areas in relation to four major relevant factors: red tide toxicity, water depth, harvest closures, and eelgrass distribution (see text for details).

The term “potentially suitable” is used to describe these areas because a complete understanding of all the environmental and social factors that must be considered in the expansion of shellfish aquaculture in New Hampshire is unknown at this time, particularly social factors and management issues that have not been fully explored (see more discussion in Objective 2 below).

In conclusion, the information obtained from Objective 1 caused the focus of the project to become Little Bay, and to emphasize oysters because the environmental conditions there are particularly suited for oyster farming. This should not be interpreted to mean that other areas in Great Bay proper, or Hampton Harbor, or the Piscataqua River have no potential for shellfish farming. Rather, the other geographic areas as well as other molluscan species (e.g., mussels, clams) seemed to show less potential for expansion in the near-term when considering current environmental and social conditions. Thus, the focus area for Objectives 2 – 4 was Little Bay and adjacent estuarine waters.

Objective 2: Determine the potential (including environmental and social factors) for expanding and diversifying molluscan shellfish aquaculture in coastal and estuarine waters.

This objective consisted largely of interviews with state regulatory and management personnel, existing shellfish farmers, potential shellfish farmers, local government officials, and others (Appendix C). The aim was to expand the emphasis of Objective 1 on environmental factors to involve social issues. As noted above, development of improved data on environmental factors such as bathymetry, substrate type, and occurrence of existing native shellfish resources would be helpful for future planning efforts. This information, however, must be considered in the context of relevant social issues. Thus, the overall result of Objectives 1 and 2 was intended as a comprehensive—albeit preliminary—understanding of the potential for expanding and possibly diversifying shellfish aquaculture in New Hampshire’s estuarine waters.

During 2009 the New Hampshire office of the Natural Resources Conservation Service (a division of the US Department of Agriculture) initiated a program to allow oyster farmers to participate in the process of restoration of natural oyster reefs. This important development resulted in participation by oyster farmers in four oyster reef restoration projects during 2009 – 2012. To date (August 2012), three different farmers have participated in restoring at total 3.5 acres of bottom area. Thus, there is now a partnership between the rapidly developing shellfish aquaculture industry in New Hampshire and an ongoing conservation program supported by the major management agencies. With respect to Objective 2, this development provided opportunities at public hearings and other venues to determine how local officials, other farmers, and management and regulatory personnel from state and federal agencies viewed shellfish aquaculture.

In sum, these interactions with individuals representing a wide range of interests and connections to shellfish aquaculture resulted in several important findings. There is

definitely widespread support for further development of shellfish farming in the state, but there are also constraints as well as focused resistance. The major social issues that need further attention include: (1) how shellfish aquaculture is viewed by residents who are abutters to the farms, (2) the relationship of shellfish aquaculture to water quality management at state and federal levels, and (3) the relationship of shellfish aquaculture to local and state planning efforts (see more discussion in Objective 3).

Unfortunately, most social topics are not easily incorporated into the mapping approach used in the present study. However, consideration of two constraints—existing boat mooring fields and policy on allowable distances between adjacent farms—allowed refinement of the *potentially suitable* areas for farming identified in Objective 1 and shown in Figure 3.

Boat moorings in Little Bay are restricted to several general areas (Fig. 4). Each mooring field consists of a variety of boat types and the number of active moorings in most fields is quite variable from year to year. New oyster farms cannot be sited within an existing mooring field. Buffer distances between farms and marinas/mooring fields are needed to protect public health accidental releases of boat sewage. Current NHDES policy is to evaluate each farm site on an individual basis considering the number of boats in the mooring field and other factors in order to determine a safe distance between the two. When the existing mooring fields (Fig. 4) were considered, the maximum potential area for shellfish aquaculture decreased from 500 acres (Fig. 3) to 400 acres (Fig. 5).

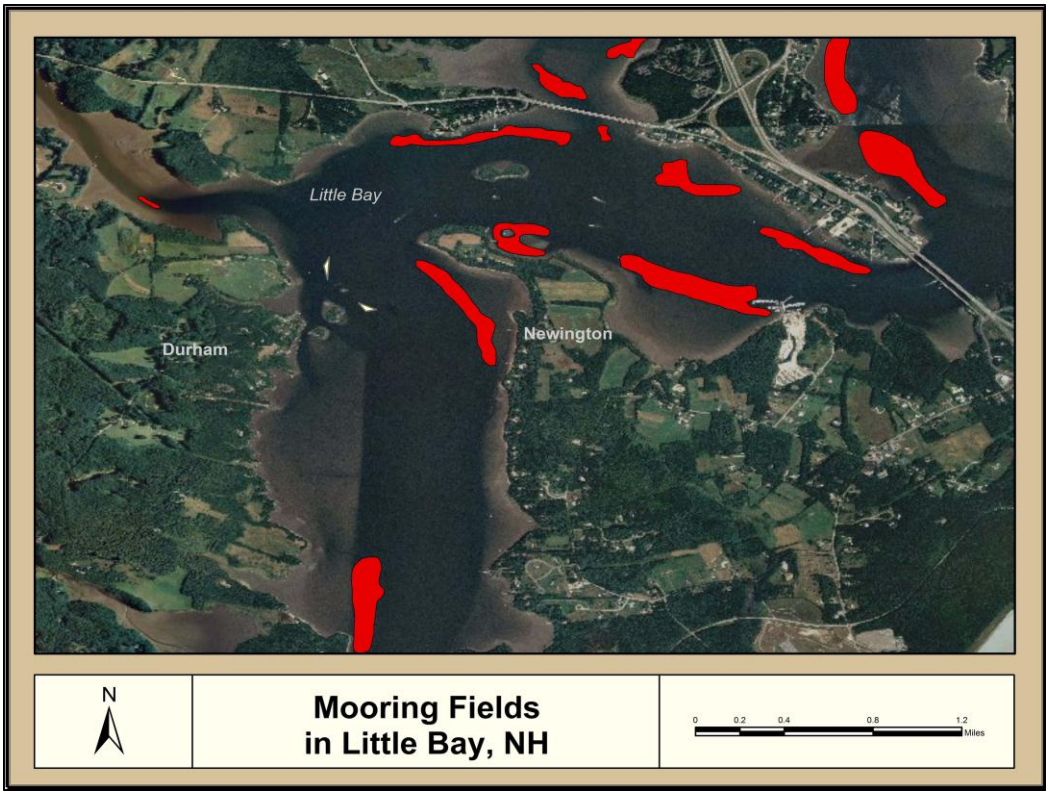


Fig. 4. General areas (red polygons) where boat mooring are permitted in Little Bay.

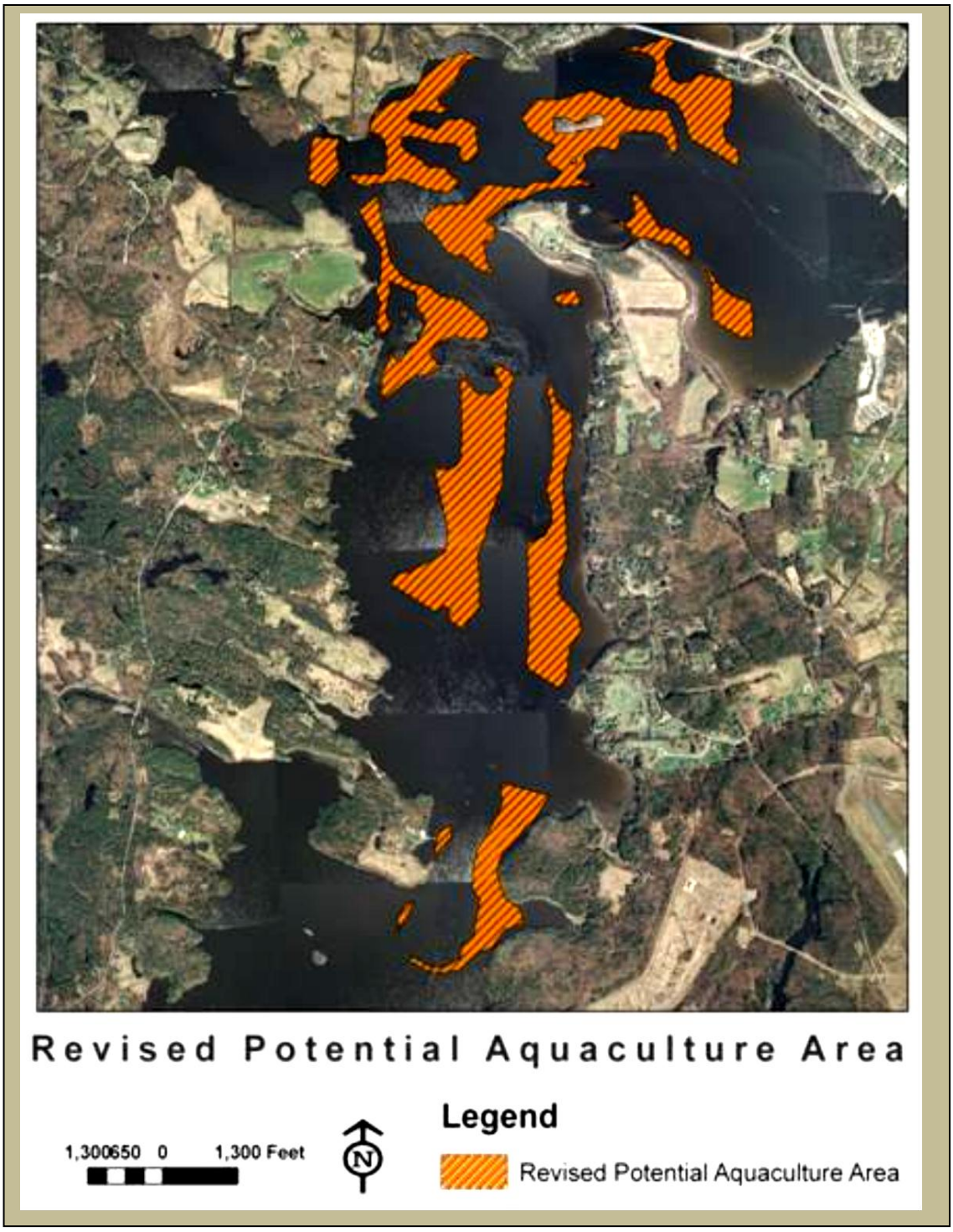


Fig. 5. Revised (from Fig. 3) map incorporating data on boat mooring fields (Fig. 4) showing maximum expansion potential for shellfish farms in Little Bay; total area available ~400 acres (prepared by Carol Elliott and Chris Nash, NHDES).

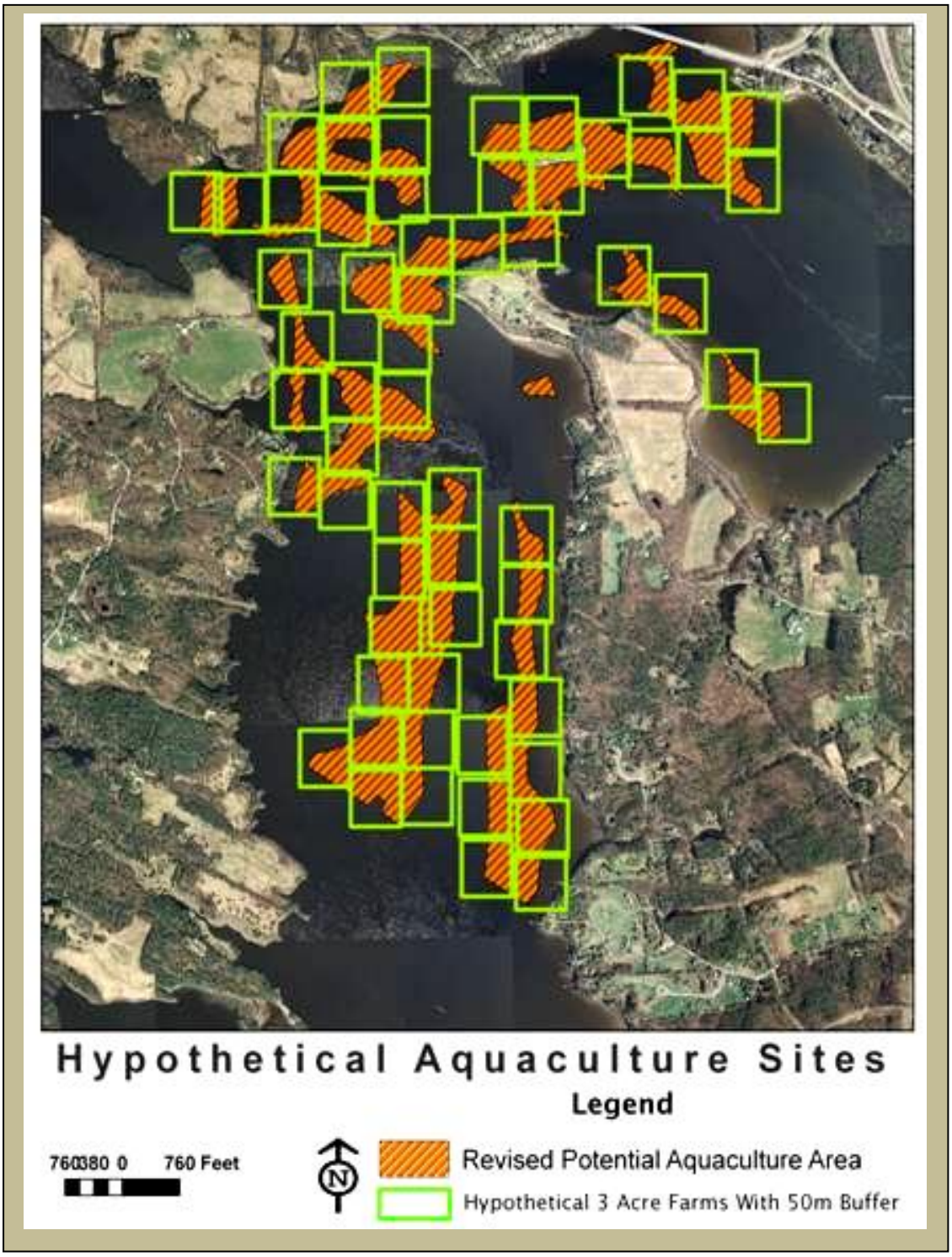


Fig. 6. Hypothetical maximum expansion of shellfish farms in Little Bay based on 3-acre, rectangular-shaped farm sites with 50m buffers: 62 farms, 186 acres occupied by new farms (prepared by Carol Elliott and Chris Nash, NHDES).

In addition to mooring fields, another factor to consider in assessing the overall potential for shellfish aquaculture expansion was distance between farms. NH Fish and Game Department policy requires 50 m between adjacent farms. Thus, the total acreage available for additional aquaculture sites is also dependent on individual farm size. For planning purposes, polygons representing hypothetical 3-acre farm sites were distributed throughout the potential aquaculture areas yielding a maximum of 62 farms occupying a total of 186 acres (Fig. 6). Farm sites of different areas would yield slightly different total coverage possibilities, but a maximum coverage of less than 200 acres of shellfish aquaculture sites for the entire Little Bay area seems reasonable at this time.

One way to think about this figure is to consider 200 acres as the "carrying capacity" based on major sociological and environmental factors for shellfish (mainly oysters) aquaculture in New Hampshire and particularly with respect to the Little Bay area. However, a number of other possibilities exist for shellfish aquaculture involving other geographic areas and other mollusc species. For example, oyster growth rates would likely be enhanced in areas (e.g., at the mouths of major streams such as the Squamscott River) with high phytoplankton concentrations and water flow but that are closed to direct harvest due to water quality considerations. These could be “nursery” areas producing fast growth rates during the first year or so, then relay the oysters to farms for final grow out (or depuration) and harvest. Other geographic areas such as Great Bay proper could hold substantial potential for shellfish farming, but management issues related to acceptable uses in the Great Bay National Estuarine Research Reserve would need to be addressed. Others species such as European flat oysters (*Ostrea edulis*), blue mussels (*Mytilus edulis*), hard clams (*Mercenaria mercenaria*), and softshell clams (*Mya arenaria*) also have aquaculture potential. Although some of these species could be farmed in the Little Bay area and some of the findings herein may apply in general terms, none were directly assessed during the present project

Objective 3: Initiate appropriate efforts to expand and diversify molluscan shellfish aquaculture in estuarine waters.

This objective was initiated early in 2010 well before Objectives 1 and 2 were completed due to the unexpected high level of interest by several individuals in developing shellfish aquaculture sites in New Hampshire. When the project was initiated, there were only two licensed estuarine shellfish aquaculture sites (Fig. 7). Task 3-3 under this objective—**to identify one or more aquaculturists and one or more suitable aquaculture sites for development**—was intended as a practical goal of the overall project. At the time of this report (August 2012), there were four new (since 2010) licensed shellfish farms in New Hampshire and several more individuals had started the permitting process (Fig. 7). Thus, the initial goal of at least one new shellfish farm already has been far exceeded.

Appendix C documents the major public and private meetings relevant to shellfish aquaculture conducted during the course of the project. A substantial portion of these communications occurred as a result of interviews with prospective shellfish farmers and associated public meetings. Another important source of information were the

meetings held before local conservation commissions required for permitting the NRCS-funded oyster restoration projects described above in Objective 2.

