



East Lyme Shellfish Management Plan



Shellfish Management Plan
December 2005

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FOREWORD

East Lyme's first Shellfish Management Plan was written and approved in 1987 and has provided the basis for the Shellfish Commission's resource management efforts since that time. Subsequently, the town prepared and adopted a Harbor Management Plan, as provided for by state statute, and established a joint harbor management/shellfish management commission by town ordinance in 1991. The decision to establish a joint commission was based on the premise that the management of shellfish resources and other coastal resources are closely linked and that recreational boating, commercial fishing, navigation, moorings, public access and other harbor activities and uses potentially impact the protection and enhancement of shellfish resources if not carefully managed.

Cognizant of the need to update the shellfish management plan and develop standards for commercial aquaculture the town applied for a special grant from the CT Department of Environmental Protection, Office of Long Island Sound Programs and work began on this update in the summer of 2004.

The granting of shellfish leases has grown increasingly complex as the number of parties interested in obtaining such leases has steadily increased while the space available for leasing is under increasing demand for other public uses spurred on by development of the Niantic Bay Boardwalk Project. Given the premise that shellfish leases are granted for public benefit, the Town needs a clear policy for shellfish leasing, and must help ensure that the industry succeeds. With the recent approval of a commercial aquaculture operation on 10 acres within Niantic Bay and possible expansion to other areas, the leasing program must take into consideration the implications of the growth of commercial aquaculture within the confines of Town waters.

Given the controversial aspects of private aquaculture operations within public waters, the Town must be pro-active in determining the best locations for these activities taking into account all available planning resources, including the Harbor Management Plan and Plan of Conservation and Development. This required an analysis of existing shellfish resources and current and planned marine activities. As part of the project, a GIS mapping component was also developed to enhance planning and management capabilities in administering the program. Both the Shellfish Lease Program and GIS mapping component have been incorporated in the Shellfish Management Plan.

In addition, the East Lyme Harbor Management/Shellfish Commission, hereafter referred to as "the Commission", undertook a study of other leasing efforts and shellfish management plans in Connecticut and other states proactively managing shellfishing aquaculture including Stonington, Fairfield, Waterford, Groton, Provincetown, Mass., Pleasant Bay, Mass., Barnstable, Mass., and the state of Rhode Island. These resources are cited in Section 5.8 of the Appendices and some have been referenced or linked from the Commission's web site.

1 INTRODUCTION AND PLAN OVERVIEW

Shellfish have existed in Connecticut waters for the last 10,000 years and, in spite of all the advances in knowledge about shellfish physiology and reproduction, there is still no absolute understanding of why some years the reproductive process is very successful and other years it is unsuccessful. The inherent uncertainty created by this lack of understanding is a significant challenge in the task of shellfish management. Because of the uncertainty factor, management has often emphasized restoration and protection of shellfish habitat and a balancing of human demands on the resource such as direct harvesting of the shellfish, the loss of habitat to dredging or other development pressures and conflicting use interests.

For a number of years, the Connecticut Department of Health Services was responsible for collecting water samples in coastal Connecticut Towns to ensure shellfish taken from Town grounds were safe for human consumption. Due to budget constraints, the responsibility for water sampling collection was transferred to municipalities. Many coastal towns, including East Lyme, had insufficient resources to manage the collection and examination of water quality samples to maintain open shellfish beds for recreational harvesting of clams and oysters. As a result shellfish beds were closed and shellfishing was prohibited in many coastal Towns on Long Island Sound.

Following the adoption of the Harbor Management Act of 1984, the Town of East Lyme established a Harbor Management and Shellfish Commission to implement the standards of the Act by creating a Harbor Management Plan. The East Lyme Harbor Management Plan was approved by the State in 1991 and Town Ordinances were established to enforce the Plan. Following acceptance of the Harbor Management Plan, a major priority of the East Lyme Harbor Management/Shellfish Commission was to reopen shellfishing beds that had been closed for more than 10 years. Intensive water quality sampling was conducted in the mid 1990s in cooperation with the Waterford/East Lyme Shellfish Commission (WELSCO) and the Connecticut Department of Agriculture/Bureau of Aquaculture (CT DA/BA). As a result, the Commission was successful in re-opening town waters to recreational shellfishing in 1996 when it signed a Memorandum Of Understanding (MOU) with the DA/BA, which designated two areas in Niantic Bay that were conditionally opened for shellfishing and a third area in Niantic Bay was approved for shellfishing year-round. Since that time, the Commission has been working to reopen other areas in Niantic Bay and in waters of Giants Neck, which will provide additional recreational shellfishing opportunities and attract potential commercial shellfish operations.

In 1996, following the reopening of shellfish grounds, the East Lyme Harbor Management/Shellfish Commission developed protocols for granting leases for commercial shellfishing, in response to requests for bottom leases from Captain John Wadsworth and Lewis Bull. The bottom lease designations were based on the original Shellfish Management Plan and interpretation of State Statutes empowering local shellfish commissions to lease bottom. Through 2000, all leases issued were for bottom culture only. In late 2000, Mohegan Aquaculture LLC approached the Commission with a proposal to conduct bottom culture on 30 acres in Niantic Bay and raised the possibility of some day conducting water-column aquaculture in the same lease area. At that time, the jurisdictional authority for permitting water column aquaculture in town waters was unclear. Until this issue could be resolved, the Commission approved the Mohegan application for bottom culture only and stipulated that a new application to conduct aquaculture activities in the water column would

have to be re-submitted to the Commission after receiving the necessary permits for water-column aquaculture from the State and Federal agencies.