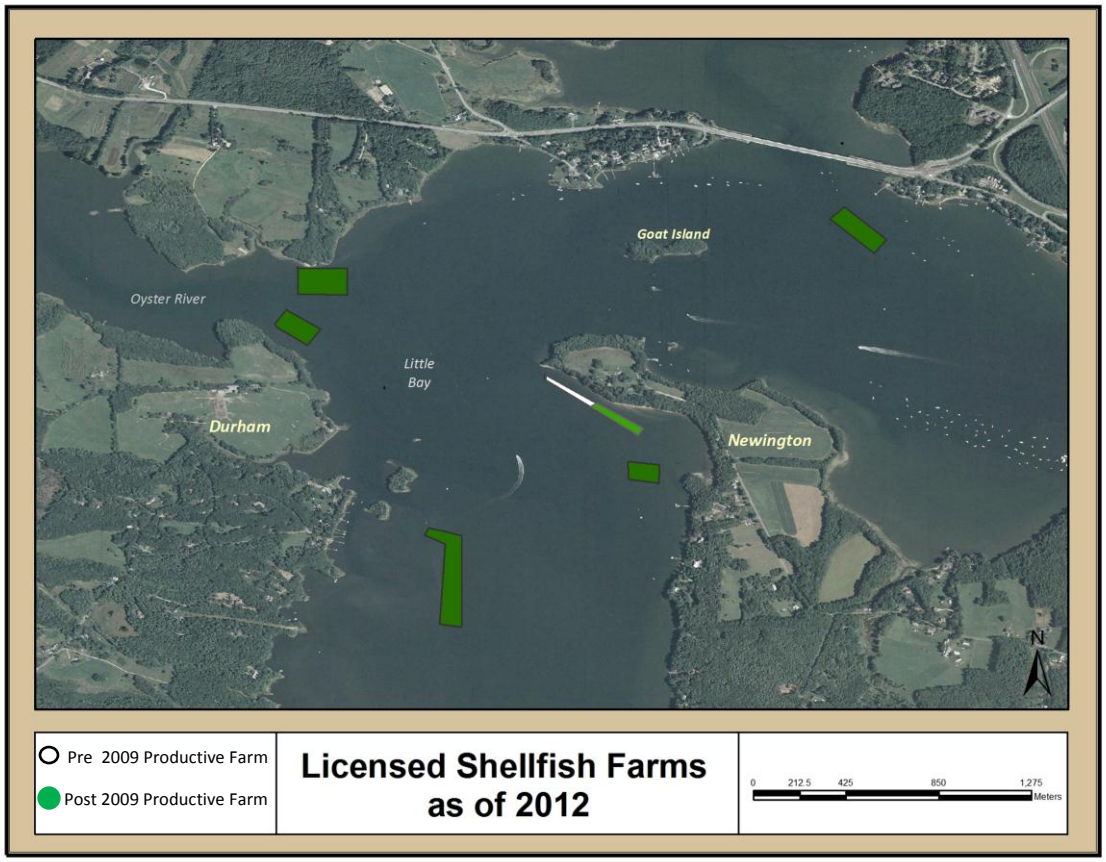


Fig. 7. Shellfish aquaculture sites in Little Bay existing before the project began (2009; white polygon) and those licensed from 2009-2012 (green polygons).

One of the major outputs from this objective was a booklet containing information relevant to the permitting process (Appendix D). The major purpose of the booklet is to provide individuals exploring shellfish aquaculture in New Hampshire information on how to proceed. It describes the overall process for obtaining a Marine Aquaculture License, relevant contacts, example best management practices, the various permits typically required for operating a farm, and other useful information. It should be noted that the booklet also aims to supplement information routinely provided by NH Fish and Game Department, the major permitting agency for shellfish aquaculture, to prospective shellfish farmers.

Objective 4: Address possible obstacles identified in Objectives 1 – 3 to the expansion of shellfish aquaculture in New Hampshire.

During the process of addressing Objectives 1 – 3, four potential obstacles to expansion of shellfish aquaculture were identified: (1) the current practice of limiting state aquaculture licenses to 1-year duration, (2) uncertainty about the role of NH Department of Environmental Services in the state permitting process, (3) public perceptions and opinions regarding shellfish aquaculture, and (4) the relationship of shellfish aquaculture to eelgrass and other factors considered in the permitting process. Each of these issues is addressed separately below.

When the project was initiated in 2009, NH Fish and Game Department (NHF&G) policy was to issue shellfish aquaculture licenses annually. Although renewals had been routine in all cases to date, the annual renewal policy nonetheless carried with it the possibility that a license could be denied at the end of any given year. Such a possibility would clearly represent an obstacle to those considering making long-term investments in shellfish aquaculture. Thus, this policy was generally viewed by prospective farmers as something that needed to be changed. On August 14, 2012 Governor John Lynch signed into law a bill that required NHF&G to adopt rules for issuing a 5-year license for oyster aquaculture operations (Fig. 8). This legislation sponsored by Rep. Adam Schroadter (R-NH Rockingham District 12) was the culmination of his efforts over the previous 2 years in working to facilitate further expansion of shellfish aquaculture in the state. The new law represents a major step forward in facilitating expansion of shellfish aquaculture in New Hampshire.

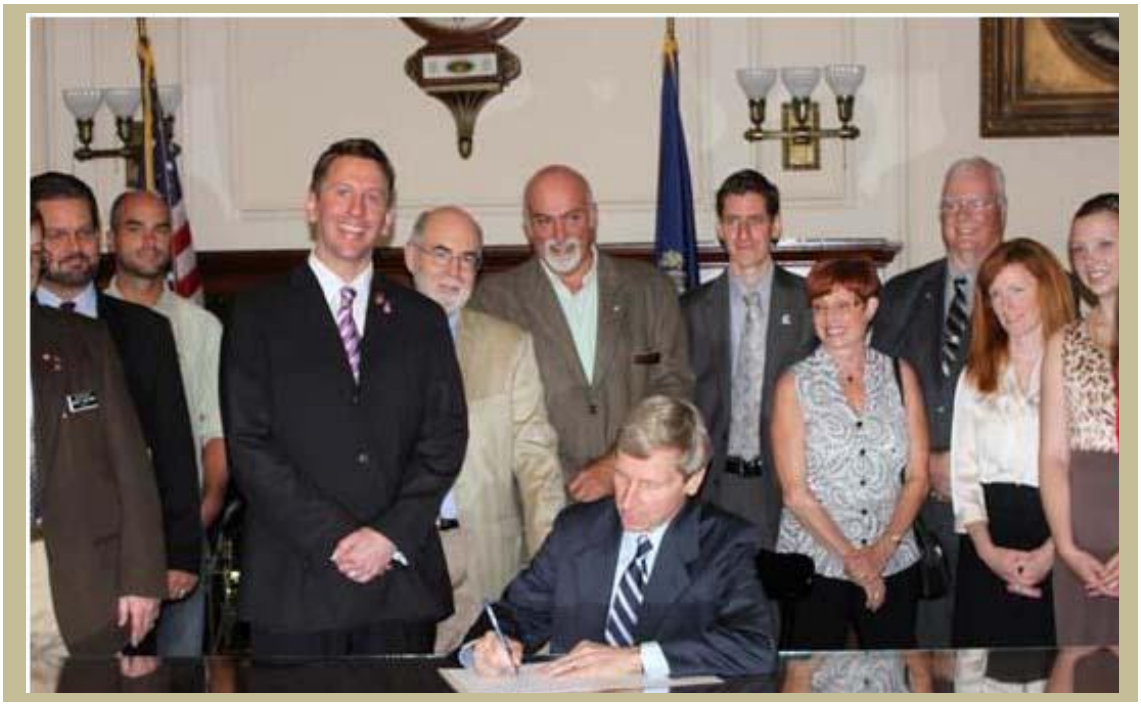


Fig. 8. Governor John Lynch signing into law a bill enabling the issuance of shellfish aquaculture licenses in New Hampshire for a 5-year period. Standing beside the Governor is Rep. Adam Schroadter, the bill's sponsor.

The Wetlands Bureau of NHDES issues permits for development activities occurring in state waters. When the project started, there was uncertainty regarding how shellfish aquaculture sites would be dealt with in the permitting process, recognizing that NHF&G was the primary state permitting agency. During 2010 and 2011, discussions on the topic occurred among regulators, shellfish farmers, and others concerned with permitting shellfish farming (Appendix C). At the time of this report, NHDES Wetlands Bureau administrative rules would classify all marine commercial shellfish farms as "major impact" projects because they are located in tidal waters. However, NHDES Wetlands has indicated an intent to use their rules to consider these operations as "minimum impact" provided that a number of conditions are met, including the acquisition of a valid NHF&G aquaculture license. This decision has the potential to facilitate permitting at the state level, but the new policy has not yet been fully implemented. Over time, NHDES Wetlands may consider additional changes to their administrative rules that would further streamline the wetlands permitting process.

The public hearings held as part of the permitting process for the six new farms that were licensed since 2010 provided a cross section of public opinion on shellfish aquaculture (Appendix C). Public perceptions and opinions regarding shellfish aquaculture range from fully supportive to fully opposed. The latter extreme, however, mainly has been voiced by those who were opposed to a farm in waters adjacent to their property. Based on comments raised at various public meetings as well as other venues where shellfish aquaculture has been discussed, it seems clear that better communication of what is involved in shellfish farming—including the range of environmental and economic benefits as well as potential negative impacts—would help facilitate the expansion process.

The final identified obstacle to further expansion of shellfish aquaculture is the relationship of shellfish farming to eelgrass, and potentially other factors considered in the permitting process. Regulatory agencies consider a wide range of environmental and social factors in the permitting process. Among environmental factors, eelgrass beds have proven to be the most contentious. New Hampshire is not alone in this respect, as other states are also struggling with similar issues. At present, NHF&G policy is to deny an application if eelgrass beds are within the boundaries of the requested license area. Some view this as unreasonable because the relationship between shellfish farming and eelgrass is not simple, nor is it necessarily negative. For example, the normal feeding activity of oysters removes suspended particles from the water, thereby increasing water clarity and potentially allowing eelgrass to colonize the immediate area. But eelgrass is not the only potentially competing "use" of areas suitable for shellfish farming. Expansion of shellfish aquaculture could be facilitated by developing more comprehensive approaches to dealing with the variety of relevant environmental and social issues.

The Future?

This project represents a step in the direction of expanding shellfish aquaculture in New Hampshire's estuarine waters, but it was just the first step. Oyster farming in particular has grown substantially during the 3-year duration of the project, and although the future looks bright for continued expansion, there clearly are limits. The major factors that likely will play a role have been identified and the multi-factor approach described herein might provide a starting point for future work. In any case, there is a wide range of environmental and social issues that must be addressed if the expansion is to occur in a sensible fashion.

The overall process of expansion of shellfish aquaculture might be approached from the perspective of marine spatial planning (MSP). Comprehensive MSP efforts typically involve the full range of human activities and environmental features in the planning area. The participants should include stakeholders across the spectrum of interests and responsibilities: oyster farmers, planning and regulatory agencies at all levels, non-government organizations, interested citizens, and others. As attempts are made to license more shellfish farms in New Hampshire, the need for more comprehensive management approaches also will increase. Regardless of the kinds of management or planning approaches used in the future, shellfish farming in New Hampshire is in a rapid growth phase and it is receiving attention from a diversity of stakeholders.

Historically, oysters were viewed and managed almost exclusively as a food resource for humans. But in the past two decades or so, their ecological roles—particularly, water filtration capabilities and habitat provision for many other species of invertebrates, fish and plants—have become more and more recognized and valued. At present in New Hampshire, the relationship of oyster farms (and wild oysters on natural and created reefs) to water quality changes has become a major research topic. For example, studies are underway to assess how oysters might be used in managing nitrogen concentrations in the Great Bay system. Both farmed and natural populations of oysters remove nitrogen in particulate forms as they feed, but more research is needed to quantify removal rates under different combinations of conditions and to determine how these rates fit into overall management plans. Oysters are now viewed from many different perspectives and by a diversity of stakeholders.

The future of shellfish farming in New Hampshire's estuarine waters seems bright. The present project has contributed to an increase from two to six licensed oyster farms in only 2 years. This growth, however, has not proceeded in any planned way. Existing regulatory programs are functioning well, but even in the short duration of this project important changes were made in the permitting process and additional issues that need attention have been identified. If this newly emerging shellfish industry is to continue to grow, it must become better imbedded in existing management and planning efforts throughout the seacoast region. Our understanding of how to best take care of the state's highly valued coastal and estuarine resources is constantly evolving. The future of shellfish farming will depend in large measure on how well it becomes integrated into the overall management process.

Appendix A

NOTE: The shapefiles in this document were produced by Krystin Ward and Ray Grizzle based on data sources described for each. See 'Access and use limitations' sections under each for additional information on the original data sources.

Bathy Poss. Aquaculture Areas.shp

Summary: This shapefile was created and added to a bathymetry map of Great Bay which was developed to determine the potential (including environmental and social factors) for expanding and diversifying molluscan shellfish aquaculture in coastal and estuarine waters.
Description: This shapefile is located in Little Bay which is part of the Great Bay system in New Hampshire. It measures 778.62 acres (approx. 577 acres if DES "closed areas" are included) and indicates areas that could be suitable for oyster aquaculture. It excludes the channel and areas where eelgrass is found.
Access and use limitations: User is required to read metadata completely before using the data. Acknowledgement of Dr. Raymond Grizzle, University of New Hampshire would be appreciated in products derived from these data.

Bathy Channel.shp

Summary: This shapefile was created and added to a bathymetry map of Great Bay which was developed to determine the potential (including environmental and social factors) for expanding and diversifying molluscan shellfish aquaculture in coastal and estuarine waters.
Description: This shapefile is located in Little Bay which is part of the Great Bay system in New Hampshire. It measures 646.06 acres and indicates an area not suitable for oyster aquaculture.
Access and use limitations: User is required to read metadata completely before using the data. Acknowledgement of Dr. Raymond Grizzle, University of New Hampshire would be appreciated in products derived from these data.

GB Bathymetry

Summary: The products which have been zipped into this archive were generated by the Special Projects Office of the National Ocean Service, NOAA as part of a project to produce user friendly bathymetry for those estuaries that
Contained more than 80% spatial coverage of digital sounding data. Not every estuary contained sufficient source data in digital form, thus only 70+ of the 130+ estuaries are included in the full data set. These data sets can be retrieved from the NOS Data Explorer service <http://nosdataexplorer.noaa.gov>.
The source data for these bathymetric products were soundings collected by The National Ocean Service over the last 150 years (retrieved from the national archives held by the National Geophysical Data Center in Boulder, CO) and Shorelines delineated by the National Ocean Service.
Description: Bathymetry for Great Bay was derived from six surveys containing 30,640 soundings. One older, less accurate, overlapping survey was omitted before tinning the data. The average separation between soundings was 39 meters. There was a survey in the southeast that dated from 1950. The other five surveys dated from 1953 or 1954. The total range of soundings was 3.4 meters to -24.7 meters at mean low water. Mean high water values between 2.1 and 2.7 meters were assigned to the shoreline. Ten points were found that were

not consistent with the surrounding data. These were removed prior to tinning. Great Bay has five 7.5 minute DEMs and a single one degree DEM.
Credits: The source data for these bathymetric products were soundings collected by The National Ocean Service over the last 150 years (retrieved from the national archives held by the National Geophysical Data Center in Boulder, CO) and Shorelines delineated by the National Ocean Service.
For further information contact: Mr. Robert Wilson, Special Projects - National Ocean Service, (301) 713-3000, **robert.wilson@noaa.gov**
Access and use limitations: these bathymetric data should not be used for navigation purposes.

Little Bay Oyster Co.shp

Summary: This data set was developed to keep a record of aquaculture farms in NH.
Description: This polygon shapefile was created from latitude/longitude corner points. Data obtained from Will Carey, owner of Little Bay Oyster Company, an oyster aquaculture farm in Little Bay, NH. Farm information may be obtained by New Hampshire Fish and Game Department.

Granite_State_Shellfish_LLC.shp

Summary: This data set was developed to keep a record of aquaculture farms in NH.
Description: This polygon shapefile was created from latitude/longitude corner points. Data obtained from Ray Grizzle and David Berlinsky, owners of Granite State Shellfish LLC, an oyster aquaculture farm in Little Bay, NH. Farm information may also be obtained by New Hampshire Fish and Game Department.

Choice Oysters_LLC.shp

Summary: This data set was developed to keep a record of aquaculture farms in NH.
Description: This polygon shapefile was created from latitude/longitude corner points. Data obtained from Krystin Ward, owner of Choice Oysters LLC, an oyster aquaculture farm in Little Bay, NH. Farm information may also be obtained by New Hampshire Fish and Game Department.

Cedar Point Shellfish.shp

Summary: This polygon shapefile was developed to keep a record of aquaculture farms in NH.
Description: This polygon shapefile was created from latitude/longitude corner points. Data obtained from the owner of Cedar Point Shellfish, an oyster aquaculture farm in Little Bay, NH. Farm information may also be obtained by New Hampshire Fish and Game Department.

Fat Dog.shp

Summary: This data set was developed to keep a record of aquaculture farms in NH.

Description: This polygon shapefile was created from latitude/longitude corner points. Data obtained from the two owners of Fat Dog, an oyster aquaculture farm in Little Bay, NH. Farm information may also be obtained by New Hampshire Fish and Game Department.

Great Bay Oyster Co.shp

Summary: This polygon shapefile was developed to keep a record of aquaculture farms in NH.
Description: This polygon shapefile was created from latitude/longitude corner points. Data obtained from Christopher J. Phillips, owner of Dover Point Oyster Co., an oyster aquaculture farm in Little Bay, NH. Farm information may also be obtained by New Hampshire Fish and Game Department.

Mooring Fields GPS.shp

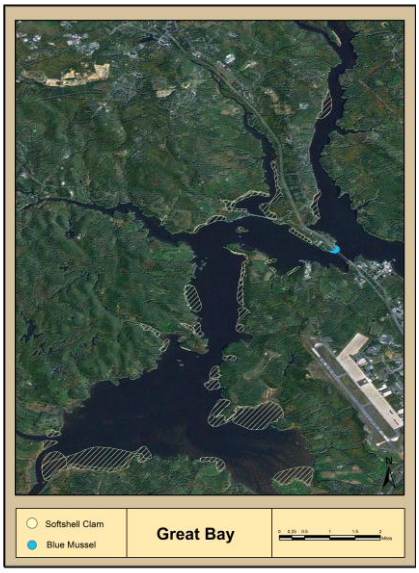
Summary: This polygon representation of mooring fields was created from latitude/longitude information obtained by NHDES from the NH Division of Ports and Harbors. This shapefile is intended to show the approximate locations of mooring fields throughout the Great Bay system. It does not indicate which moorings are in use and it does not show the most current data.
Description: The mooring data was added to Great Bay base maps and was combined with other limiting factors to oyster aquaculture farms.
Access and use limitations: Shapefiles used in this report and current data is managed by NH Division of Ports and Harbors and NH Department of Environmental Services.

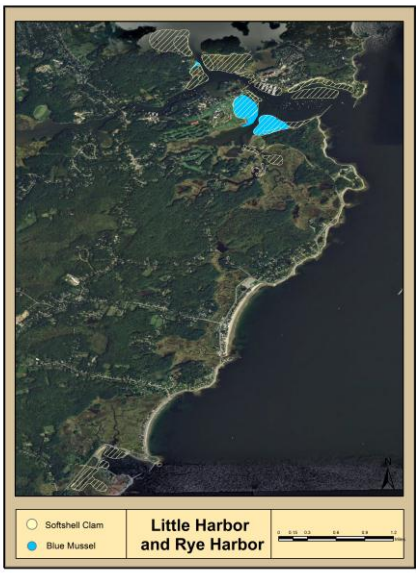
PSP Stations.shp

Summary: The purpose of this program is to monitor shellfish meats for the presence of Paralytic Shellfish Poisoning toxin and implement harvesting closures as necessary in accordance with the National Shellfish Sanitation Program (NSSP).
Description: As part of New Hampshire's Biotoxin Monitoring Program, the NH Department of Environmental Services (NHDES) has compiled data for Paralytic Shellfish Poisoning (PSP) caused by Alexandrium fundyense in NH's coastal waters with data starting in 1991. The monitoring program includes weekly testing of blue mussels from Hampton/Seabrook Harbor and the Isle of Shoals (Star Island) for the period April through October. Weekly sampling may be extended PSP toxins are still being detected at the end of the monitoring season. Blue Mussel (Mytilus edulis) is the species used for PSP monitoring because it accumulates the toxin more rapidly than other shellfish species (Bricelj and Shumway, 1998). Testing is done by NH Department of Health and Human Services (DHHS) by mouse bioassay (MBA) and the results are given in micrograms of PSP toxin per 100 grams of tissue.
Credits: New Hampshire Department of Environmental Services
Access and use limitations: User is required to read metadata completely before using the data. Acknowledgement of Chris Nash/DES and/or NH Harbormaster would be appreciated in products derived from these data.

Shellfish Beds_1982_2008.shp

Summary: The purpose of this coverage is to compile all existing information about the occurrence of shellfish resources in NH's tidal waters. The coverage will be used by NHDES for shellfish indicator reports.
Description: The NH Department of Environmental Services (NHDES) has compiled geographic information on the boundaries of shellfish beds in NH's tidal waters. Softshell clam, oyster beds, blue mussel and razor clam have been documented. The coverage contains the boundaries of shellfish beds from historical maps extending back to 1982. The coverage is updated annually with new boundaries that have been mapped during the year. It should be noted that this shapefile is a representation of available data, and is not a complete depiction of all shellfish resources that were or currently are present
Credits: Philip Trowbridge, Matthew A. Wood and Carol Elliott (NHDES)
Access and use limitations: User is required to read metadata completely before using the data. Acknowledgement of Philip Trowbridge, New Hampshire Department of Environmental Services would be appreciated in products derived from these data.





Shellfish Closures_2009.shp

Summary:This polygon shapefile represents areas in Great Bay, NH that are closed or open to the harvest of recreational or farmed oysters/shellfish to be determined by New Hampshire Department of Environmental Services.
Description: The closed areas can include; prohibited, prohibited/safety zone, prohibited/unclassified, and restricted. The open areas can include; approved or conditionally approved areas.
Credits: User is required to read metadata completely before using the data. Acknowledgement of Philip Trowbridge, New Hampshire Department of Environmental Services would be appreciated in products derived from these data.

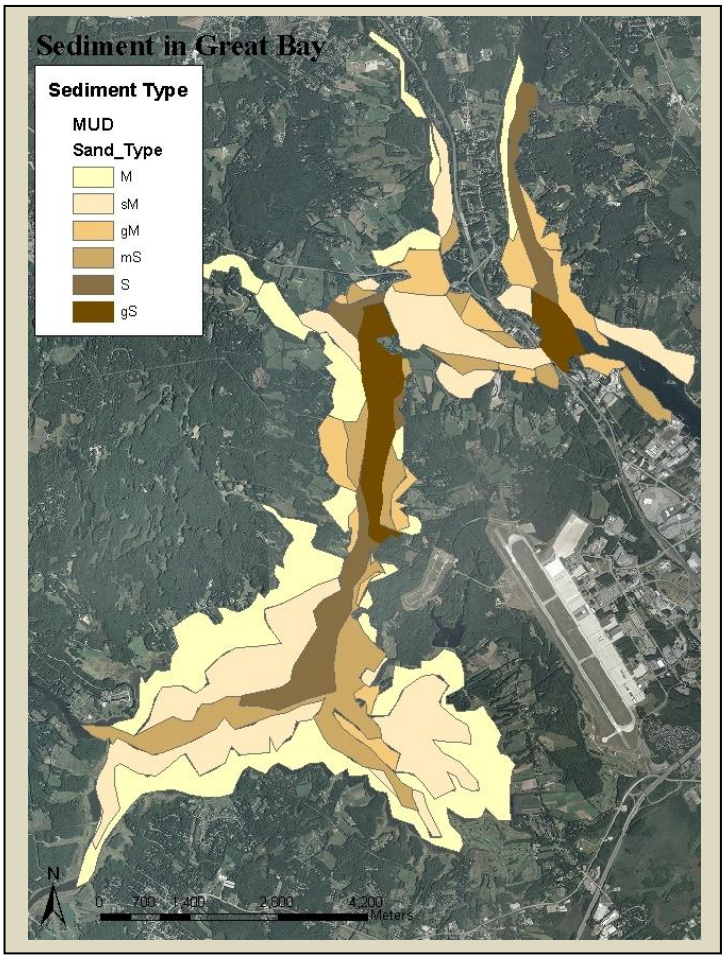
Access and use limitations: Acknowledgement of Chris Nash at the New Hampshire Department of Environmental Services Shellfish Program would be appreciated in products derived from these data.

Eelgrass2008.shp

Summary: Purpose: The dataset was developed to monitor the distribution of eelgrass within the Great Bay Estuary over time. The surveys have been completed yearly since 1986 to track trends over time.
Description: The dataset shows the locations where eelgrass was observed in the Great Bay Estuary based on low-altitude aerial surveillance. The study area includes the following water bodies: Great Bay, the mouth of the Squamscott River, the tidal portion of the Lamprey, the tidal portion of the Oyster River, the tidal portion of the Bellamy River, the Piscataqua River and Portsmouth Harbor and its associated creeks. Aerial photographs are taken of the study area at 3000 feet at low spring tide with roughly 60% overlap on a calm day without preceding rain events and when the sun is at a low angle to minimize reflection (between 7 am and 10 am). Photographs are taken in late summer, usually late August or early September, depending on tides and weather, to reflect the maximum eelgrass annual biomass. 35 mm film (ASA 200) is used to acquire the images. Typically 300 images are needed to cover the entire Great Bay Estuary. The orientation of the photographs is near-vertical. This is a slight *deviation from the NOAA Coastal Change Analysis Program protocol, but follows a published method (Short and* Burdick, 1986). The photographs, in the form of 35mm slides or digital computer images, are projected on a screen and the eelgrass images are transferred to a base map. These maps are then digitized using ArcInfo software. The eelgrass habitat mapped from the aerial imagery is verified using the ground truthing data by placing the ground-truthing locations onto the digital image using ArcInfo software. Ground-truthing is done from a small boat during the same season as the photographs are taken. Ground-truth observations are made at low tide. Samples are collected with an eelgrass sampling hook. Positions are determined using GPS. The ground-truth surveys assess 10-20% of the eelgrass beds mapped in the estuary. The aerial survey is completed yearly. The first survey in the series was completed in 1986.
Purpose: The dataset was developed to monitor the distribution of eelgrass within the Great Bay Estuary over time. The surveys have been completed yearly since 1986 to track trends over time.
Credits: Citation information: Originator: Dr. Frederick Short, University of New Hampshire, Durham, NH Title: Great Bay Estuary Eelgrass, 2008 Geospatial Data Presentation
Form: Vector digital data
Online Linkage: http://www.granit.unh.edu/data/search?dset=eelgrass2008/nh
Use_Constraints: User is required to read metadata completely before using the data. The information provided in this coverage is a subset of spatial databases developed by the New Hampshire Department of Environmental Services (NHDES). Development of these databases is an ongoing project; they may not contain all existing and potential sites, stations, or threats. The NHDES is not responsible for the use or interpretation of this information, or for any inaccuracies in the site names, tax map and lot information, or locations. All information is subject to verification. These data are to be used for planning purposes only; distribution is discouraged.
Access and use limitations: There are no access and use limitations for this item.

Sediment.shp

Summary: Meghan Wengrove a graduate student at UNH compiled data from 8 sources to delineate the location of sediment types in the Great Bay of New Hampshire and match them with the bathymetry and current fields.
Credits: Sediment data came from 8 sources: 1) Three different theses: Peter Armstrong (1974), Jason Clere (1993), Ata Bilgili (1993, 2000). 2) Larry Ward Ph.D. (1995). 3) Ray Grizzle Ph.D. (2010). 4) NHDES National Coastal Assessment Program. 5) Data collected during Meghan Wengrove's field experiments. Bathymetry from 2 sources: 1) Tom Lippmann Ph.D. raw data taken with a multi-beam sonar and GPS. 2) Larry Ward Ph.D.
Access and use limitations: Current data are unavailable, except for a partially validated model of currents from the 1990s.



Appendix B

Appendix B - NHDES PSP Toxicity Data Summary

SAMPNUM	SITEID	SITE	SAMPDATE	SAMPTYPE	PSP (µg toxin/100g tissue)
01-47	ACHB1	Hampton Beach/Atlantic Ocean1	10/29/2001	SURF CLAM	<44
01-48	ACHB1	Hampton Beach/Atlantic Ocean1	10/29/2001	SURF CLAM	<44
03-60	ACHB2	Hampton Beach/Atlantic Ocean2	9/30/2003	SURF CLAM	
08-13a	ACHB2	Hampton Beach/Atlantic Ocean2	5/9/2008	SURF CLAM	38
05-17	ACHB3	Hampton Beach/Atlantic Ocean3	5/27/2005	SURF CLAM	50.8
05-33	ACHB4	Hampton Beach/Atlantic Ocean4	6/23/2005	SURF CLAM	328
05-46	ACHB4	Hampton Beach/Atlantic Ocean4	7/21/2005	SURF CLAM	235
05-56	ACHB4	Hampton Beach/Atlantic Ocean4	8/22/2005	SURF CLAM	203
05-67	ACHB4	Hampton Beach/Atlantic Ocean4	9/20/2005	SURF CLAM	61
05-77	ACHB4	Hampton Beach/Atlantic Ocean4	10/18/2005	SURF CLAM	
05-82	ACHB4	Hampton Beach/Atlantic Ocean4	11/1/2005	SURF CLAM	111
05-84	ACHB4	Hampton Beach/Atlantic Ocean4	11/13/2005	SURF CLAM	56
05-86	ACHB4	Hampton Beach/Atlantic Ocean4	11/29/2005	SURF CLAM	59
05-87	ACHB4	Hampton Beach/Atlantic Ocean4	12/1/2005	SURF CLAM	79
06-09	ACHB4	Hampton Beach/Atlantic Ocean4	4/27/2006	SURF CLAM	63.5

06-13	ACHB4	Hampton Beach/Atlantic Ocean4	5/8/2006	SURF CLAM	55
06-32	ACHB4	Hampton Beach/Atlantic Ocean4	7/12/2006	SURF CLAM	58.4
07-22	ACHB4	Hampton Beach/Atlantic Ocean4	6/18/2007	SURF CLAM	74.4
07-27	ACHB4	Hampton Beach/Atlantic Ocean4	7/2/2007	SURF CLAM	48.7
08-13b	ACHB4	Hampton Beach/Atlantic Ocean4	5/9/2008	SURF CLAM	42
08-28a	ACHB4	Hampton Beach/Atlantic Ocean4	6/5/2008	SURF CLAM	145
08-43	ACHB4	Hampton Beach/Atlantic Ocean4	7/7/2008	SURF CLAM	98.4
08-53	ACHB4	Hampton Beach/Atlantic Ocean4	8/4/2008	SURF CLAM	79.4
08-57	ACHB4	Hampton Beach/Atlantic Ocean4	8/18/2008	SURF CLAM	65.8
09-45	ACHB4	Hampton Beach/Atlantic Ocean4	8/19/2009	SURF CLAM	83.2
09-52	ACHB4	Hampton Beach/Atlantic Ocean4	9/9/2009	SURF CLAM	57.7
01-50	ACJB1	Jenness Beach/Atlantic Ocean1	11/15/2001	SURF CLAM	<44
01-51	ACJB2	Jenness Beach/Atlantic Ocean2	11/15/2001	SURF CLAM	<44
06-43	ACLBH1	Atlantic Coast/Little Boars Head Aquaculture Site	8/14/2006	BLUE MUSSEL	<44
04-38	ACRH2	Rye Harbor	8/16/2004	BLUE MUSSEL	<44
04-44	ACRH2	Rye Harbor	8/31/2004	BLUE MUSSEL	<44
04-47	ACRH2	Rye Harbor	9/8/2004	BLUE MUSSEL	<44
05-74	ACRH2	Rye Harbor	10/10/2005	BLUE MUSSEL	<44
03-18	ACRL1	Rye Ledge	6/5/2003	BLUE MUSSEL	<44

03-21	ACRL1	Rye Ledge	6/10/2003	BLUE MUSSEL	<44
03-24	ACRL1	Rye Ledge	6/12/2003	BLUE MUSSEL	<44
03-25	ACRL1	Rye Ledge	6/16/2003	BLUE MUSSEL	50.8
03-31	ACRL1	Rye Ledge	6/23/2003	BLUE MUSSEL	51.5
03-34	ACRL1	Rye Ledge	6/30/2003	BLUE MUSSEL	<44
03-61	ACRL1	Rye Ledge	10/1/2003	BLUE MUSSEL	<44
05-39	ACUNH1	UNH Offshore Aquaculture Site1	7/5/2005	BLUE MUSSEL	154
05-43	ACUNH1	UNH Offshore Aquaculture Site1	7/12/2005	BLUE MUSSEL	47.7
05-45	ACUNH1	UNH Offshore Aquaculture Site1	7/19/2005	BLUE MUSSEL	44.7
05-21	GBAP1	Great Bay/Adams Point	6/1/2005	AMERICAN OYSTER	<44
05-28	GBAP1	Great Bay/Adams Point	6/15/2005	AMERICAN OYSTER	<44
05-32	GBAP1	Great Bay/Adams Point	6/21/2005	AMERICAN OYSTER	<44
08-28b	GBAP1	Great Bay/Adams Point	6/5/2008	AMERICAN OYSTER	<42
09-19	GB-MARINE	Little Bay/Great Bay Marine	6/1/2009	BLUE MUSSEL	53
09-36	GB-MARINE	Little Bay/Great Bay Marine	7/21/2009	BLUE MUSSEL	51
03-29	GBNI1	Great Bay/Nannie Island	6/19/2003	AMERICAN OYSTER	<44
08-16	GBNI1	Great Bay/Nannie Island	5/15/2008	AMERICAN OYSTER	<44
08-19	GBNI1	Great Bay/Nannie Island	5/20/2008	AMERICAN OYSTER	<44
91-01	HHHR1	Hampton	4/1/1991	BLUE MUSSEL	<44
91-02	HHHR1	Hampton	4/7/1991	BLUE MUSSEL	<44
91-03	HHHR1	Hampton	4/14/1991	BLUE MUSSEL	<44
91-04	HHHR1	Hampton	4/21/1991	BLUE MUSSEL	<44
91-05	HHHR1	Hampton	4/28/1991	BLUE MUSSEL	<44
91-06	HHHR1	Hampton	5/2/1991	BLUE MUSSEL	45
91-07	HHHR1	Hampton	5/5/1991	BLUE MUSSEL	<44
91-08	HHHR1	Hampton	5/8/1991	BLUE MUSSEL	<44
91-09	HHHR1	Hampton	5/12/1991	BLUE MUSSEL	<44

91-10	HHHR1	Hampton	5/19/1991	BLUE MUSSEL	<44
91-11	HHHR1	Hampton	5/26/1991	BLUE MUSSEL	<44
91-12	HHHR1	Hampton	6/2/1991	BLUE MUSSEL	<44
91-13	HHHR1	Hampton	6/9/1991	BLUE MUSSEL	<44
91-14	HHHR1	Hampton	6/16/1991	BLUE MUSSEL	<44
91-15	HHHR1	Hampton	6/23/1991	BLUE MUSSEL	<44
91-16	HHHR1	Hampton	6/30/1991	BLUE MUSSEL	<44
91-17	HHHR1	Hampton	7/7/1991	BLUE MUSSEL	<44
91-18	HHHR1	Hampton	7/14/1991	BLUE MUSSEL	<44
91-19	HHHR1	Hampton	7/21/1991	BLUE MUSSEL	N/A
91-20	HHHR1	Hampton	7/28/1991	BLUE MUSSEL	<44
91-21	HHHR1	Hampton	8/4/1991	BLUE MUSSEL	<44
91-22	HHHR1	Hampton	8/11/1991	BLUE MUSSEL	<44
91-23	HHHR1	Hampton	8/18/1991	BLUE MUSSEL	<44
91-24	HHHR1	Hampton	8/25/1991	BLUE MUSSEL	<44
91-25	HHHR1	Hampton	9/2/1991	BLUE MUSSEL	<44
91-26	HHHR1	Hampton	9/9/1991	BLUE MUSSEL	<44
91-27	HHHR1	Hampton	9/15/1991	BLUE MUSSEL	<44
91-28	HHHR1	Hampton	9/22/1991	BLUE MUSSEL	<44
91-29	HHHR1	Hampton	10/6/1991	BLUE MUSSEL	<44
91-30	HHHR1	Hampton	10/13/1991	BLUE MUSSEL	<44
91-31	HHHR1	Hampton	10/27/1991	BLUE MUSSEL	<44
92-01	HHHR1	Hampton	4/5/1992	BLUE MUSSEL	<44
92-02	HHHR1	Hampton	4/12/1992	BLUE MUSSEL	<44
92-03	HHHR1	Hampton	4/20/1992	BLUE MUSSEL	<44
92-04	HHHR1	Hampton	4/26/1992	BLUE MUSSEL	<44
92-05	HHHR1	Hampton	5/3/1992	BLUE MUSSEL	<44
92-06	HHHR1	Hampton	5/10/1992	BLUE MUSSEL	<44