After the Mohegan's received a structures permit from the Army Corp of Engineers, it informed the Commission that further approval from the Town of East Lyme was not required. The Commission realized that the existing process for granting lease designations was inadequate. In 2002-2003, the Commission worked with other local shellfish commissions, State and Federal agencies, to develop regulations for managing shellfish aquaculture in Town waters; elements of this management plan included: jurisdictional authority, application process, and acceptable aquaculture area and activities. With the assistance of Town counsel, a uniform aquaculture lease agreement was developed which better-defined expectations and conditions for conducting shellfish aquaculture in Town waters. As past leases expired, they were renewed using the guidelines of the new management plan, which required the shellfish growers to sign a formal lease agreement with the Town of East Lyme.

In 2004, the East Lyme Planning Department applied for and received a grant from the CT DEP Office of Long Island Sound to update the Town's Shellfish Management Plan and incorporate the recently developed aquaculture regulations and lease agreements. This Shellfish Management Plan contains the current operating procedures and regulations for commercial and recreational shellfishing and for conducting shellfish aquaculture within the Town of East Lyme waters.

Looking forward, the Commission intends to maintain a balanced use of the Town's coastal waters and to protect the natural resources and marine communities that inhabit these areas. The coastline and particularly Niantic Bay will be utilized more in the future following the completion and opening of the Boardwalk Project. Maintaining exceptional water quality will remain a high priority of the Commission, with the recognition that access to, and use of, the Town's most valuable natural resources needs to be balanced carefully and responsibly to protect the aquatic ecosystem and preserve the scenic quality that draws so many people to East Lyme.

Issues that need to be addressed on the level of management policy/strategy include: 1) resource management via feasibility studies, habitat surveys, etc.; 2) access, ownership and use issues; 3) water quality and habitat issues; and 4) public information, education and awareness issues.

The revised shellfish management plan is organized according to the following structure.

Section 2. provides a summary of those issues that the Commission believes should be addressed within the management plan and by the Commission in order to protect and enhance the town's shellfish resources. The list of issues was developed over the past 17 years since the first plan was developed. In addition, the Commission has sought public input from those attending its monthly meetings and also held a public meeting in September 2004 to explain the planning process and encourage public participation in the process. A summary of the input received at that meeting is contained in Section 5.6 of the Appendices.

Section 3. details the Commissions stated goals, objectives, and strategies which taken as whole, indicate the steps necessary for the Commission to best manage and

enhance shellfish resources. The Commission's goals and objectives are general in nature, but importantly, provide the basis for its regulations set forth in Section 4.

Section 4. includes the Commission's enabling authorities, jurisdiction, and regulations as they affect recreational shellfishing, commercial shellfishing, and aquaculture.

Section 5. contains information referenced in the text of the plan, including ELSC Permit Application Materials, Connecticut Shellfishing Statutes, and the DOA 2002 Triennial Report of East Lyme Growing Waters.

In addition, sections from the original plan which provide good background information including A History of Shellfisheries, A Resource Assessment, and a summary of Public Participation are also included.

2 SHELLFISH MANAGEMENT ISSUES AND OPPORTUNITIES

In general, the first East Lyme Shellfish Management Plan has served the town well. However, significant social, economic and technological changes over that last two decades warrant a plan update that responds well to these changes and anticipates future demand for shellfish harvesting and potential impacts to shellfish habitat and reproduction. A few of the most significant changes are worthy of special note.

First, huge investments of public money to improve water quality in Long Island Sound through implementation of the Long Island Sound Study, the Clean Water Act, Federal Coastal Management Act and others has yielded positive results. With better water, there is increased interest in both recreational and commercial harvesting.

Second, technological advancements and research have stimulated increased interest in aquaculture technologies that hold the promise of improved yields. Regulation of "Type II" commercial aquaculture, now defined in Section 4.7.3.2 of the regulations below, includes all on-bottom cages, bags, and all off-bottom suspended systems including long lines, lantern nets, rafts, and associated work floats for the culture of shellfish or seaweed and other aquatic organisms. Also included under this category is the installation of intake and discharge structures for land-based hatchery with once through circulation system. The promise of improved yields, however, must be carefully balanced with the need to allocate resources and water areas fairly between competing interests that include the public access (both for recreational shellfishing and other public access and recreational uses), boating and navigation issues, habitat and water quality issues, resources protection (e.g., eelgrass beds) and aesthetic considerations.

These issues were highlighted during the recent approval process for Type II Aquaculture proposed by Mohegan Aquaculture LLC utilizing a large area within Niantic Bay. The regulatory process at the federal and state level was complex and to an extent, the shellfish Commission's input was limited by a lack of specific standards in the shellfish management plan.

Third, the Commission's authorities have evolved over time and were, at the time of the plan revision, set forth in a number of locations making them difficult to examine as a whole.

Finally, ever-increasing demand for boating facilities and new public access enhancements such as the Boardwalk Project mean that the balance of competing uses and preservation needs is more precarious than ever before.

The Commission held a public information session in September, 2004 to explain the planning update process and solicit input concerning the current state of shellfish management issues and opportunities. The meeting was well attended by town officials, commercial shellfishermen and interested members of the general public. During the course of that meeting, a planning exercise was undertaken to develop a prioritized list of issues and opportunities. In order of importance, these were the following:

1. **Need to balance competing uses:** moorings, shellfishing, navigation, recreational and commercial fishing, public access
2. **Boating Issues:** Moorings, transients, seasonal, navigation
3. **Aquaculture Concerns:** Gear conflicts with other uses, environmental benefits and potential adverse impacts

4. **Water Quality:** Need to maintain and improve water quality for shellfish. Concerns with geese/fecal coliform, and nonpoint source pollution from runoff
5. **Permitting Criteria & Process:** Need to define, if possible, what can and should be done, and where. Streamline existing processes
6. **Economic Development, downtown revitalization**
7. **Aesthetics,** esp. with respect to aquaculture structures
8. **Jurisdictional Issues:** local vs. state vs. federal, multitown jurisdiction over river and bay areas
9. **Public Access,** esp. small craft launching
10. **Waterfront Development**



Public Meeting 9/04

3 GOALS, OBJECTIVES, AND STRATEGIES

The waters of East Lyme support rich shellfish populations that are an important natural resource. The Commission has identified or in some cases, reaffirmed, with public input, the following goals, objectives, and strategies to promote public and private sector participation to advance the sustainable use of shellfish resources and the marine environments they are part of.

- Develop enabling frameworks of goals, policies and regulations that specifically recognize the unique characteristics of East Lyme coastal waters to both protect aquatic environments and foster sustainable development of shellfish resources.
- Recognize the importance of aquaculture and other marine uses in the region and the corresponding need for balanced expansion of shellfish and shellfish habitat for the benefit of current and future generations.
- Enhance water quality to maximize the extent of town coastal waters open to recreational and commercial shellfish harvesting activities.
- Improve and strengthen regulations and enforcement mechanisms in an integrated manner for the sustainable management of coastal and marine resources.
- Facilitate and implement effective harvesting strategies to achieve responsible shellfishing in the region, by sharing information and expertise with other shellfish commissions, State and Federal regulatory agencies, marine scientists and technologists and the shellfish industry.
- Acknowledge public ownership, public trust principles, the considerable public investments for water quality improvements, and the importance of maintaining and enhancing public access to shellfish beds in shallow water
- Loss or degradation of habitat results in loss of shellfish resources. Accordingly, habitat protection, restoration and enhancement are critical to the Commission's mission.

As in the original Shellfish Management Plan, the East Lyme Shellfish Commission has identified key strategies to maintain the productivity of the Town's shellfish resources and meet the goals and policies established above. These strategies can be broadly classified as: 1) resource management, 2) water quality maintenance, 3) equitable access, ownership and use, and 4) public awareness, information and education.

3.1 *Resource Management Strategies:*

- Maximize the amount of productive, open shellfish beds for public recreational harvesting.
- Examine all shellfish resources for integration into a comprehensive management plan.
- Develop a shellfish survey program to provide harvest and utilization data from commercial and recreational sources.
- Identify nursery/seed areas and areas for possible transplantation sites.

- Interact with regulatory agencies in the preservation and restoration of tidal and inland wetlands for their buffering function in the modulation of storm runoff.
- Adopt an equitable fee schedule to allow the shellfish management program to be self-supporting.
- Develop an internship program with local high schools and colleges.
- Examine habitat restoration and introduction or reintroduction of shellfish into appropriate town waters.
- Promote and manage responsible new technologies for shellfish propagation (Aquaculture)

3.2 *Water Quality and Habitat Maintenance Strategies:*

- Reexamine water quality testing of areas with potential for conditional openings of shellfish beds.
- Encourage town to repair or replace faulty sewer systems that may have adverse effects on water quality and monitor all systems near water.
- Encourage and examine the possibility of restoring circulation in constricted coves and estuaries, either with culverts, removal of debris or dredging.
- Request sanitary surveys of structures adjacent to shellfish waters while obtaining statements from all appropriate regulatory and funding agencies, at all levels of government, on their responsibilities in bringing about improved water quality.
- Require quantification of any short-term or long term impacts on shellfish resources due to approved waterfront development, and of appropriate mitigatory measures for adverse impacts (retrofitting of marinas with pumpout stations, etc.)

3.3 *Equitable Access, Ownership and Use Strategies:*

- Recognize need to balance shellfishing activities with other competing uses, with an emphasis on habitat protection and enhancement.
- Clarify ownership of any granted or leased grounds within the Town waters.
- Allocate appropriate areas for leasing to commercial shellfishers for transplant, relay beds and aquaculture activities.
- Provide a permit and leasing program which will allow for the equitable utilization of a renewable public shellfish resource on a sustainable yield basis
- Provide delineation, signage and maintenance of all legally available public right-of-ways to shellfish resources.
- Examine possible access to areas being considered for conditional openings and encourage appropriate access.
- Review and evaluate pending applications referred to the Commission by regulatory agencies for the purpose of ensuring public access, navigation and boating access, and versatility of design to allow for seasonal harvesting of shellfish.