92-07	HHHR1	Hampton	5/17/1992	BLUE MUSSEL	<44
92-08	HHHR1	Hampton	5/24/1992	BLUE MUSSEL	<44
92-09	HHHR1	Hampton	5/31/1992	BLUE MUSSEL	<44
92-10	HHHR1	Hampton	6/7/1992	BLUE MUSSEL	<44
92-11	HHHR1	Hampton	6/14/1992	BLUE MUSSEL	<44
92-12	HHHR1	Hampton	6/21/1992	BLUE MUSSEL	<44
92-13	HHHR1	Hampton	6/28/1992	BLUE MUSSEL	<44
92-14	HHHR1	Hampton	7/5/1992	BLUE MUSSEL	<44
92-15	HHHR1	Hampton	7/19/1992	BLUE MUSSEL	<44
92-16	HHHR1	Hampton	7/26/1992	BLUE MUSSEL	<44
92-17	HHHR1	Hampton	8/2/1992	BLUE MUSSEL	<44
92-18	HHHR1	Hampton	8/9/1992	BLUE MUSSEL	<44
92-19	HHHR1	Hampton	8/17/1992	BLUE MUSSEL	<44
92-20	HHHR1	Hampton	8/23/1992	BLUE MUSSEL	<44
92-21	HHHR1	Hampton	8/30/1992	BLUE MUSSEL	<44
92-22	HHHR1	Hampton	9/7/1992	BLUE MUSSEL	<44
92-23	HHHR1	Hampton	9/13/1992	BLUE MUSSEL	<44
92-24	HHHR1	Hampton	9/20/1992	BLUE MUSSEL	<44
92-25	HHHR1	Hampton	9/27/1992	BLUE MUSSEL	<44
92-26	HHHR1	Hampton	10/4/1992	BLUE MUSSEL	<44
92-27	HHHR1	Hampton	10/13/1992	BLUE MUSSEL	<44
92-28	HHHR1	Hampton	10/18/1992	BLUE MUSSEL	<44
92-29	HHHR1	Hampton	10/25/1992	BLUE MUSSEL	<44
93-01	HHHR1	Hampton Beach	3/15/1993	SURF CLAM	<44
93-02	HHHR1	Hampton	4/14/1993	BLUE MUSSEL	<44
93-03	HHHR1	Hampton	4/21/1993	BLUE MUSSEL	<44
93-04	HHHR1	Hampton	4/27/1993	BLUE MUSSEL	<44
93-05	HHHR1	Hampton	5/4/1993	BLUE MUSSEL	70
93-06	HHHR1	Hampton	5/5/1993	BLUE MUSSEL	75
93-07	HHHR1	Hampton	5/11/1993	BLUE MUSSEL	134

93-08	HHHR1	Hampton	5/18/1993	BLUE MUSSEL	63
93-09	HHHR1	Hampton	5/25/1993	BLUE MUSSEL	67
93-10	HHHR1	Hampton	6/2/1993	BLUE MUSSEL	214
93-11	HHHR1	Hampton	6/8/1993	BLUE MUSSEL	127
93-12	HHHR1	Hampton	6/14/1993	BLUE MUSSEL	68
93-13	HHHR1	Hampton	6/22/1993	BLUE MUSSEL	<44
93-14	HHHR1	Hampton	6/29/1993	BLUE MUSSEL	<44
93-15	HHHR1	Hampton	7/7/1993	BLUE MUSSEL	<44
93-16	HHHR1	Hampton	7/14/1993	BLUE MUSSEL	<44
93-17	HHHR1	Hampton	7/20/1993	BLUE MUSSEL	<44
93-18	HHHR1	Hampton	7/27/1993	BLUE MUSSEL	<44
93-19	HHHR1	Hampton	8/2/1993	BLUE MUSSEL	<44
93-20	HHHR1	Hampton	8/10/1993	BLUE MUSSEL	<44
93-21	HHHR1	Hampton	8/16/1993	BLUE MUSSEL	<44
93-22	HHHR1	Hampton	8/24/1993	BLUE MUSSEL	<44
93-23	HHHR1	Hampton	8/30/1993	BLUE MUSSEL	<44
93-24	HHHR1	Hampton	9/8/1993	BLUE MUSSEL	<44
93-25	HHHR1	Hampton	9/13/1993	BLUE MUSSEL	<44
93-26	HHHR1	Hampton	9/21/1993	BLUE MUSSEL	<44
93-27	HHHR1	Hampton	9/27/1993	BLUE MUSSEL	<44
93-28	HHHR1	Hampton	10/5/1993	BLUE MUSSEL	<44
93-29	HHHR1	Hampton	10/11/1993	BLUE MUSSEL	<44
93-30	HHHR1	Hampton	10/20/1993	BLUE MUSSEL	<44
93-31	HHHR1	Hampton	10/25/1993	BLUE MUSSEL	<44
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94-09	HHHR1	Hampton	5/24/1994	BLUE MUSSEL	63
94-10	HHHR1	Hampton	5/26/1994	BLUE MUSSEL	68
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04-03	HHHR1	Hampton	4/14/2004	BLUE MUSSEL	<44
04-04	HHHR1	Hampton	4/20/2004	BLUE MUSSEL	<44
04-05	HHHR1	Hampton	4/28/2004	BLUE MUSSEL	<44
04-06	HHHR1	Hampton	5/5/2004	BLUE MUSSEL	<44
04-08	HHHR1	Hampton	5/11/2004	BLUE MUSSEL	<44
04-11	HHHR1	Hampton	5/19/2004	BLUE MUSSEL	<44
04-13	HHHR1	Hampton	5/26/2004	BLUE MUSSEL	<44
04-14	HHHR1	Hampton	5/31/2004	BLUE MUSSEL	<44
04-16	HHHR1	Hampton	6/7/2004	BLUE MUSSEL	<44
04-18	HHHR1	Hampton	6/13/2004	BLUE MUSSEL	<44
04-20	HHHR1	Hampton	6/20/2004	BLUE MUSSEL	

04-21	HHHR1	Hampton	6/21/2004	BLUE MUSSEL	<44
04-24	HHHR1	Hampton	6/28/2004	BLUE MUSSEL	<44
04-25	HHHR1	Hampton	7/5/2004	BLUE MUSSEL	<44
04-27	HHHR1	Hampton	7/12/2004	BLUE MUSSEL	<44
04-29	HHHR1	Hampton	7/18/2004	BLUE MUSSEL	<44
04-31	HHHR1	Hampton	7/26/2004	BLUE MUSSEL	<44
04-33	HHHR1	Hampton	8/1/2004	BLUE MUSSEL	<44
04-35	HHHR1	Hampton	8/9/2004	BLUE MUSSEL	<44
04-37	HHHR1	Hampton	8/15/2004	BLUE MUSSEL	<44
04-40	HHHR1	Hampton	8/23/2004	BLUE MUSSEL	<44
04-42	HHHR1	Hampton	8/29/2004	BLUE MUSSEL	<44
04-43	HHHR1	Hampton	8/31/2004	BLUE MUSSEL	<44
04-46	HHHR1	Hampton	9/8/2004	BLUE MUSSEL	<44
04-49	HHHR1	Hampton	9/12/2004	BLUE MUSSEL	<44
04-52	HHHR1	Hampton	9/22/2004	BLUE MUSSEL	<44
04-53	HHHR1	Hampton	9/26/2004	BLUE MUSSEL	<44
04-55	HHHR1	Hampton	10/4/2004	BLUE MUSSEL	<44
04-56	HHHR1	Hampton	10/11/2004	BLUE MUSSEL	<44
04-57	HHHR1	Hampton	10/18/2004	BLUE MUSSEL	<44
05-01	HHHR1	Hampton	4/5/2005	BLUE MUSSEL	<44
05-02	HHHR1	Hampton	4/11/2005	BLUE MUSSEL	<44
05-03	HHHR1	Hampton	4/18/2005	BLUE MUSSEL	<44
05-04	HHHR1	Hampton	4/25/2005	BLUE MUSSEL	<44
05-05	HHHR1	Hampton	5/2/2005	BLUE MUSSEL	<44
05-08	HHHR1	Hampton	5/6/2005	BLUE MUSSEL	<44
05-11	HHHR1	Hampton	5/12/2005	BLUE MUSSEL	<44
05-13	HHHR1	Hampton	5/18/2005	BLUE MUSSEL	60
05-16	HHHR1	Hampton	5/25/2005	BLUE MUSSEL	129
05-19	HHHR1	Hampton	5/31/2005	BLUE MUSSEL	591

05-22	HHHR1	Hampton	6/6/2005	BLUE MUSSEL	822
05-26	HHHR1	Hampton	6/13/2005	BLUE MUSSEL	349
05-31	HHHR1	Hampton	6/21/2005	BLUE MUSSEL	263
05-37	HHHR1	Hampton	6/28/2005	BLUE MUSSEL	86.6
05-40	HHHR1	Hampton	7/5/2005	BLUE MUSSEL	44.9
05-41	HHHR1	Hampton	7/11/2005	BLUE MUSSEL	<44
05-47	HHHR1	Hampton	7/21/2005	BLUE MUSSEL	<44
05-49	HHHR1	Hampton	7/26/2005	BLUE MUSSEL	<44
05-51	HHHR1	Hampton	8/1/2005	BLUE MUSSEL	<44
05-52	HHHR1	Hampton	8/8/2005	BLUE MUSSEL	<44
05-54	HHHR1	Hampton	8/15/2005	BLUE MUSSEL	<44
05-57	HHHR1	Hampton	8/22/2005	BLUE MUSSEL	<44
05-60	HHHR1	Hampton	8/30/2005	BLUE MUSSEL	<44
05-62	HHHR1	Hampton	9/6/2005	BLUE MUSSEL	<44
05-63	HHHR1	Hampton	9/12/2005	BLUE MUSSEL	<44
05-65	HHHR1	Hampton	9/19/2005	BLUE MUSSEL	<44
05-69	HHHR1	Hampton	9/26/2005	BLUE MUSSEL	<44
05-71	HHHR1	Hampton	10/3/2005	BLUE MUSSEL	<44
05-75	HHHR1	Hampton	10/10/2005	BLUE MUSSEL	<44
05-78	HHHR1	Hampton	10/18/2005	BLUE MUSSEL	<44
05-79	HHHR1	Hampton	10/24/2005	BLUE MUSSEL	<44
05-81	HHHR1	Hampton	10/31/2005	BLUE MUSSEL	<44
05-83	HHHR1	Hampton	11/7/2005	BLUE MUSSEL	<44
05-85	HHHR1	Hampton	11/15/2005	BLUE MUSSEL	<44
06-02	HHHR1	Hampton	4/4/2006	BLUE MUSSEL	<44
06-03	HHHR1	Hampton	4/9/2006	BLUE MUSSEL	<44
06-05	HHHR1	Hampton	4/17/2006	BLUE MUSSEL	<44
06-07	HHHR1	Hampton	4/25/2006	BLUE MUSSEL	<44
06-10	HHHR1	Hampton	5/2/2006	BLUE MUSSEL	<44

06-12	HHHR1	Hampton	5/8/2006	BLUE MUSSEL	48
06-14	HHHR1	Hampton	5/11/2006	BLUE MUSSEL	<44
06-15	HHHR1	Hampton	5/17/2006	BLUE MUSSEL	45
06-17	HHHR1	Hampton	5/22/2006	BLUE MUSSEL	<44
06-19	HHHR1	Hampton	5/30/2006	BLUE MUSSEL	<44
06-21	HHHR1	Hampton	6/6/2006	BLUE MUSSEL	<44
06-23	HHHR1	Hampton	6/12/2006	BLUE MUSSEL	47.4
06-25	HHHR1	Hampton	6/19/2006	BLUE MUSSEL	46.6
06-27	HHHR1	Hampton	6/26/2006	BLUE MUSSEL	<44
06-29	HHHR1	Hampton	7/3/2006	BLUE MUSSEL	<44
06-30	HHHR1	Hampton	7/11/2006	BLUE MUSSEL	<44
06-34	HHHR1	Hampton	7/19/2006	BLUE MUSSEL	<44
06-35	HHHR1	Hampton	7/24/2006	BLUE MUSSEL	<44
06-37	HHHR1	Hampton	7/31/2006	BLUE MUSSEL	<44
06-39	HHHR1	Hampton	8/7/2006	BLUE MUSSEL	<44
06-41	HHHR1	Hampton	8/14/2006	BLUE MUSSEL	<44
06-45	HHHR1	Hampton	8/21/2006	BLUE MUSSEL	<44
06-48	HHHR1	Hampton	8/28/2006	BLUE MUSSEL	<44
06-50	HHHR1	Hampton	9/6/2006	BLUE MUSSEL	<44
06-51	HHHR1	Hampton	9/11/2006	BLUE MUSSEL	<44
06-53	HHHR1	Hampton	9/19/2006	BLUE MUSSEL	<44
06-54	HHHR1	Hampton	9/25/2006	BLUE MUSSEL	<44
06-56	HHHR1	Hampton	10/3/2006	BLUE MUSSEL	<44
06-57	HHHR1	Hampton	10/9/2006	BLUE MUSSEL	<44
06-58	HHHR1	Hampton	10/15/2006	BLUE MUSSEL	<44
06-59	HHHR1	Hampton	10/23/2006	BLUE MUSSEL	<44
06-60	HHHR1	Hampton	10/30/2006	BLUE MUSSEL	<44
07-01	HHHR1	Hampton	4/2/2007	BLUE MUSSEL	<44
07-02	HHHR1	Hampton	4/10/2007	BLUE MUSSEL	<44

07-04	HHHR1	Hampton	4/18/2007	BLUE MUSSEL	<44
07-05	HHHR1	Hampton	4/23/2007	BLUE MUSSEL	<44
07-07	HHHR1	Hampton	5/1/2007	BLUE MUSSEL	<44
07-09	HHHR1	Hampton	5/7/2007	BLUE MUSSEL	44.8
07-11	HHHR1	Hampton	5/9/2007	BLUE MUSSEL	<44
07-15	HHHR1	Hampton	5/23/2007	BLUE MUSSEL	<44
07-16	HHHR1	Hampton	5/29/2007	BLUE MUSSEL	<44
07-32	HHHR1	Hampton	7/17/2007	BLUE MUSSEL	<44
07-35	HHHR1	Hampton	7/24/2007	BLUE MUSSEL	<44
07-36	HHHR1	Hampton	7/30/2007	BLUE MUSSEL	<44
07-38	HHHR1	Hampton	8/6/2007	BLUE MUSSEL	<44
07-44	HHHR1	Hampton	8/27/2007	BLUE MUSSEL	<44
07-46	HHHR1	Hampton	9/4/2007	BLUE MUSSEL	<44
07-54	HHHR1	Hampton	10/1/2007	BLUE MUSSEL	<44
07-55	HHHR1	Hampton	10/9/2007	BLUE MUSSEL	<44
08-04	HHHR1	Hampton	4/9/2008	BLUE MUSSEL	<44
08-07	HHHR1	Hampton	4/22/2008	BLUE MUSSEL	<44
08-12	HHHR1	Hampton	5/7/2008	BLUE MUSSEL	175
08-31	HHHR1	Hampton	6/11/2008	BLUE MUSSEL	487
08-36	HHHR1	Hampton	6/23/2008	BLUE MUSSEL	59.7
08-42	HHHR1	Hampton	7/7/2008	BLUE MUSSEL	<44
08-52	HHHR1	Hampton	8/4/2008	BLUE MUSSEL	<44
08-59	HHHR1	Hampton	8/19/2008	BLUE MUSSEL	<44
08-62	HHHR1	Hampton	9/2/2008	BLUE MUSSEL	<44
08-68	HHHR1	Hampton	9/17/2008	BLUE MUSSEL	<44
08-71	HHHR1	Hampton	9/29/2008	SOFSHELL CLAM	<44
08-75	HHHR1	Hampton	10/20/2008	BLUE MUSSEL	<44
09-01	HHHR1	Hampton	4/5/2009	BLUE MUSSEL	<44
09-04	HHHR1	Hampton	4/14/2009	BLUE MUSSEL	<44

09-08	HHHR1	Hampton	4/28/2009	BLUE MUSSEL	<44
09-12	HHHR1	Hampton	5/13/2009	BLUE MUSSEL	48.6
09-15	HHHR1	Hampton	5/26/2009	BLUE MUSSEL	53.4
09-18	HHHR1	Hampton	6/1/2009	BLUE MUSSEL	73.9
09-22	HHHR1	Hampton	6/8/2009	BLUE MUSSEL	47.2
09-28	HHHR1	Hampton	6/29/2009	BLUE MUSSEL	<44
09-40	HHHR1	Hampton	8/4/2009	BLUE MUSSEL	<44
09-47	HHHR1	Hampton	8/24/2009	BLUE MUSSEL	<44
09-56	HHHR1	Hampton	9/21/2009	BLUE MUSSEL	<44
09-61	HHHR1	Hampton	10/12/2009	BLUE MUSSEL	<44
07-13	HHHR2	Hampton	5/14/2007	BLUE MUSSEL	<44
07-18	HHHR2	Hampton	6/5/2007	BLUE MUSSEL	<44
07-20	HHHR2	Hampton	6/12/2007	BLUE MUSSEL	99
07-21	HHHR2	Hampton	6/17/2007	BLUE MUSSEL	166
07-26	HHHR2	Hampton	6/26/2007	BLUE MUSSEL	<44
07-29	HHHR2	Hampton	7/5/2007	BLUE MUSSEL	<44
07-30	HHHR2	Hampton	7/10/2007	BLUE MUSSEL	<44
07-41	HHHR2	Hampton	8/14/2007	BLUE MUSSEL	<44
07-43	HHHR2	Hampton	8/21/2007	BLUE MUSSEL	<44
07-48	HHHR2	Hampton	9/10/2007	BLUE MUSSEL	<44
07-50	HHHR2	Hampton	9/17/2007	BLUE MUSSEL	<44
07-53	HHHR2	Hampton	9/24/2007	BLUE MUSSEL	<44
07-56	HHHR2	Hampton	10/15/2007	BLUE MUSSEL	<44
07-57	HHHR2	Hampton	10/23/2007	BLUE MUSSEL	<44
07-58	HHHR2	Hampton	10/29/2007	BLUE MUSSEL	<44
08-01	HHHR2	Hampton	4/2/2008	BLUE MUSSEL	<44
08-05	HHHR2	Hampton	4/15/2008	BLUE MUSSEL	<44
08-09	HHHR2	Hampton	4/28/2008	BLUE MUSSEL	<44
08-14	HHHR2	Hampton	5/12/2008	BLUE MUSSEL	296