- Ensure consistency between state and local regulations to facilitate harvest and management of shellfish resources.
- Encourage state and municipal adoption of bulkhead and channel lines to prevent further encroachment on, or diminished access to, shellfish resources.

3.4 *Public Awareness, Information and Education Strategies:*

- Develop an educational program on shellfish resources and their dependence on land use policies and practices for public education.
- Provide maps of approved and closed shellfish growing areas and public access points with all shellfish permits.
- Address issue of availability of necessary facilities (i.e. dock space) for commercial shellfishers.
- Coordinate public and private boating interests for seasonal removal of coastal structures such as moorings and docks, to facilitate the harvest of shellfish.
- Encourage legislation to more clearly define and fund agencies and programs which can protect or restore shellfish habitats and resources.
- Monitor harvests and provide assistance, possibly in the form of additional shellfish wardens, to enforce shellfishing regulations.

4 REGULATIONS

4.1 Purpose

The Town of East Lyme, recognizing the value of its shellfish resources, has established a Shellfish Commission to protect, manage and enhance this resource. The objectives of this plan shall be to re-establish active recreational and commercial shell fisheries in the waters of East Lyme, improve the yield and quality of shellfish, and prevent exploitation of all shellfish resources beyond the maximum sustainable yield.

4.2 Establishment, Jurisdiction and Membership

4.2.1 Establishment of the Commission, Authorities

In accordance with Section 26-257a of the General Statutes of the State of Connecticut, the board of selectmen of the town of East Lyme constituted a Shellfish Commission (ELSC), effective June 20, 1987. This was superseded by the adoption of the Harbor Management Plan ordinance, Article II Section 11a effective 1/1/95, as follows:

There is constituted a seven-member Harbor Management Commission which shall have the powers and duties conferred on such commissions by Chapter 444a of the Connecticut General Statutes, Revision of 1958, as amended, and the Harbor Management Commission is designated as the East Lyme Shellfish Commission and shall further have all of the authority granted to local shellfish commissions by Chapter 492 of the Connecticut General Statutes, Revision of 1958, as amended, except to the extent that the Waterford-East Lyme Shellfish Commission has been granted powers and duties by Section 26-287 of said statutes.

The Commission shall have the power to adopt, amend, and repeal any rules and regulations governing its procedures and the exercise of its powers and duties.

The Commission may call upon any other departments of the town of East Lyme for assistance in the performance of projects of mutual interest.

The Commission shall keep accurate minutes and records of its proceedings and official actions, showing the vote of each member upon any question, and the absence or failure of any member to vote.

The Commission shall make an annual report to the Board of Selectmen, detailing its financial records and accomplishments, for inclusion in the Town Annual Report. It should also submit any other reports that may be requested by the Board of Selectmen.

The Commission may form subcommittees for the purpose of addressing various issues. These subcommittees will address four major issues:

- 1) Resource Management
- 2) Access, Ownership and Use Issue
- 3) Water Quality Improvement
- 4) Public Information and Education Programs

4.2.2 Jurisdiction

The Commission shall have jurisdiction over the navigable waters of as defined in Subsection 15-3a CGS, within the East Lyme Harbor Management Area, as defined by Section 2 of the East Lyme Harbor Management Ordinance. The Commission shall also have charge of all the shellfisheries and shellfish grounds lying in the town not granted to the Waterford-East Lyme Shellfish Commission by Section 26-287 CGS Revision of 1958, as amended, and not under the jurisdiction of the commissioner of agriculture, including all river, inland waters and flats adjacent to all beaches and waters within the limits and marine bounds (below the mean high water line) of the Town as follows.

1. Niantic River. The waters of the Niantic River, from the Golden Spur Bridge southerly to the highway bridge at "the Rope Ferry Road, so called", are under the jurisdiction of the Waterford-East Lyme Shellfish Commission.
2. Niantic Bay. The waters of Niantic Bay within the boundaries of East Lyme are demarcated by the following lines: on the east, by a line from the center of the highway bridge to the center of the railroad bridge and along the center line of the channel in a generally southwesterly direction until the waters reach a depth of six feet, then due south until the line intersects with a straight line drawn from Black Point to Millstone point, which marks the southern limit of Town waters. On the northern and western sides, the boundary is formed by the shoreline of the Bay.
3. Long Island Sound Region. The southerly boundary of this region is demarcated by a line drawn from Hatchett's Point to Black Point. The eastern boundary is defined by the shoreline, and the western boundary is defined by a line drawn from the center of the railroad bridge crossing the Four Mile River, extending due south to connect to the southern boundary, and due north along the centerline of the river channel to the Mile Creek River Road Bridge. This area also includes the Pattagansett River and Brides Brook regions.

A map showing the waters under the jurisdiction of the ELSC is located on page 16.