08-21	HHHR2	Hampton	5/21/2008	BLUE MUSSEL	143
08-22	HHHR2	Hampton	5/27/2008	BLUE MUSSEL	78.3
08-28	HHHR2	Hampton	6/5/2008	BLUE MUSSEL	682
08-35	HHHR2	Hampton	6/17/2008	BLUE MUSSEL	146
08-39	HHHR2	Hampton	6/30/2008	BLUE MUSSEL	<44
08-45	HHHR2	Hampton	7/14/2008	BLUE MUSSEL	<44
08-49	HHHR2	Hampton	7/22/2008	BLUE MUSSEL	<44
08-50	HHHR2	Hampton	7/28/2008	BLUE MUSSEL	<44
08-55	HHHR2	Hampton	8/13/2008	BLUE MUSSEL	<44
08-60	HHHR2	Hampton	8/26/2008	BLUE MUSSEL	<44
08-65	HHHR2	Hampton	9/8/2008	BLUE MUSSEL	<44
08-69	HHHR2	Hampton	9/22/2008	BLUE MUSSEL	<44
08-72	HHHR2	Hampton	9/29/2008	BLUE MUSSEL	<44
08-73	HHHR2	Hampton	10/5/2008	BLUE MUSSEL	<44
08-74	HHHR2	Hampton	10/13/2008	BLUE MUSSEL	<44
08-76	HHHR2	Hampton	10/28/2008	BLUE MUSSEL	<44
09-03	HHHR2	Hampton	4/13/2009	BLUE MUSSEL	<44
09-05	HHHR2	Hampton	4/20/2009	BLUE MUSSEL	<44
09-09	HHHR2	Hampton	5/4/2009	BLUE MUSSEL	<44
09-14	HHHR2	Hampton	5/19/2009	BLUE MUSSEL	<44
09-17	HHHR2	Hampton	5/28/2009	BLUE MUSSEL	77.4
09-24	HHHR2	Hampton	6/15/2009	BLUE MUSSEL	<44
09-26	HHHR2	Hampton	6/22/2009	BLUE MUSSEL	<44
09-30	HHHR2	Hampton	7/6/2009	BLUE MUSSEL	<44
09-33	HHHR2	Hampton	7/15/2009	BLUE MUSSEL	332
09-37	HHHR2	Hampton	7/23/2009	BLUE MUSSEL	46
09-38	HHHR2	Hampton	7/28/2009	BLUE MUSSEL	49
09-42	HHHR2	Hampton	8/10/2009	BLUE MUSSEL	<44
09-44	HHHR2	Hampton	8/17/2009	BLUE MUSSEL	<44

09-50	HHHR2	Hampton	9/2/2009	BLUE MUSSEL	<44
09-53	HHHR2	Hampton	9/9/2009	BLUE MUSSEL	<44
09-55	HHHR2	Hampton	9/16/2009	BLUE MUSSEL	<44
09-59	HHHR2	Hampton	9/29/2009	BLUE MUSSEL	<44
09-60	HHHR2	Hampton	10/5/2009	BLUE MUSSEL	<44
09-62	HHHR2	Hampton	10/19/2009	BLUE MUSSEL	<44
05-68	HHMG1	Hampton/Middle Ground	9/26/2005	SOFTSHELL CLAM	<44
09-46	HHMG1	Hampton/Middle Ground	8/19/2009	SOFTSHELL CLAM	<44
05-59	HHWL1	Hampton/Willows Flat	8/30/2005	SOFTSHELL CLAM	<44
06-47	HHWL1	Hampton/Willows Flat	8/28/2006	SOFTSHELL CLAM	<44
08-47	IOSLUNGING	off of Lunging Island, Isles of Shoals	7/17/2008	LOBSTER TOMALLEY	233
00-09	IOSSI1	Star Island	5/24/2000	BLUE MUSSEL	<44
00-14	IOSSI1	Star Island	6/21/2000	BLUE MUSSEL	<44
00-16	IOSSI1	Star Island	6/28/2000	BLUE MUSSEL	<44
00-18	IOSSI1	Star Island	7/5/2000	BLUE MUSSEL	<44
00-20	IOSSI1	Star Island	7/12/2000	BLUE MUSSEL	<44
00-22	IOSSI1	Star Island	7/19/2000	BLUE MUSSEL	<44
00-24	IOSSI1	Star Island	7/26/2000	BLUE MUSSEL	<44
00-26	IOSSI1	Star Island	8/3/2000	BLUE MUSSEL	<44
00-28	IOSSI1	Star Island	8/9/2000	BLUE MUSSEL	<44
00-29	IOSSI1	Star Island	8/15/2000	BLUE MUSSEL	<44
00-33	IOSSI1	Star Island	8/23/2000	BLUE MUSSEL	<44
00-35	IOSSI1	Star Island	8/30/2000	BLUE MUSSEL	<44
00-37	IOSSI1	Star Island	9/6/2000	BLUE MUSSEL	<44
00-40	IOSSI1	Star Island	9/20/2000	BLUE MUSSEL	<44
00-42	IOSSI1	Star Island	9/28/2000	BLUE MUSSEL	<44
01-06	IOSSI1	Star Island	5/8/2001	BLUE MUSSEL	<44
01-08	IOSSI1	Star Island	5/14/2001	BLUE MUSSEL	<44

01-11	IOSSI1	Star Island	5/25/2001	BLUE MUSSEL	<44
01-13	IOSSI1	Star Island	6/4/2001	BLUE MUSSEL	<44
01-17	IOSSI1	Star Island	6/20/2001	BLUE MUSSEL	<44
01-19	IOSSI1	Star Island	6/27/2001	BLUE MUSSEL	<44
01-21	IOSSI1	Star Island	7/2/2001	BLUE MUSSEL	<44
01-24	IOSSI1	Star Island	7/18/2001	BLUE MUSSEL	<44
01-25	IOSSI1	Star Island	7/25/2001	BLUE MUSSEL	<44
01-28	IOSSI1	Star Island	8/1/2001	BLUE MUSSEL	<44
01-29	IOSSI1	Star Island	8/8/2001	BLUE MUSSEL	<44
01-32	IOSSI1	Star Island	8/15/2001	BLUE MUSSEL	<44
01-34	IOSSI1	Star Island	8/23/2001	BLUE MUSSEL	<44
01-36	IOSSI1	Star Island	8/29/2001	BLUE MUSSEL	<44
01-37	IOSSI1	Star Island	9/5/2001	BLUE MUSSEL	<44
01-40	IOSSI1	Star Island	9/12/2001	BLUE MUSSEL	<44
01-41	IOSSI1	Star Island	9/19/2001	BLUE MUSSEL	<44
02-19	IOSSI1	Star Island	6/27/2002	BLUE MUSSEL	<44
02-21	IOSSI1	Star Island	7/2/2002	BLUE MUSSEL	<44
02-22	IOSSI1	Star Island	7/9/2002	BLUE MUSSEL	<44
02-25	IOSSI1	Star Island	7/16/2002	BLUE MUSSEL	<44
02-27	IOSSI1	Star Island	7/24/2002	BLUE MUSSEL	<44
02-29	IOSSI1	Star Island	7/31/2002	BLUE MUSSEL	<44
02-30	IOSSI1	Star Island	8/6/2002	BLUE MUSSEL	<44
02-33	IOSSI1	Star Island	8/13/2002	BLUE MUSSEL	<44
02-34	IOSSI1	Star Island	8/20/2002	BLUE MUSSEL	<44
02-37	IOSSI1	Star Island	8/27/2002	BLUE MUSSEL	<44
02-39	IOSSI1	Star Island	9/3/2002	BLUE MUSSEL	<44
02-40	IOSSI1	Star Island	9/10/2002	BLUE MUSSEL	<44
02-43	IOSSI1	Star Island	9/18/2002	BLUE MUSSEL	<44
03-28	IOSSI1	Star Island	6/18/2003	BLUE MUSSEL	81.5

03-33	IOSSI1	Star Island	6/24/2003	BLUE MUSSEL	47.4
03-36	IOSSI1	Star Island	7/1/2003	BLUE MUSSEL	<44
03-37	IOSSI1	Star Island	7/7/2003	BLUE MUSSEL	<44
03-40	IOSSI1	Star Island	7/16/2003	BLUE MUSSEL	<44
03-41	IOSSI1	Star Island	7/22/2003	BLUE MUSSEL	<44
03-43	IOSSI1	Star Island	7/29/2003	BLUE MUSSEL	<44
03-46	IOSSI1	Star Island	8/4/2003	BLUE MUSSEL	
03-48	IOSSI1	Star Island	8/14/2003	BLUE MUSSEL	<44
03-50	IOSSI1	Star Island	8/19/2003	BLUE MUSSEL	<44
03-51	IOSSI1	Star Island	8/26/2003	BLUE MUSSEL	<44
03-54	IOSSI1	Star Island	9/2/2003	BLUE MUSSEL	<44
03-56	IOSSI1	Star Island	9/15/2003	BLUE MUSSEL	<44
03-63	IOSSI1	Star Island	10/7/2003	BLUE MUSSEL	<44
04-15	IOSSI1	Star Island	6/1/2004	BLUE MUSSEL	44.6
04-17	IOSSI1	Star Island	6/9/2004	BLUE MUSSEL	44.7
04-19	IOSSI1	Star Island	6/16/2004	BLUE MUSSEL	<44
04-22	IOSSI1	Star Island	6/22/2004	BLUE MUSSEL	<44
04-23	IOSSI1	Star Island	6/28/2004	BLUE MUSSEL	<44
04-26	IOSSI1	Star Island	7/6/2004	BLUE MUSSEL	<44
04-28	IOSSI1	Star Island	7/12/2004	BLUE MUSSEL	<44
04-30	IOSSI1	Star Island	7/20/2004	BLUE MUSSEL	<44
04-32	IOSSI1	Star Island	7/27/2004	BLUE MUSSEL	<44
04-34	IOSSI1	Star Island	8/2/2004	BLUE MUSSEL	<44
04-36	IOSSI1	Star Island	8/10/2004	BLUE MUSSEL	47.2
04-39	IOSSI1	Star Island	8/17/2004	BLUE MUSSEL	<44
04-41	IOSSI1	Star Island	8/24/2004	BLUE MUSSEL	67.7
04-45	IOSSI1	Star Island	8/31/2004	BLUE MUSSEL	206
04-48	IOSSI1	Star Island	9/8/2004	BLUE MUSSEL	143
04-50	IOSSI1	Star Island	9/15/2004	BLUE MUSSEL	59.3

04-51	IOSSI1	Star Island	9/22/2004	BLUE MUSSEL	<44
04-54	IOSSI1	Star Island	9/27/2004	BLUE MUSSEL	<44
07-39	IOSSI1	Star Island	8/8/2007	BLUE MUSSEL	<44
07-42	IOSSI1	Star Island	8/20/2007	BLUE MUSSEL	<44
07-49	IOSSI1	Star Island	9/13/2007	BLUE MUSSEL	<44
07-51	IOSSI1	Star Island	9/18/2007	BLUE MUSSEL	<44
02-08	IOSSI2	Star Island	5/20/2002	BLUE MUSSEL	<44
02-11	IOSSI2	Star Island	5/29/2002	BLUE MUSSEL	46.23
02-15	IOSSI2	Star Island	6/10/2002	BLUE MUSSEL	<44
03-10	IOSSI2	Star Island	5/15/2003	BLUE MUSSEL	<44
03-11	IOSSI2	Star Island	5/20/2003	BLUE MUSSEL	<44
03-15	IOSSI2	Star Island	5/28/2003	BLUE MUSSEL	<44
03-17	IOSSI2	Star Island	6/3/2003	BLUE MUSSEL	114
04-07	IOSSI2	Star Island	5/6/2004	BLUE MUSSEL	<44
04-09	IOSSI2	Star Island	5/12/2004	BLUE MUSSEL	<44
04-10	IOSSI2	Star Island	5/17/2004	BLUE MUSSEL	<44
04-12	IOSSI2	Star Island	5/24/2004	BLUE MUSSEL	<44
05-06	IOSSI2	Star Island	5/5/2005	BLUE MUSSEL	567
05-10	IOSSI2	Star Island	5/11/2005	BLUE MUSSEL	341
05-12	IOSSI2	Star Island	5/17/2005	BLUE MUSSEL	418
05-20	IOSSI2	Star Island	6/1/2005	BLUE MUSSEL	360
05-24	IOSSI2	Star Island	6/7/2005	BLUE MUSSEL	952.6
05-25	IOSSI2	Star Island	6/13/2005	BLUE MUSSEL	437
05-29	IOSSI2	Star Island	6/20/2005	BLUE MUSSEL	1224
05-34	IOSSI2	Star Island	6/27/2005	BLUE MUSSEL	386.5
05-38	IOSSI2	Star Island	7/5/2005	BLUE MUSSEL	164
05-42	IOSSI2	Star Island	7/12/2005	BLUE MUSSEL	<44
05-44	IOSSI2	Star Island	7/19/2005	BLUE MUSSEL	<44
05-48	IOSSI2	Star Island	7/24/2005	BLUE MUSSEL	<44

05-50	IOSSI2	Star Island	8/1/2005	BLUE MUSSEL	<44
05-53	IOSSI2	Star Island	8/8/2005	BLUE MUSSEL	<44
05-55	IOSSI2	Star Island	8/16/2005	BLUE MUSSEL	<44
05-58	IOSSI2	Star Island	8/24/2005	BLUE MUSSEL	<44
05-61	IOSSI2	Star Island	9/6/2005	BLUE MUSSEL	<44
05-64	IOSSI2	Star Island	9/13/2005	BLUE MUSSEL	<44
05-66	IOSSI2	Star Island	9/19/2005	BLUE MUSSEL	<44
05-70	IOSSI2	Star Island	9/26/2005	BLUE MUSSEL	<44
06-01	IOSSI2	Star Island	4/3/2006	BLUE MUSSEL	<44
06-04	IOSSI2	Star Island	4/10/2006	BLUE MUSSEL	<44
06-06	IOSSI2	Star Island	4/19/2006	BLUE MUSSEL	<44
06-08	IOSSI2	Star Island	4/26/2006	BLUE MUSSEL	<44
06-11	IOSSI2	Star Island	5/8/2006	BLUE MUSSEL	258
06-16	IOSSI2	Star Island	5/18/2006	BLUE MUSSEL	297
06-18	IOSSI2	Star Island	5/24/2006	BLUE MUSSEL	89.3
06-20	IOSSI2	Star Island	5/31/2006	BLUE MUSSEL	54.8
06-22	IOSSI2	Star Island	6/6/2006	BLUE MUSSEL	101
06-24	IOSSI2	Star Island	6/12/2006	BLUE MUSSEL	524
06-26	IOSSI2	Star Island	6/19/2006	BLUE MUSSEL	632
06-28	IOSSI2	Star Island	6/26/2006	BLUE MUSSEL	286
06-31	IOSSI2	Star Island	7/11/2006	BLUE MUSSEL	137
06-33	IOSSI2	Star Island	7/17/2006	BLUE MUSSEL	88
06-36	IOSSI2	Star Island	7/24/2006	BLUE MUSSEL	<44
06-38	IOSSI2	Star Island	7/31/2006	BLUE MUSSEL	<44
06-40	IOSSI2	Star Island	8/8/2006	BLUE MUSSEL	<44
06-42	IOSSI2	Star Island	8/14/2006	BLUE MUSSEL	<44
06-46	IOSSI2	Star Island	8/23/2006	BLUE MUSSEL	<44
06-49	IOSSI2	Star Island	8/30/2006	BLUE MUSSEL	<44
06-52	IOSSI2	Star Island	9/18/2006	BLUE MUSSEL	<44

06-55	IOSSI2	Star Island	9/27/2006	BLUE MUSSEL	<44
07-03	IOSSI2	Star Island	4/10/2007	BLUE MUSSEL	<44
07-06	IOSSI2	Star Island	4/25/2007	BLUE MUSSEL	<44
07-08	IOSSI2	Star Island	5/2/2007	BLUE MUSSEL	<44
07-10	IOSSI2	Star Island	5/7/2007	BLUE MUSSEL	<44
07-12	IOSSI2	Star Island	5/14/2007	BLUE MUSSEL	<44
07-14	IOSSI2	Star Island	5/21/2007	BLUE MUSSEL	<44
07-17	IOSSI2	Star Island	5/31/2007	BLUE MUSSEL	97.2
07-19	IOSSI2	Star Island	6/6/2007	BLUE MUSSEL	79.2
07-23	IOSSI2	Star Island	6/18/2007	BLUE MUSSEL	514
07-24	IOSSI2	Star Island	6/24/2007	BLUE MUSSEL	308
07-28	IOSSI2	Star Island	7/2/2007	BLUE MUSSEL	77.5
07-31	IOSSI2	Star Island	7/12/2007	BLUE MUSSEL	<44
07-33	IOSSI2	Star Island	7/17/2007	BLUE MUSSEL	<44
07-34	IOSSI2	Star Island	7/23/2007	BLUE MUSSEL	<44
07-37	IOSSI2	Star Island	7/31/2007	BLUE MUSSEL	<44
07-40	IOSSI2	Star Island	8/13/2007	BLUE MUSSEL	<44
07-45	IOSSI2	Star Island	8/27/2007	BLUE MUSSEL	<44
07-47	IOSSI2	Star Island	9/6/2007	BLUE MUSSEL	<44
07-52	IOSSI2	Star Island	9/24/2007	BLUE MUSSEL	<44
08-02	IOSSI2	Star Island	4/3/2008	BLUE MUSSEL	<44
08-03	IOSSI2	Star Island	4/8/2008	BLUE MUSSEL	<44
08-06	IOSSI2	Star Island	4/15/2008	BLUE MUSSEL	<44
08-08	IOSSI2	Star Island	4/22/2008	BLUE MUSSEL	<44
08-10	IOSSI2	Star Island	4/28/2008	BLUE MUSSEL	<44
08-11	IOSSI2	Star Island	5/6/2008	BLUE MUSSEL	164
08-17	IOSSI2	Star Island	5/15/2008	BLUE MUSSEL	442
08-20	IOSSI2	Star Island	5/20/2008	BLUE MUSSEL	1448
08-24	IOSSI2	Star Island	5/28/2008	BLUE MUSSEL	1170