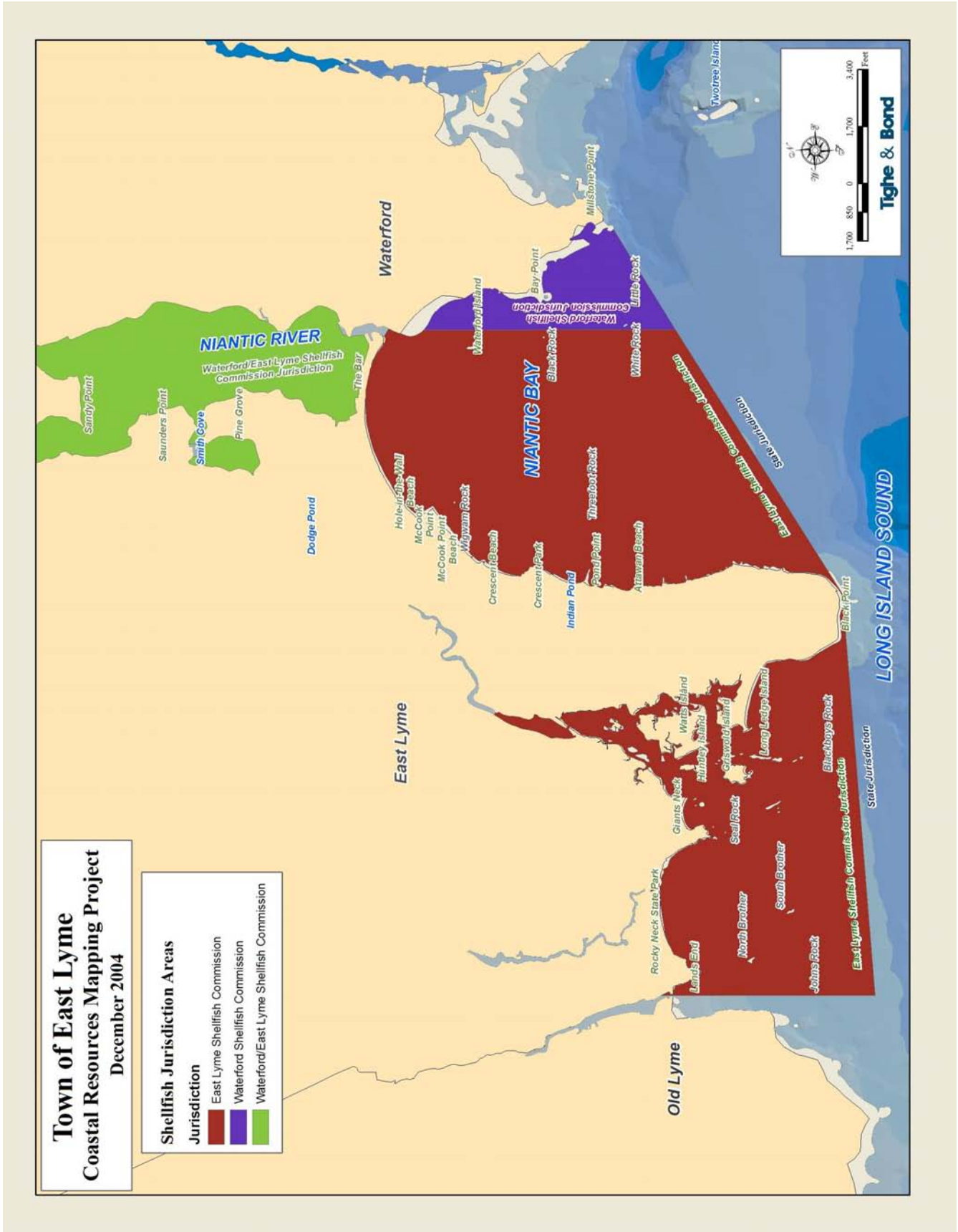
4.2.3 Membership and Terms of Service

The members of the Harbor Management Commission shall be appointed by the Board of Selectmen, four for terms to expire on Monday of January 1988, and three terms to expire on the first Monday of January, 1990. Upon expiration of each of the initial terms, appointment shall be made to fill such terms for four years. Vacancies shall be filled by the Board of Selectmen in accordance with Chapter 4 of the Charter. The Harbor Master shall be a non-voting ex-officio member of the Commission, and if there shall be a vacancy in the office of the Harbor Master, the Deputy Harbor Master shall so serve until the vacancy is filled.

4.3 Fees

The Commission may issue licenses for the collection of shellfish and fix the fees for such collections, may designate the quantities of such shellfish to be taken, the sizes of such shellfish, and the methods of taking.

The Commission may prohibit the taking of shellfish from certain designated areas for periods not in excess of one year.



All monies collected by the Commission under the provisions of Section 26-257b of the General Statutes of the State of Connecticut shall be paid to the Commission and used by the Commission for the protection and propagation of the shellfish under its control. The Commission reserves the right to arrange for the exchange of "in-kind services", e.g. 10% of a commercial harvester's catch in lieu of bushel fees, or similar arrangements which will aid the Commission in the implementation of its programs. A fee and fine structure will be established by the Commission, adopted, and reviewed yearly. The fee schedule is available at the Town Hall (Selectman's Office) and the town web site.

4.4 Enforcement

The Commission shall have the power to appoint enforcement officers to supervise the beds and enforce the regulations issued by the Commission and authorized as above. Any person who violates any provision of these rules shall be fined not more than two hundred (\$200.00) upon conviction, or imprisoned not more than ten (10) days or both. Upon conviction, the court may order that such person may not be entitled to a permit or license to take shellfish from waters under the Commission's jurisdiction for the remainder of that season following such conviction.