08-26	IOSSI2	Star Island	6/3/2008	BLUE MUSSEL	1037
08-29	IOSSI2	Star Island	6/9/2008	BLUE MUSSEL	1773
08-34	IOSSI2	Star Island	6/16/2008	BLUE MUSSEL	566
08-38	IOSSI2	Star Island	6/24/2008	BLUE MUSSEL	136
08-41	IOSSI2	Star Island	7/1/2008	BLUE MUSSEL	130
08-44	IOSSI2	Star Island	7/8/2008	BLUE MUSSEL	46.8
08-46	IOSSI2	Star Island	7/15/2008	BLUE MUSSEL	<44
08-48	IOSSI2	Star Island	7/22/2008	BLUE MUSSEL	<44
08-51	IOSSI2	Star Island	7/30/2008	BLUE MUSSEL	<44
08-54	IOSSI2	Star Island	8/5/2008	BLUE MUSSEL	<44
08-56	IOSSI2	Star Island	8/13/2008	BLUE MUSSEL	<44
08-58	IOSSI2	Star Island	8/18/2008	BLUE MUSSEL	<44
08-61	IOSSI2	Star Island	8/26/2008	BLUE MUSSEL	<44
08-63	IOSSI2	Star Island	9/2/2008	BLUE MUSSEL	<44
08-66	IOSSI2	Star Island	9/8/2008	BLUE MUSSEL	<44
08-67	IOSSI2	Star Island	9/16/2008	BLUE MUSSEL	<44
08-70	IOSSI2	Star Island	9/22/2008	BLUE MUSSEL	<44
09-02	IOSSI2	Star Island	4/5/2009	BLUE MUSSEL	<44
09-06	IOSSI2	Star Island	4/20/2009	BLUE MUSSEL	<44
09-07	IOSSI2	Star Island	4/27/2009	BLUE MUSSEL	47.2
09-10	IOSSI2	Star Island	5/6/2009	BLUE MUSSEL	74.1
09-11	IOSSI2	Star Island	5/12/2009	BLUE MUSSEL	103.5
09-13	IOSSI2	Star Island	5/18/2009	BLUE MUSSEL	97.5
09-16	IOSSI2	Star Island	5/26/2009	BLUE MUSSEL	63.6
09-20	IOSSI2	Star Island	6/2/2009	BLUE MUSSEL	76.1
09-23	IOSSI2	Star Island	6/8/2009	BLUE MUSSEL	49
09-25	IOSSI2	Star Island	6/16/2009	BLUE MUSSEL	<44
09-27	IOSSI2	Star Island	6/24/2009	BLUE MUSSEL	<44
09-29	IOSSI2	Star Island	7/1/2009	BLUE MUSSEL	<44

09-32	IOSSI2	Star Island	7/13/2009	BLUE MUSSEL	1583
09-34	IOSSI2	Star Island	7/20/2009	BLUE MUSSEL	590
09-39	IOSSI2	Star Island	7/28/2009	BLUE MUSSEL	222
09-41	IOSSI2	Star Island	8/4/2009	BLUE MUSSEL	44.8
09-43	IOSSI2	Star Island	8/10/2009	BLUE MUSSEL	<44
09-48	IOSSI2	Star Island	8/26/2009	BLUE MUSSEL	<44
09-49	IOSSI2	Star Island	9/1/2009	BLUE MUSSEL	<44
09-51	IOSSI2	Star Island	9/8/2009	BLUE MUSSEL	<44
09-54	IOSSI2	Star Island	9/14/2009	BLUE MUSSEL	<44
09-57	IOSSI2	Star Island	9/21/2009	BLUE MUSSEL	<44
03-23	IOSSI3	Star Island	6/12/2003	BLUE MUSSEL	48.8
08-32	LBFP1	Little Bay/Fox Point	6/11/2008	SOFTSHELL CLAM	<44
09-31	LBFP2	Little Bay/Fox Point	7/13/2009	AMERICAN OYSTER	<44
09-35	LBFP2	Little Bay/Fox Point	7/20/2009	AMERICAN OYSTER	<44
03-19	LBHP1	Little Bay/Hilton Park	6/5/2003	BLUE MUSSEL	<44
03-27	LBHP1	Little Bay/Hilton Park	6/18/2003	BLUE MUSSEL	47.9
03-32	LBHP1	Little Bay/Hilton Park	6/24/2003	BLUE MUSSEL	<44
05-14	LBHP1	Little Bay/Hilton Park	5/19/2005	BLUE MUSSEL	<44
05-15	LBHP1	Little Bay/Hilton Park	5/24/2005	BLUE MUSSEL	45
05-18	LBHP1	Little Bay/Hilton Park	5/31/2005	BLUE MUSSEL	73
05-23	LBHP1	Little Bay/Hilton Park	6/6/2005	BLUE MUSSEL	46.6
05-27	LBHP1	Little Bay/Hilton Park	6/13/2005	BLUE MUSSEL	68.5
05-30	LBHP1	Little Bay/Hilton Park	6/21/2005	BLUE MUSSEL	53.8
05-36	LBHP1	Little Bay/Hilton Park	6/27/2005	BLUE MUSSEL	58.6
05-80	LBHP1	Little Bay/Hilton Park	10/26/2005	BLUE MUSSEL	<44
07-25	LBHP1	Little Bay/Hilton Park	6/25/2007	BLUE MUSSEL	<44

08-13	LBHP1	Little Bay/Hilton Park	5/7/2008	BLUE MUSSEL	48.6
08-15	LBHP1	Little Bay/Hilton Park	5/13/2008	BLUE MUSSEL	55.5
08-18	LBHP1	Little Bay/Hilton Park	5/19/2008	BLUE MUSSEL	52.8
08-23	LBHP1	Little Bay/Hilton Park	5/27/2008	BLUE MUSSEL	46.6
08-25	LBHP1	Little Bay/Hilton Park	6/3/2008	BLUE MUSSEL	754
08-27	LBHP1	Little Bay/Hilton Park	6/4/2008	BLUE MUSSEL	678
08-30	LBHP1	Little Bay/Hilton Park	6/9/2008	BLUE MUSSEL	497
08-33	LBHP1	Little Bay/Hilton Park	6/16/2008	BLUE MUSSEL	66
08-37	LBHP1	Little Bay/Hilton Park	6/23/2008	BLUE MUSSEL	<44
08-40	LBHP1	Little Bay/Hilton Park	6/30/2008	BLUE MUSSEL	<44
09-21	LBHP1	Little Bay/Hilton Park	6/3/2009	BLUE MUSSEL	45.2
05-72	LHSG1	Little Harbor/Sagamore Flat	10/3/2005	SOFTSHELL CLAM	<44
02-13	LHTF1	Little Harbor	5/29/2002	BLUE MUSSEL	<44
03-22	LHTF1	Little Harbor	6/10/2003	BLUE MUSSEL	44
03-62	LHTF1	Little Harbor	10/6/2003	BLUE MUSSEL	<44
05-07	LHTF1	Little Harbor	5/5/2005	BLUE MUSSEL	<44
05-09	LHTF1	Little Harbor	5/9/2005	BLUE MUSSEL	<44
05-35	LHTF1	Little Harbor	6/27/2005	BLUE MUSSEL	55.9
05-76	LHTF1	Little Harbor	10/10/2005	BLUE MUSSEL	<44
05-73	LHWM1	Little Harbor/Wentworth Mansion Bed	10/3/2005	BLUE MUSSEL	<44
06-44	LHWM1	Little Harbor/Wentworth Mansion Bed	8/21/2006	BLUE MUSSEL	<44
06-61	LHWM1	Little Harbor/Wentworth Mansion Bed	10/30/2006	BLUE MUSSEL	<44
08-64	LHWM1	Little Harbor/Wentworth Mansion Bed	9/4/2008	BLUE MUSSEL	<44
09-58	LHWM1	Little Harbor/Wentworth Mansion Bed	9/29/2009	BLUE MUSSEL	<44

Appendix C

2010

1. April 15, 2010: Newington Conservation Commission. Ray Grizzle and Krystin Ward. Meeting on a Minimum Impact Expedited Application required by the NHDES Wetlands Bureau.

This public meeting provided information on how the Newington Conservation Commission viewed oyster restoration and oyster farming activities in the context of their mission. Ray Grizzle presented a request to restore 1 acre of oyster reef at the bottom of Little Bay off Fox Point using seasoned ocean quahog and softshell clam shell with oyster spat set on the shell. Grizzle said this spot was chosen due to the known success of the Little Bay Oyster Farm in the adjacent area, the presence of suitable hard substrate, and scattered live oysters in the area. Grizzle said that it takes three years for oysters to reach market size, and currently most existing reefs are only living for four years and are then dying out from disease. Grizzle said that the primary purpose of the proposed restored reef is for ecological and educational purposes; and there will have no structures, no buoy markings and no harvesting.

Chair, Justin Richardson requested a more precise measurement of the placement of the reef, expressing a concern of possible interference with recreation activities like swimming, as well as the effects of activities such as jet skis and boat moorings might have on the habitat. Grizzle responded that the reef would be six feet below low tide, but agreed to provide more precise information on the proposed location.

Grizzle indicated that the NHDES confirmed that they would agree to an expedited permit for the project, which would fall under federal habitat restoration. George Fletcher asked about the effect oyster reefs have on nitrogen reductions, and Jane Hislop asked if there was any potential for EPA nitrogen reduction credits. Grizzle said that although many acres of oyster farms and/or reefs would be required to make substantial reductions in ambient nitrogen content of Great Bay, many scientists and management personnel consider oysters beneficial to the environment and the economy.

Grizzle asked how the commission would feel about additional oyster reefs or farms along the east side of Fox Point and Chair Richardson said they would need buoys to be extra careful of boaters and swimmers in the area. Nancy Cauvet moved that Chair, Justin Richardson sign the expedited application contingent on providing the exact location of the one-acre plot. Peggy Lamson seconded and all voted in favor before Chair Richardson signed the application.

2. May 13, 2010: Durham Conservation Commission. Ray Grizzle and Krystin Ward. Meeting on a Minimum Impact Expedited Application required by the NHDES Wetlands Bureau.

This public meeting provided information on how the Durham Conservation Commission viewed oyster restoration and oyster farming activities in the context of their mission. Grizzle presented a request for the proposed oyster reef restoration project, and distributed a map detailing the project noting that he is requesting an expedited NHDES wetlands permit. Grizzle reported the project will begin in approximately 3 months. He also explained that he is a partner in the Granite State Shellfish, LLC. He said the project sets aside ½ acre of the farm not to be used in

the project and that the project will consist of 1 acre of constructed/restored oyster reef. Grizzle said the funding will be from Natural Resources Conservation Service, a federal source of funding which goes directly to the farmers. Grizzle described the project as consisting of 30 cu yards of seasoned mollusk shell spread onto the bottom, then placing young oysters (spat) on the bed to provide a substrate for the natural oysters as a kind of "jump start" to further reef development. The project is in a closed area, so the oysters will not be harvested.

Commission members discussed with Grizzle if this project would have any impact on Mr. Ray Konisky's oyster project and the longevity expected of the oysters from this project. He explained that the project would not adversely affect Mr. Konisky's project and the longevity expected for the oysters is 2-4 years.

Stephen Roberts moved to recommend approval of the expedited DES wetland permit for the oyster farming project, this was SECONDED by Dwight Baldwin and APPROVED unanimously.

3. June 9, 2010: Piscataqua Region Estuaries Partnership, Attendees. Ray Konisky (TNC), Kevin Lucey (NHCP), Jeff Barnum (CCA), Colin Lawson (Antioch), Eric Hutchins (NOAA), Dave Burdick (UNH), Ray Grizzle (UNH), and Derek Sowers (PREP).

This meeting of representatives from management agencies provided information on views of the agencies present on oyster restoration and oyster farming, particularly focusing on how the two can be interrelated. Konisky and Grizzle gave a presentation on the need for oyster reef restoration, past projects, and current strategies for enhancing local populations. The successful 2009 "shell-planting" pilot is being followed by a full acre restoration reef to be sited in the Oyster River at Wagon Hill Farm in July. Techniques, logistics, and the regulatory permitting processes were described. Konisky provided general cost structures that are now at about $75K/acre restored. Grizzle discussed how shellfish farm areas have been in some cases set aside for conservation purposes, mainly in the form of "restoration" areas funded by the USDA's Natural Resources Conservation Service. He spoke about seed hatchery capacity at UNH and the potential for creating a brood stock local to Great Bay. Hutchins noted that New Jersey has just shut down its oyster conservationist program in all waters closed to harvest in response to pressure from commercial oyster harvesters. In contrast, the restoration and conservation community here in NH enjoys supportive relationships among regulators, NH Fish and Game, and oyster growers.

4. November 4, 2010: Grizzle phone conversation/meeting with Peter Wellenberger.

Ray Grizzle called Peter to discuss shellfish aquaculture in the GBNERR. He relayed to me that he did not object to existing or future shellfish aquaculture operations within the Reserve, but rather felt that any expansion should be done in a controlled manner. We both agreed that large-scale farms involving many acres are probably not appropriate, but smaller farms of a few acres likely are. We also agreed that determining the exact locations and numbers of future farms would need to proceed in a planned fashion, as we are presently doing with the shellfish expansion project coordinated through Chris Nash. I indicated that I plan on meeting with him in early 2011 to discuss the topic further.

5. December 8, 2010: Grizzle meeting with Steve Weglarz concerning a potential oyster farm.

I met with Steve at JEL for about an hour to discuss his interest in starting an oyster farm in New Hampshire. We discussed the overall process including choosing a site, permitting, grow-out techniques, purchasing seed, time and money commitments, and other topics. Steve has identified the general area north of Goat Island in Little Bay as a potential site. He has a background in salmon farming and is considering oyster farming as potential full-time occupation. I told him of the upcoming Northeast Shellfish Sanitation Association meeting in March 2011 and the focus of one session on opportunities for development of oyster farming in New Hampshire.

Steve has abandoned the Goat Island site and is now looking at an area in Durham across the bay from the Grizzle/Berlinsky farm.

6. Grizzle and Ward meeting at Moody Point, with Joe M. Girard from Newmarket, NH.

Met with Joe in Newmarket to discuss oyster aquaculture. Joe is originally from California and was interested in a large scale (30 acres) operation in Great Bay. He would fund the farm and hire managers and farmers to run it. Joe has run for NH state office.

2011

1. February 3, 2011: New Hampshire Fish and Game Department. Public hearing for a 2-acre shellfish aquaculture farm in Newington, NH for Krystin Ward.

DURHAM, N.H. -- The New Hampshire Fish and Game Department will hold a public hearing regarding a proposed oyster aquaculture operation on Thursday, February 3, 2011, at 10:00 a.m., at the New Hampshire Fish and Game Region 3 Office, 225 Main Street, Durham, N.H. The public is welcome to attend the hearing and to comment on the proposed aquaculture plan.

The aquaculture applicant, Krystin Ward, proposes to operate a 2-acre bottom oyster grow-out plot in the subtidal waters along the Newington shore in Upper Little Bay.

Krystin Ward spent 5-10 minutes covering a proposed 2 acre oyster aquaculture farm in Little Bay, at a public meeting in Newington at F&G's office in Durham, NH. Bruce Smith (F&G) was in attendance. Dave Keddell (USACOE), Chris Nash and Carol Elliott (DES), Will Carey (LBOC), Ray Grizzle (UNH) and abutters from Newington were in attendance. A copy of the aquaculture application was made available to the public and written questions or concerns were allowed from the public to the director of F&G in Concord, NH.

2. July 8, 2011: New Hampshire Fish and Game Department. Public hearing on two proposed marine aquaculture applications, one for Steve Weglarz and the other for Will Carey.

DURHAM, N.H. -- The New Hampshire Fish and Game Department will hold a public hearing on two proposed marine aquaculture applications for licenses Friday, July 8, 2011, at the N.H. Fish and Game Department's Region 3 Office, 225 Main St., Durham, N.H., 03824.

At 9:00 AM, Stephen Weglarz Jr, will be heard on his application for a two-acre bottom culture operation for American oyster and softshell clam. The location proposed is at the mouth of the Oyster River off the northeast side of Durham Point.

The second hearing will commence at 11:00 AM. This hearing is for William Carey, Little Bay Oyster Co., and concerns an expansion of 1.5 acres of his currently licensed operation in Upper Little Bay off Fox Point. Little Bay Oyster Co. has operated an oyster aquaculture business for the past three years in a 1.5-acre plot adjacent to the newly proposed site.

3. Grizzle and Ward meeting at UNH Jackson Estuarine Laboratory with Alex Biori and his friend concerning a potential oyster farm.

They are both seniors at the University of New Hampshire and will be graduating in 2011. They will partner with 2 other Massachusetts residents. They were interested in what gear to use and what areas to look for in the bay. Both of them did not know a lot about shellfish aquaculture. They are interested in a four acre farm.

4. Grizzle and Ward meeting at Jackson Estuarine Laboratory with Alex Boeri and his father Rob (3rd partner), as well as Jay Baker (fourth partner) concerning a potential oyster farm.

This is the second meeting about the steps needed to obtain an oyster farm in Great Bay. 4 acres is still the goal. Length of permit was discussed as well as what gear would work in the Great Bay system. Cost the # of oysters per acre was also discussed. These 4 partners eventually received a license from NHF&G in 2011 and call themselves "Fat Dog Shellfish LLC".