4.5 Recreational Shellfishing – Clamming, Musseling and Oystering

4.5.1 Permits Required

All recreational shellfishing is allowed by permit only. Permit fees are set by the Commission in accordance with Section 4.3. There are no refunds of shellfish permit fees. Penalties for shellfishing without a permit or violating permit conditions are set forth in Section 4.4.

Any person purchasing a clamming permit may use it for the term specified on the permit to take his/her daily limit of oysters when oyster season is open. Permit is also valid for taking of mussels.

Anyone under the age of 12 may shellfish without a permit if accompanied by a valid permit holder. The Daily Limit for both will be the same as a single permit holder.

Permits are available from local bait and tackle shops and Town Hall. Shellfish permits include the shellfish map, open shellfish areas as described below, permitted activities and fines for non-compliance.

Any resident of the State of Connecticut will be allowed and required to purchase a permit. Out-of-State residents who are renting living accommodations in the Town of East Lyme, may purchase a permit at designated rates for the time of their stay only, with proof in writing of at least seven (7) days continuous residency in town.

4.5.2 Limits and Conditions

Daily Limit is one peck (8 quarts) per permit for clams and one peck (8 quarts) for oysters. The state limit for mussels is ½ bushel per day.

Name and address of all permittees shall be registered on the permit. The permittee will receive a copy that shall be carried during shellfishing. Both local and permanent addresses of out of state residents are required.

No person shall take from these waters or beaches or have in his possession, soft shell clams which are less than one and one half inches (1-1/2") in length or hard shell clams which are less than one inch (1") in thickness or will pass through a ring of one and one half inch (1-1/2") internal diameter, or razor clams which are less than four inches (4") in length. Oysters must be at least three inches (3") in length.

No rake, tong or other device shall be used for taking of hard shell clams with spaces or openings between the teeth or prongs less than one inch (1"). The taking of shellfish will only be allowed between Sunrise and Sunset.

All state laws pertaining to shellfishing not covered by the Commissions regulations will apply and be enforced by the Commission's and the State's Wardens.

Possession of a permit does not allow the holder to take shellfish in areas that are subject to closure and have been posted as either temporarily or permanently closed.

Taking of shellfish by free swimming, snorkel or scuba diving is prohibited.

There is no shellfishing in Leased Areas. See map on page 19 for locations of Leased Areas.

4.5.3 Seasonal Open and Closed Areas

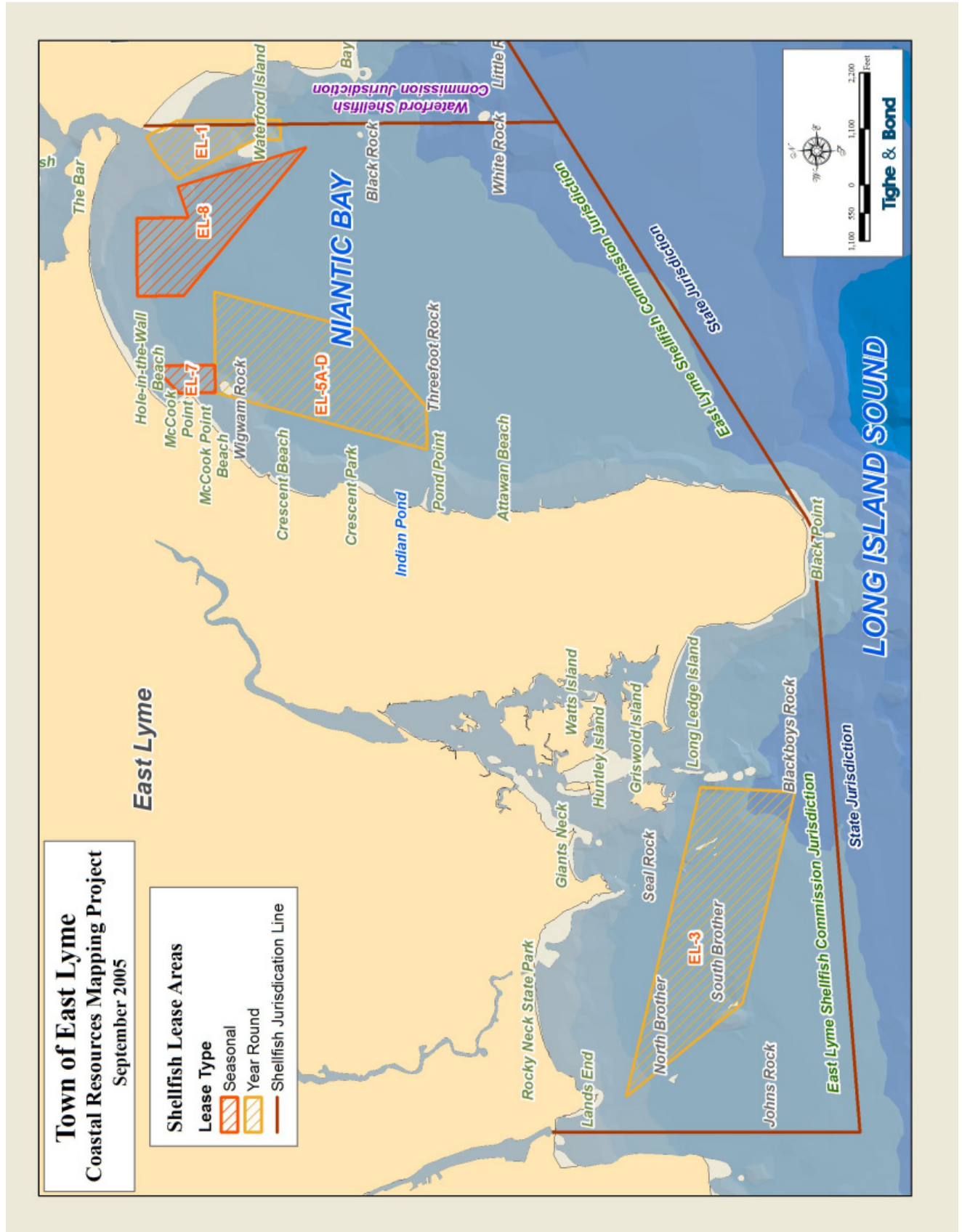
The Shellfish Commission on a periodic basis will determine clamming, musseling and oystering season. Areas open for shellfishing (Conditionally Approved – see below for definition) are dependent upon the season and/or rainfall. Please refer to the Approved Shellfish Areas maps (p.21 and p.57) and detailed description of shellfish areas under Section 4.5.5.