5. August 25, 2011: New Hampshire Fish and Game Department. Public hearing on proposed oyster aquaculture operation for Fat Dog Shellfish Company LLC.

DURHAM, N.H.-- The New Hampshire Fish and Game Department will hold a public hearing on a proposed marine aquaculture application for licensing on *Thursday, August 25, 2011, at 9:00 AM at the Department's Region 3 Office: 225 Main Street, Durham, NH, 03824*. The public is welcome to attend the hearing and to comment on the proposed aquaculture plan.

The aquaculture applicant, Fat Dog Shellfish Company LLC, will be heard on its application for a four-acre bottom culture operation of American oyster. The proposed location is along the edge of the Upper Little Bay channel, where it grades upward to a softer, shallow bottom.

6. January 31, 2011: Newmarket Conservation Commission. Krystin Ward and Ray Konisky. "Pre" public meeting.

Met with Drew Kiefaber and Jeffrey Goldknopf at 5:30 pm at TNC's Great Bay office. 2 Minimum Expedited Wetlands permits covering 3 proposed reefs at the mouth of the Lamprey River were discussed. Ray Konisky discussing 2 one acre reefs. Krystin Ward discussing a half-acre reef. Purpose: oyster reef restoration using seasoned ocean quahog and soft shell clamshell with oyster spat set on the shell.

7. February 10, 2011: Newmarket Conservation Commission. Ray Grizzle and Krystin Ward in attendance. Meeting on a Minimum Impact Expedited Application required by the DES Wetlands Bureau.

Two Minimum Expedited Wetlands permits covering three proposed reefs at the mouth of the Lamprey River were discussed. Ray Grizzle discussed a 1-acre reef and a 1 .5-acre reef. Purpose: oyster reef restoration using seasoned ocean quahog and soft shell clamshell with oyster spat-on-shell from remote setting.

8. February 17, 2011: Public hearing on proposed oyster aquaculture operation for Will Carey, Little Bay Oyster Co.

Aquaculture applicant William Carey proposes to hold a raft with suspended oysters at Great Bay Marine, Inc., in Newington, N.H. These oysters will eventually be transferred to Carey's existing aquaculture site in Upper Little Bay for grow-out and ultimate sale. Written comments on this proposal may be submitted by March 3, 2011.

9. November, 2011: UNH Jackson Estuarine Laboratory. Grizzle and Ward meeting with Michael Chambers (UNH) and Jonathan Bunker (UNH) discussing a potential oyster farm for Jonathan and Jessica Cranney.

Jonathan and Jessica have surveyed a potential 3 acre site on the northeast side of Fox Point heading towards Great Bay Marine. Jonathan and Michael wanted to discuss location, bottom type and gear type for the farm. We also discussed oyster survival, disease, and potential for sales in the area.

10. November, 2011: UNH Jackson Estuarine Laboratory. Grizzle meeting with Chris Phillips and a potential oyster farm.

Chris has surveyed Little Bay and found 3 potential sites which he discussed with Ray. He intends to decide on a 3 acre site and submit an application to NHF&G before the October site survey deadline. We discussed gear type, oyster survival, and locations.

11. Grizzle meeting with Adam Schroadter in Newmarket, NH.

Adam, now a state representative, owner of Stone Church, Newmarket and son-in-law of Joe Girard.

12. 2011 meeting: UNH Jackson Estuarine Laboratory. Grizzle and Ward meeting with Rob Cinq-Mar at Jackson Lab.

Rob was interested in “floating” structures for farming. He was concerned about the start-up costs and oyster survival on the farms.

2012

1. March 9, 2012: Fish and Game Department. Public Hearing on Two Proposed Great Bay Shellfish Operations: One for Chris Phillips and the other for Krystin Ward.

DURHAM, N.H. -- The New Hampshire Fish and Game Department will hold a public hearing regarding two proposed marine aquaculture applications for licensing on Friday, March 9, 2012, starting at 9:00 a.m. The hearing will be held at Fish and Game’s Region 3 Office, 225 Main Street, Durham, N.H. 03824. The public is welcome to attend the hearing and comment on the proposed aquaculture plans.

At 9:00 a.m., the application of Christopher J. Phillips of the Great Bay Oyster Co. in Dover will be heard regarding his proposed three-acre bottom culture operation of American oyster and hard clam. The proposed location is along the Dover Point shore of the Lower Little Bay, about 50 meters offshore the Scammell Bridge on Route 4.

At 10:00 a.m., the application of Krystin Ward of Choice Oysters, LLC, of Portsmouth will be heard on her proposed one-acre bottom culture site for American oyster and hard clam. The proposed location is at the north side of the mouth of the Oyster River in Durham.

Detailed plans for both proposed aquaculture operations are available for public review at the Fish and Game Region 3 Office in Durham or online.

WARD, Meeting Minutes:

To: File

From: B.W. Smith and Robert Eckert

Subject: Public Hearing for the Choice Oysters, LLC Proposed Aquaculture License

As required by Fis 807.07 (f) and (g), a public hearing was held at the New Hampshire Fish and Game Department's Region 3 Office at 10:00 AM on March 9, 2012. Prior to this, the applicant (Krystin Ward) had notified abutters and sent copies of the application to State and Federal agencies (807.07 (g). Written, public notice in local newspapers preceded the public hearing as required by 807.07 (i). The application was for a one (1) acre bottom site located in Lower Little Bay (see attached). American oyster and hard clams are the proposed species.

The hearing was opened by Doug Grout (Chief of Marine Fisheries) at 10:05 AM. Introductory comments included the purpose of the hearing, a brief review of the process for marine aquaculture licensing and he described the Department's survey (see attachment). Following this, the applicant gave a presentation and circulated copies of an overview (attached) that described the proposed project. Salient points were as follows:

Krystin Ward:

One (1) acre site north of the mouth of the Oyster River.

Deep water for overwintering.

Hard clams will go on the bottom.

500,000 oysters this year, bottom culture in bags and condos or stacked trays (4ft. x 3ft. x 1.8 ft.). Small orange buoys to mark each condo, four (4) large buoys mark site.

Questions from representatives of government agencies, as well as the general public, were requested. The following questions were asked and answered:

I live near the site, would my view change?

Not much, clams are in the shallow part of the site. Oyster condos in deeper water; usually not seen. Maybe at extreme low tides you will see the oyster condos.

How will this site affect future moorings in area?

The moorings may have to be located further from site. Most of the site is in shallower water and should not affect mooring placement. The site is located pretty far from any current mooring.

How will your clam's affect local clammers?

The site will be marked with buoys and any clam in that area will be private.

Doug Grout: No soft shell clams were seen during a Scuba survey of the site, so there should not be much activity by local clammers in the site area.

Ray Grizzle: Hardshell clams do occur naturally in this area but are usually as singles. They do very well in our local waters.

What about sight pollution (flags, buoys, boat traffic)?

Going to have pontoon boat, this has a smaller engine and is not noisy. The condos will be in deeper water and you will rarely ever see them.

Where are the oysters from? Are they sterile?

From a hatchery in Maine, they are not sterile and will produce offspring.

When will you harvest?

Harvest when they are three (3) years old.

Concerns about diseases?

No, all seed are certified disease free.

Will you use sterile oyster? (I have heard they grow faster)

They do grow faster, but no plan on using sterile oysters.

How will you harvest the hard clams?

Dig up one by one in the sand.

There is a sign near your site that says no anchoring because of pipe line; Problem?

No problem, I will be held stable by pulling up condos and will be walking on flats to harvest the hard clams.

Are you going to leave holes on the flats and litter the area?

Goal is not to litter the beach in any way. You will not be able to see condos and plan is not to destroy the area. Hard clams collected by digging.

Ray Grizzle: Hard clams only dig down a few inches and are going to be on the sand. They are collected using a rake and do not need to be collected during low tide.

Will you see the buoys and condos at low tide?

Yes for buoys, and condos only at extreme low tides.

Will you disturb the seals?

Ray Grizzle:

I have been able to be within 30-40 feet of seals before they move. This operation will not disturb the seals.

The audience (see attached attendance sheet) was invited to present statements, either in

favor or in opposition; the following comments were heard:

Mr. MacLean: (Owns house that is an abutter to site)

Is not for oyster farm site. Does not want to be looking out window and see condos. If one acre now, there will be ten (10) acres later. He pays a lot for his taxes and his view.

Phil Johnson: (abutter to site)

Does not like the condos, has to think more about a comment. He pays a lot for his taxes and for his view. He does not want to see condos, even during extremely low tides.

Mr. MacLean:

This site will be the first of many.

Doug Grout:

There will always be a public hearing about new sites and the abutters will be notified. The department takes many things into consideration when issuing new licenses.

Mr. MacLean:

How will this affect my two (2) moorings that I am entitled to (not in yet)?

Doug Grout:

It will affect your moorings; they may have to be moved out more.

Will Carey:

Supports the site. You will maybe see the condos once or twice a year. The buoys are very small. Ward will use condos smaller than the ones Granite State uses.

Mr. MacLean:

It hurts me to look out at low tide and see exposed condos and it will contaminate my view. The bay already looks like a runway with all the lights for the oil spill alerts.

Ray Grizzle:

Supports the site and Ward. Fish and Game can write detailed regulations.

Don Swanson: (CCA President)

Supports the project and all projects that help to rebuild oysters in Great Bay.

The next steps in the licensing process were explained to those present. Following a 14-day extended comment period, which goes to March 23rd, during which written comment may be sent to New Hampshire Fish and Game, there will be a review of the total record (application, oral comment at the public hearing, and written comment). If there are no major objections and/or unmanageable problems with the proposed project, then a draft license will be prepared and shared with government agencies as requested. Finally, an approved license may be issued.

Bruce W. Smith

Marine Biologist

BWS/vjb

cc: Sandy Falicon

Douglas E. Grout

Lt. Jeffrey A. Marston

2. August 22, 2012: Fish and Game Department. Public Hearing on Proposed Great Bay Aquaculture Application

***DURHAM, N.H.* -- The New Hampshire Fish and Game Department will hold a public hearing on a proposed marine aquaculture application for license on *Wednesday, August 22, 2012, at 9:00 a.m. at the New Hampshire Fish and Game Department's Region 3 Office, 225 Main St., Durham, N.H.* 03824. The public is welcome to attend and to offer comments on the proposed aquaculture plan.**

Detailed plans for this project are available for public review at Fish and Game's Region 3 Office in Durham, N.H. The application being considered is proposed by J&J Oyster Farm LLC. The proposed operation is for bottom shellfish grow-out of three species: American oyster, softshell clam and hard clam. The site would be a 2.5-acre area that lies north of Fox Point, Newington, in Lower Little Bay between Broad Cove and Hen Island.

3. July, 2012: First attempt at acquiring a 1.5 acre oyster aquaculture site by Laura Ward, Fox Point Oysters LLC.

Laura submitted a complete aquaculture application to the NH Fish and Game Department and marked her site with corner buoys for the site inspection. Fish and Game determined that the site would limit landowners/abutters direct access to their mooring. The application has not been approved yet and the applicant still has the right to modify the site for another site survey.

Appendix D

Oyster Aquaculture in NH

Informational Booklet for Prospective Farmers

Krystin Ward

Owner/Operator of Choice Oysters LLC

Research Technician, University of New Hampshire

This booklet was created for prospective shellfish farmers in the State of New Hampshire. When the process was started in 2011, there were only 2 farms in existence. I was the 3rd farmer to come into Little Bay and found it challenging to understand the agencies involved and the steps required for obtaining a license. I have included permits, certificates and licenses necessary for farming and I hope that combining all the information in one place will make it easier for farmers as New Hampshire moves forward to streamline the process.

Krystin Ward
Choice Oysters LLC

Acknowledgments:

Thanks to The NH Department of Environmental Services, Shellfish Program for working closely with farmers each year to establish a safe protocol for harvest and sale of shellfish; The NH Fish and Game Marine Program for outlining the "Steps to obtain an aquaculture license"; Northeast Shellfish Growers Association and existing farmers for "New England Shellfish Growers BMP's"; New Hampshire Department of Health and Human Services.

Table of Contents

Steps to obtain a Marine Aquaculture License

1. Obtain and complete a "**Marine Aquaculture License Application**" from the NH Fish and Game Department, Marine division;

- Under RSA 211:62-e
- As described in Fis 807.0 8(j) in writing (Application Procedures for a Marine Aquaculture License)

Contact: Bruce Smith, Marine Biologist
Marine Fisheries Division
225 Main St.
Durham, NH 03824
(603)-868-1095

2. Send completed application for license to NHF&G Director:

New Hampshire Fish and Game Department
Executive Director, Glenn Normandeau
2 Hazen Dr.
Concord, NH 03301

- The executive director shall determine the completeness of the application and notify the applicant in writing within 30 days as to its completeness or describe fully any deficiency found.
- A copy of the application is also sent to:

Marine Fisheries Division
225 Main St.
Durham, NH 03824
(603)-868-1095

If NH Fish and Game determines that the application is complete – **continue to step 3**
If application is not complete, the application must be revised and sent back to NHF&G, Marine Fisheries Division, Durham until it is satisfactory.

3. After the application has been accepted, NHF&G will conduct a site assessment:

- Will be conducted between May and October.
- Site assessment will include:
  a. Site visit;
  b. Benthic substrate evaluation to characterize the sediment types;
  c. Review of the fisheries uses in the area;
  d. Typical wildlife and aquatic plants;
  e. Location of channel, navigational aids, moorings;
  f. Recreational, commercial, or other activities being conducted in the area;
  g. Tidal information such as flow rate, height or direction; and
  h. Location of other aquaculture activities within one mile of the proposed site(s).

4. Following steps 1-3, a public hearing will be scheduled and the applicant shall:

- Send written notice at least 21 days prior to the public hearing by certified mail to all abutters and littoral owners of the proposed project if different from the licensee, and submit copies of the certified receipts to the executive director.
- Refer to sample "Abutters Letter"
- Letter should include:

a. Details of the project
b. Exact locations(s) of the project
c. Date, time and place of the public hearing
d. Name and mailing address of executive director so they can respond in writing
e. Deadline for written comment which shall be 14 days after the scheduled public hearing

- Obtain a receipt for registered mailings and include in final application to the F&G director, Concord.

5. After steps 1-4 are complete, applicant should send copies of the "Marine Aquaculture License Application" to 5 other agencies:

- Refer to "Agencies for Permitting" page
- The application will include a list of abutters and should include a list of all the agencies notified.

The executive director shall provide public notice in the newspaper of the scheduled hearing date at least 21 days prior to the hearing. Any interested person may submit written comments on the proposed project to the executive director up to 14 days after the public hearing on the proposed aquaculture project.
The executive director shall review all of the information to determine that the proposed aquaculture operation would not pose any unacceptable risk as specified in Fis 807.02(g), does not conflict with or negatively impact any recreational, commercial or other use currently being conducted in the area in and around the proposed project area, or does not adversely impact the value or use of private property in and around the projected area before issuing a license.

6. After the hearing, the complete application and public record is reviewed.

- A 21 day post hearing comment period is required for full record consideration.

7. After the 21 day period, the NHF&G Executive Director will issue the license as the application describes it, issue the license with revisions as suggested by public comment and NHF&G discretion, or deny the license.

Contacts for final draft of Marine Aquaculture Application:

This is a list of agencies that are directly involved in obtaining a license. Once you have obtained a license, you will continue to work with a few of the agencies on a weekly basis as you grow, harvest and sell shellfish.

Shellfish Inspection & Licensing
Division of Public Health Services
29 Hazen Drive
Concord, NH
03301-6504
603-271-4589
Fax: 603-271-4859
Tdd Access: 1-800-735-2964
foodprotection@dhhs.state.nh.us

Wetlands Program
NHDES Wetlands Bureau
C/o Dori Wiggin
NHDES Portsmouth Regional Office
Pease International Tradeport
222 International Drive, Suite 175
Portsmouth, NH 03801
(603) 559-1500
*****Please forward a copy to Chris Nash; same address

NH Port Authority
Geno Marconi
Director of Ports and Harbors
555Market Street
Portsmouth, NH 03801
436-8550

United States Coast Guard
Sector Southeastern New England Command Center
259 High Street
South Portland, ME 04106-0007
508-457-3211

Army Corps of Engineers
USACE Regulatory Division
C/o David M Keddell NAE
696 Virginia Road
Concord, Massachusetts 01742
David.M.Keddell@usace.army.mil
*Include NHF&G info and NHDES info with copy of application

New Hampshire Fish and Game Department
Marine Fisheries division
225 Maine St.
Durham, NH 03824

New Hampshire Fish and Game Department
Executive Director, Glenn Normandeau
2 Hazen Dr.
Concord, NH 03301

***** The EPA will be notified by Army Corps of Engineers if necessary
***** Do not contact NMFS directly. They will be notified by the Army Corps of Engineers.

Northeast Shellfish Growers
Best Management Practices (BMP's)

This section is adapted from the East Coast Shellfish Growers Association. It is an example of a BMP plan for a typical oyster farm:

Farm Name:
Address:
Phone Number:
Responsible for BMP:
Date of Latest Revision:
Species Grown:
Location of Farm
Description of Basic Farm Process:
CODE OF CONDUCT: We endorse the ECSGA Code of Conduct for Molluscan Shellfish

Shellfish farmers shall:
• Conduct aquaculture operations in accordance with all applicable laws and regulations, and acquire and maintain all pertinent permits.
• Make the best effort to produce and handle products of the highest quality and ensure product safety.
• Make a best effort to communicate early and openly with water based and land based neighbors about all facets of their operation.
• Work to benefit the local economy by patronizing local businesses and through employment and contributions to the tax base and infrastructure.
• Site, plan, develop and manage aquaculture operations in a manner that minimizes environmental impacts.
• Site, plan, develop and manage aquaculture operations in a manner that ensures the economic and social sustainability of the operation.
• Take all appropriate measures to avoid and contain disease outbreaks and report them quickly to the proper authorities if suspected.
• Consult and collaborate with government authorities, researchers, other producers and stakeholders for the development and implementation of regulations, technologies and standards to achieve environmentally, economically and socially sustainable shellfish culture when feasible.
• Encourage other growers to adopt the shellfish code of conduct and better management practices.

BMP ELEMENT PERMITS AND TITLES HELD
We will apply for all of the permits required by the state to operate a shellfish farm and to sell our product in-state and out-of-state

THE FARM SITE
It is important to ha e a farm site that will support good shellfish survival and growth, and at the same time avoid unnecessary conflicts with navigation, traditional fishing and protected habitats and species. It is a state requirement to mark the farm site, and these markers also serve to keep recreational and commercial boat traffic away from the site to avoid damage to the boats and to the growing shellfish. Site marking also serve to minimize inadvertent or intentional poaching. A good farm site also needs to be protected from future changes that could make the farm site unusable or less valuable, especially upland or upstream development that could negatively impact water quality or reduce access to the sites.

FARM SITING
• Our farm site and plan will be reviewed in a public scoping session held in ***(add date)***
• Our farm site was chosen for characteristics necessary for good shellfish growth.
• Our farm site is in a state-approved aquaculture zone.
• Our farm site was chosen to avoid sensitive habitats.
• Our farm site chosen to avoid submerged aquatic vegetation.
• Our farm site was chosen to stay clear of navigation channels and areas traditionally used for fishing or recreational boating.

SITE MARKING
• Farm boundaries will be marked according to state regulations.

• GPS is used to ensure that farm operations occur in the permitted location.
• Damaged or missing boundary markers are replaced as soon as possible

SITE SECURITY

• We participate in programs to educate the public and other fishermen about the farm.
• Farm personnel are instructed to take a firm but friendly approach with those suspected of doing harm.
• Farm personnel notify marine police if illegal activity is suspected
• We will assist in the prosecution of known offenders.

ACCESS TO SITES

• Access to the farm site is by boat.
• Farm personnel are instructed to avoid routes to farm sites that might damage aquatic vegetation.
• Farm personnel are instructed to avoid passing close to bird nesting areas.

POTENTIAL CHANGES TO SITES AND SITE ACCESS

We monitor and evaluate the potential effects of proposed development projects that might interfere with farm operations.

• We participate in public hearings for projects that will negatively affect farm operations.
• We look for opportunities, and when possible make presentations at public events in order to educate stakeholders about shellfish farming and its benefits.
• We take the time to talk to the owners of homes adjacent to the farm site in order to keep relations friendly.

GOOD NEIGHBOR POLICY

We recognize that even though we took care to properly site our farm that there are still some cases where we need to take extra care to be good neighbors. The following are some of the things we do to be good neighbors:

NOISE

• We operate boats and machinery to minimize noise.
• We seek to minimize noise from the farm when it might bother neighbors.

ODORS

• We are aware of potential odors coming from the gear we remove from the water.
• We clean gear before storage to minimize foul odors.
• We dispose of material we clean off our gear efficiently to minimize offensive odors.

RECREATIONAL AND COMMERCIAL BOATING

• Our submerged farm gear has a minimum of 4 feet of water over it so that recreational boats can freely pass over the area.
• Farm gear is regularly inspected for damage caused by boats.

UPLAND GEAR STORAGE AREAS

• Our gear storage area chosen to be as unobtrusive as possible.
• Gear is usually cleaned before it is brought to storage area.
• Gear is stored in a neat and orderly fashion.

SEED SOURCING

One of the most important aspects of good management on the farm is the selection of seed and its source. Good seed will grow faster and stay healthier. And choosing seed from reputable hatcheries lessens the possibility of introducing diseases and unwanted organisms into our environment. For these reasons we:

• We purchase seed from reputable hatcheries.
• We purchase seed from out-of-state hatcheries that are approved by state officials.

OPERATIONAL MAINTENANCE ISSUES: FOULING CONTROL

One of the most difficult tasks on our farm is keeping the gear and the shellfish free of fouling organisms. The task is similar to what land farmers face with weed control. And as with land farming, if we allow the fouling organisms to get out of control they will choke our crop yields.

• We clean our in-the-water gear frequently to minimize the amount of material entering the water.
• When fouling is heavy we may use brine (saturated salt) dips to control it. When fouling is heavy we may use air-drying to control it.
• We never use chemicals that could harm the environment at our farm site.

OPERATIONAL/MAINTENANCE ISSUES: PREDATOR CONTROL
There are a number of predators that prey on shellfish and in some cases can occur in significant numbers and cause a lot of damage the crop. It is important for us to recognize predators that can cause harm, and either keep them away from our crop through exclusion or directly eliminate them by other means.

• The cages we use keep most predators away from our crop
• We work with NOAA and state officials to find methods to deter predation by protected species.

OPERATIONAL/MAINTENANCE ISSUES
Silt or mud can build up on our farm site. Although a small amount of silt doesn't require any maintenance on our part, larger amounts have to be removed to prevent the shellfish from suffocating, and our harvest methods can also re-suspend silt.

• We are aware that some farm activities stir up silt and use methods to minimize the impacts from this.

OPERATIONAL/MAINTENANCE ISSUES: GEAR MAINTENANCE, DISPOSAL AND RECYCLING
The gear we use to grow our shellfish represents a significant investment, and we do everything we can to make sure it stays in place and doesn't become a hazard or nuisance to others. We are also committed to recycling as much material as possible when it is no longer usable.

• We use robust anchoring systems for our gear to avoid loss in severe weather events.
• We instruct employees to pick up loose gear as soon as possible.
• We instruct employees to discard nothing into the bay where our farm is located.
• We recycle much of our plastic material.
• We cooperate with adjacent farms to pool recyclable materials.
• We keep gear at our on-land site in a neat orderly fashion.
• We participate in local "Earth Day" events.

OPERATIONAL/MAINTENANCE ISSUES: FUEL HANDLING AND FUEL SPILL CONTINGENCIES
We know that considerable environmental damage can come from gasoline or oil spills. In our case some of the equipment we use in the field runs on gasoline. It is important to us and to the environment to take precautions with fuels.

• Farm employees are instructed in proper fuel and oil handling procedures to minimize possible spills.
• Farm equipment is well-maintained to minimize fuel and oil leaks
• Farm boats and vehicles carry absorbent materials that can be used to clean up small fuel spills.

OPERATIONAL/MAINTENANCE ISSUES: HANDLING AND REPORTING DISEASE
The shellfish we grow are susceptible to a couple of diseases caused by microscopic organisms. These diseases do not affect the quality of our product nor do they pose any problems for people who consume them. Keeping disease to a minimum on our farm is important for us to communicate farm diseases to other growers and to state authorities so that disease outbreaks can be contained as well as possible. In order to control diseases on the farm:

• We use disease-resistant stocks to minimize disease effect
• We monitor our crops and if disease is suspected we will take samples and send them to a competent laboratory for analysis
• We will communicate confirmed disease events to appropriate authorities and neighboring growers.

OPERATIONAL/MAINTENANCE ISSUES: PROTECTED SPECIES AND HABITATS
Protecting vulnerable species and sensitive habitats is important to us and to the community.

• If SAV appears on the farm site we report it's occurrence to the appropriate state agency as soon as it is detected.

RECERATIONAL/MAINTENANCE ISSUES: PROTECTING HUMAN HEALTH
Producing and selling a product that is safe to eat is critical to our business. The National Shellfish Sanitation Program, working through our state authorities, sets the food safety standards by which we operate.

• We comply with all state regulations that safeguard consumers who eat our products.
• When we see or suspect sewage leaks we report them to state authorities.
• Our company is a member of the Interstate Shellfish Sanitation Conference, part of the National Shellfish Sanitation Program.
• We get our shellfish under refrigeration immediately after harvest

RECORD KEEPING - KEEPING MONITORING THE CROP AND THE ENVIRONMENT

As in any business, maintaining good records is a key part of good management. Having good records of the environment and good data for our crops allows us to become more efficient.

• We maintain detailed records of the physical environment.
• We monitor crops through careful observations of their condition, and by taking measurements and counts of the stock.

RECORD KEE ING - KEEPING THIS BMP DOCUMENT CURRENT

This Code and BMP document is a large part of our operations manual for our farm. Keeping it current is important to our business.

• We review and change our Best Management Plan to account for changes in farming practices.
• We are members of the East Coast Shellfish Growers Association list serve and become aware of changes in regulations and farming practices through their communications.

An oyster farm can involve an Importation Permit

To obtain a permit contact:
Contact: Bruce Smith, Marine Biologist
Marine Fisheries Division
225 Maine St.
Durham, NH 03824
(603)-868-1095

Fee: $15.00

NH Fish and Game Department
11 Hazen Drive, Concord NH 03301

APPLICATION TO IMPORT WILDLIFE/FISH

Office Use Only

MUST BE SUBMITTED NO LESS THAN 30 DAYS PRIOR TO IMPORTATION DATE.
As required by RSA 207:14, application is hereby made for a permit to import into the State of New Hampshire the following birds, animals or fish

_____ ph: _____
Name of Applicant (Last, First, M.I.)

_____
Street Address (Street/RR Box, PO Box , City, State and Zip)

_____
Mailing Address, if different (Street/RR Box, PO Box , City, State and Zip)

Species of Wildlife: _____ # _____ (m)_____ (f)_____
_____ (m)_____ (f)_____
_____ (m)_____ (f)_____

_____ ph: _____
Name of Person & Business address from whom wildlife or fish obtained.

_____
Name & Location of Where wildlife will be possessed (Street/RR Box, PO Box , City, State and Zip)

Import purpose (circle one): Possess Propagate Exhibit Regulated Shooting Area Aquaculture Release

Possession Permit Number: _____
Exhibition Permit Number: _____
Aquaculture Permit Number: _____
Release Permit Number: _____
Propagation Permit Number: _____
Regulated Shooting Area Number: _____
Federal Permit Number: _____
Individual Train & Shoot Permit Number: _____

NOTE: The larvae will be remotely set on oyster shell, then spread onto four different restoration sites. An F&G scientific permit and NH DES permit applications are in preparation.

Wildlife species to be imported into the state, which are not on the Controlled Species List, need additional information.

Please provide information on that species to include:
Species distribution; Physical description, such as fur, color, body length; Habitat and range\territory; Shelter needs; Diet; Occurrence; Breeding; Life cycle; Value; Status; Related species as stated in Fis 803.13 (9).

_____ _____
Date Applicant's Signature

Example of Oyster Health Certificate

Obtained from Hatchery

micro technologies, inc.

Shellfish Health Certificate Report

Company: Muscongus Bay Aquaculture, Inc.
Address: P.O. Box 204
Bremen, ME 04551-0158

Report Date: 07-Apr-11
Receipt Date: 29-Mar-11

Site: Hatchery Facility, Bremen, ME
Species: *Crassostrea virginica*
Age: Seed
Size: 1.5 mm

Accession: M11032901
Collected By: Jean MacKenzie
Date Collected: 28-Mar-11
Witnessed by:

Agent	Common Name	Results	Prevalence	Comments
Perkinsus spp.	Dermo	not observed		
Haplosporidium nelsoni	MSX	not observed		
Haplosporidium costale	SSO	not observed		
n/a	QPX	n/a		
Roscovarius crassostreae	JOD	not observed		
n/a	Neoplasia	n/a		
Bonamia ostreae		n/a		

N/A = not applicable or not requested

Methods:

Over one hundred and fifty (150) shellfish were inspected according to methods outlined in the 'FHS blue book: suggested procedures for the detection and identification of certain finfish and shellfish pathogens' (USFWS & AFS-FHS 2010) and the 'Manual of diagnostic tests for aquatic animals' (OIE 2009). Appropriate controls were used. Screening involved initial examination for morphological abnormalities and other pathologies, and testing for etiologic agents by culture, histology and PCR. Two or more assays were used to confiorm any presumptive findings. In the case of JOD (for oyster species only), currently accepted methods for initial screening are limited to detection of morphologic characteristics such as conchiolin deposition, valve cupping and mantle recession; any presumptive diagnosis is followed through by culture and PCR.

Comments:

Examination of gross external and internal anatomy indicated that the animals were within normal parameters for the species. As noted above, P. marinus, MSX, SSO, and JOD were not observed in any of the samples tested.

Please feel free to call with any questions or concerns. Thank you for working with MicroTechnologies, Inc.

Sincerely,

Cem Giray Ph.D., Chief Scientific Officer

William R. Keleher, Jr., Fish Health Official

41 Main St. Richmond, Maine 04357 Tel: 207.737.2637 Fax: 207.737.4504 www.microtechnologies.biz

Shellfish Inspection

The Shellfish Inspection and Licensing Program is responsible for ensuring that commercial processing of shellfish within New Hampshire is done in a safe and sanitary environment.

All commercial shellfish dealers must receive the Department of Public Health Services certification and be included on the Interstate Certified Shellfish Sanitation List that is updated each month by the US Food and Drug Administration (USFDA).
The program is also responsible for certifying and inspecting the facilities and conveyances of all relayers and aqua culturists who harvest shellfish from New Hampshire waters for commercial sale.
Anyone who owns or operates a shellfish processing plant or vehicle for transporting shellfish in New Hampshire must obtain a shellfish certificate from Food Protection prior to operation. In order to be eligible to obtain a shellfish certificate, a person or corporation must meet the following requirements:

The shellfish processing plant or vehicle owned or operated by the prospective certificate holder must meet the requirements of New Hampshire Statutes He-P2150;
The prospective certificate holder must complete and submit an ***application*** to Food Protection for a shellfish certificate with appropriate fees;

The prospective certificate holder must develop, maintain and submit a completed ***Hazard Analysis Critical Control Point (HACCP) Plan*** for each type of shellfish that will be sold by the dealer; and, if the shellfish processing plant or vehicle utilizes a private water system, a water test result within the last 30 days must be submitted.
Compliance Inspections
Food Protection will conduct an on-site inspection of the plant or vehicle, as well as the HACCP plan. If satisfied that the information regarding the applicant, the HACCP plan and the applicant's operation and facilities are in compliance with the New Hampshire Shellfish Sanitation Rules, a shellfish certificate will be issued, which will expire on December 31st of that year. Routine inspections will be conducted by Food Protection based on the type of certificate issued to the applicant, during which time the records of all shellfish transactions and the sanitation monitoring records will be reviewed.

Please Contact:

Shellfish Inspection & Licensing
Division of Public Health Services
NH Department of Health & Human Services
29 Hazen Drive
Concord, NH 03301
Phone: (603) 271-4589
Toll Free: (800) 852-3345, ext. 4589
Fax Number (603) 271-4859
After Hours Emergency (603) 271-5300 (24 Hours)

Oyster & Clam Diseases

Oyster Diseases

Factors Affecting the Health of Oysters - Oysters are long-lived, sessile animals, which feed by filtering large quantities, up to 100 gallons, of seawater per day. They accumulate hundred folds of micro-organisms and pollutants. These characteristics make them susceptible for diseases. Several factors can cause pathological changes in oysters. Different factors affect them during their planktonic, larval stage. The sum of environmental stimuli, together with the genetic makeup of the oysters, will determine their likelihood to get ill.

Dermo Disease - Dermo disease is caused by a single-celled Protozoan parasite, *Perkinsus marinus*. Originally, it was thought to be caused by a fungus and named *Dermocystidium marinum*. Even after the reclassification the disease is commonly called "Dermo". The severity of the disease increases periodically in infected areas. Mortalities can reach 100% and have been reported to be 30-50% in the first year, with cumulative mortalities of 75% or higher in the second year in oysters introduced to an infected area. The disease does not cause serious mortalities below salinities of 12-15ppt but can persist in overwintering oysters in salinities below 5ppt. Dermo is a warm temperature disease; outbreaks and mortality occur in the summer months (June – Oct. in the Chesapeake). Epizootic disease occurs typically in the warmer temps (18 – 30C range).

MSX - (Multinucleated Sphere Unknown) disease is caused by a single-celled Protozoan parasite, *Haplosporidium nelsoni*. MSX is lethal to the eastern oyster (*Crassostrea virginica*), but it is not known to be harmful to humans.

Roseovarius Oyster Disease (ROD), previously known as Juvenile Oyster Disease (JOD), affects hatchery-raised seed of eastern oysters, *Crassostrea virginica*, on the east coast of the U.S. from Maine to New York. The disease is caused by a marine a–proteobacterium *Roseovarius crassostreae*, a member of the *Roseobacter* clade.

Clam Diseases

QPX (Quahog Parasite Unknown) is a Protozoan parasite of hard clams, *Mercenaria mercenaria*. DNA analysis places the QPX in marine fungus-like protists (Labyrinthomorpha, Thraustochytriales). Organisms from this group occur commonly in marine and estuarine environments.

Additional Shellfish Aquaculture Contacts

NH Department of Environmental Services

Prospective aquaculturists should consult with the DES Shellfish Program on possible farm sites to ensure the sites are in waters that are open for harvest. Once a license is granted, aquaculturists will need to regularly consult with the DES Shellfish Program to ensure there are no public health-related harvesting closures affecting their farm on desired harvest dates.

NHDES Shellfish Program
222 International Drive, Suite 175
Pease Tradeport
Portsmouth, NH 03801
(603) 559-1509
(603) 559-1510 (fax)

Chris Nash
Shellfish Program Manager
(603) 559-1509
chris.nash@des.nh.gov

The East Coast Shellfish Growers Association

Represents over 1,000 shellfish farmers from Maine to Florida. These proud stewards of the marine environment produce sustainable farmed shellfish while providing thousands of jobs in rural coastal towns.
The ECSGA informs policy makers and regulators to protect a way of life.
1623 Whitesville Rd. Toms River, NJ 08755
www.ecsga.org

Executive Director
Bob Rheault
(401) 783-3360
bob@ecsga.org

Shellfish and Gear

Little Bay Oyster Company
Will and Jocelyn Carey
(914) 382-1586
littlebayoyster@ymail.com

Brooks Trap Mill
211 Beechwood Street
Thomaston, ME 04851
(800) 425-4526

Atlantic Aquaculture Supply, LLC
560 Metacom Avenue
Warren, RI 02885
(401)247-1661

Distributor

J.P.'s Shellfish
P.O. Box 666
Eliot, Maine 03903
Phone: (207) 439-6018
Fax: (207) 439-7794
www.jpshellfish.com
james@jpshellfish.com