Area "A" is conditionally open on a year-round basis. Area "B" is closed seasonally between May 1st and November 15th. Both areas have a 1-inch rainfall closure trigger. Area "E" is conditionally approved on a year-round basis. Area "F" is approved between November 1st and April 30th. The area between is approved on a year-round basis.

A map depicting the conditionally approved areas "A", "B", "E" and "F" and written description of such areas is included in a recreational permit issued by the Commission.

Areas A and B: Conditionally Approved: A 1-inch rainfall in a 24 hour period will result in the closure of a conditional area for a minimum of 7 days. The Commission will take water samples after 5 days and announce the opening or continued closure of such areas. Closure may also occur for sewage or chemical effluent release or other public health reasons.

Areas E and F: Conditionally Approved: A 2-inch rainfall in a 24 hour period will result in the closure of a conditional area for a minimum of 7 days. The Commission will take water samples after 5 days and announce the opening or continued closure of such areas. Closure may also occur for sewage or chemical effluent release or other public health reasons.



4.5.4 Public Notice

The Commission shall advise the public of openings and closures by the use of status "signal disks" located at the state boat launch on Rope Ferry Road for areas "A" and "B" and at Hole in the Wall Beach for areas "E" and "F." Red disks signify CLOSED and white signify OPEN.

4.5.5 Map and Description of Public Shellfishing Beds

Existing and potential recreational shellfishing areas are shown on the Shellfish Areas Maps on p.21 and p.57.

DESCRIPTION OF THE CONDITIONALLY APPROVED/APPROVED AREAS TO BE CLOSED CONTINGENT UPON THE OCCURRENCE OF SPECIFIC EVENTS

(Note: Areas "A" and "B" are not under the East Lyme Shellfish Commission's jurisdiction and are not shown – contact the Waterford/East Lyme Shellfish Commission for further information)

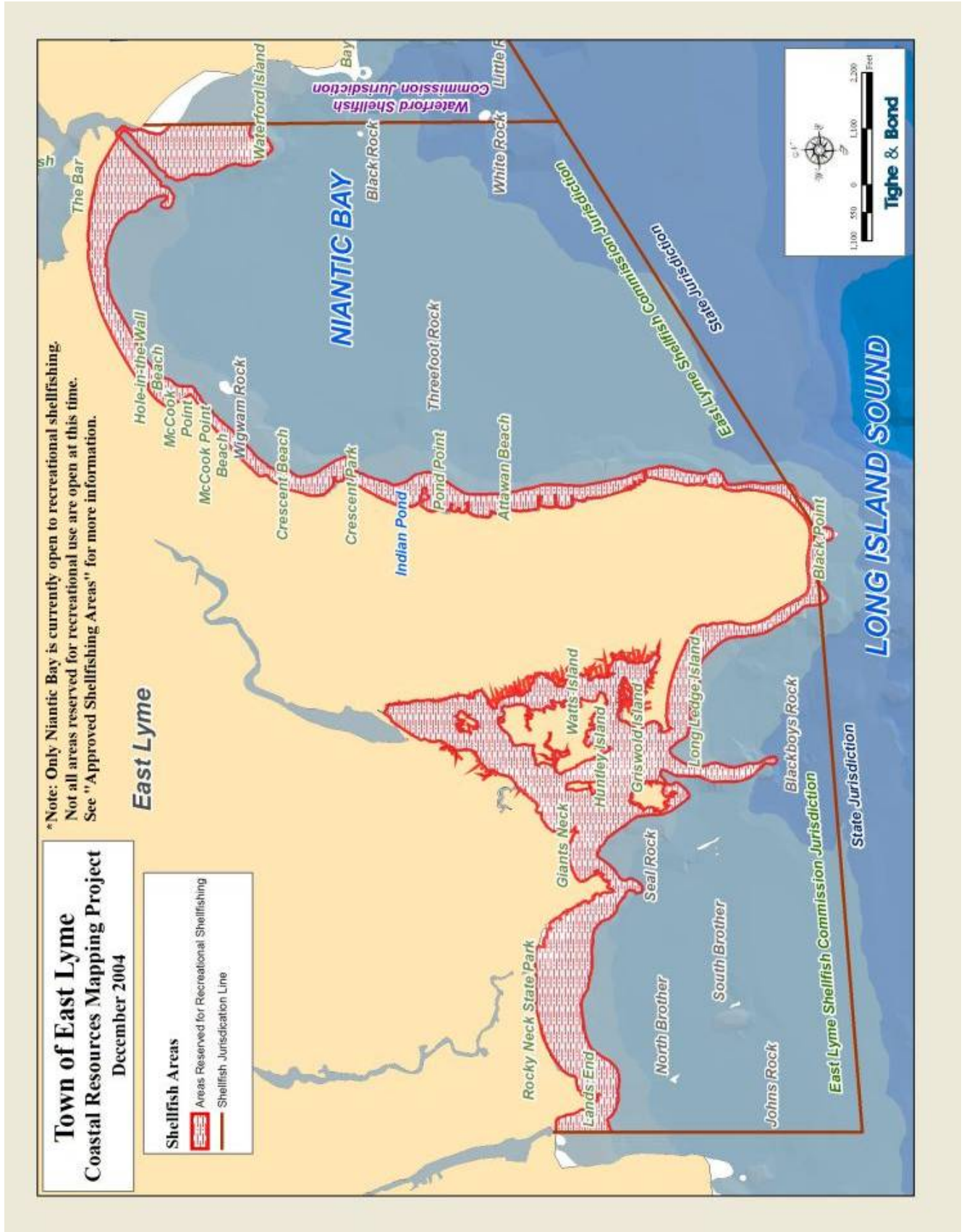
Conditionally Approved – Rain Fall

Area "A"/Niantic River – East Lyme, Waterford: The tidal Waters of the Niantic River and its tributaries enclosed by a line commencing at the shellfish demarcation sign on the eastern shore of Keeny Cove, Waterford, west to the southern extremity of land on the western shore of Keeny Cove (Horse Point), then commencing again at the shellfish demarcation sign at the southwestern extremity of Sandy Point in Waterford, thence south to the shellfish demarcation sign at the eastern end of the Town Road fire dock at Saunder's Point in East Lyme, east 1,300 feet to the shellfish demarcation sign (buoy) in the middle of the Niantic River, thence southeasterly to the shellfish demarcation sign (buoy) located at the "pipe" identified on the NOAA navigational chart, thence east to the shellfish demarcation sign at the Bayview Beach Association dock in Waterford.

Conditionally Approved – Rain Fall/Seasonal

Area "B"/Niantic River – East Lyme, Waterford: The tidal waters of the Niantic River and its tributaries enclosed by a line commencing at the shellfish demarcation sign on the eastern end of the Town Road fire dock at Saunder's Point, East Lyme, east 1,300 feet to the shellfish demarcation sign (buoy) in the middle of the Niantic River, thence southeasterly to the shellfish demarcation sign (buoy) located at the "pipe" identified on the NOAA navigational chart, thence east to the shellfish demarcation sign at the Bayview Beach Association dock in Waterford and bounded on the south by a line commencing at the shellfish demarcation sign located approximately 1,000 feet north of the State boat launch area in Waterford, southwesterly to buoy G "7", thence south to the shellfish demarcation sign on the north shore of the Bar 1,200 feet west of the former Route 156 swing bridge, East Lyme, exclusive of Conditionally Restricted-Relay and Restricted-Relay areas in East Lyme and Waterford. This Conditionally Approved area shall be "closed" seasonally between May 1 and October 15.

Area "E"/Upper Niantic Bay, East Lyme: The tidal waters of Niantic Bay in East Lyme enclosed by a line commencing at the shellfish demarcation sign on the south shore of "The Bar" at a point 3,000 feet west of the mouth of the Niantic River, south-southwest to navigational buoy C"5" at Threefoot Rock, thence northeast to



the shellfish demarcation sign on the eastern shore of the Niantic Bay in Waterford 1200 feet south of the mouth of the Niantic River, thence west to navigational day marker G "1", thence north-northwest to the southeast shore of "The Bar" in East Lyme at a point 1600 feet west of the mouth of the Niantic river.

Area "F"/ Conditional Approved - Seasonal, East Lyme: The tidal waters of Niantic Bay in the special anchorage area off Crescent Beach enclosed by a line commencing at the shellfish demarcation sign located at Crescent Beach on the eastern extremity of the point of land at the intersection of Crescent Avenue and Bayview Avenue east to navigational buoy G"9", thence southwest to the shellfish demarcation sign located on the eastern extremity of the Niantic Bay Yacht Club breakwater at a point 100 feet south of the northern extremity of that breakwater, thence west-northwest to the shellfish demarcation sign located at a point 500 feet north of the Davis (Indian) Pond outlet. This area shall be closed to the harvesting of shellfish seasonally while this anchorage area is in use from May 1 - October 31.

Approved Area, East Lyme: This area is bounded commencing by a line from a shellfish demarcation sign at the eastern extremity of land at Pond Point, east to Navigational buoy C"5" at Threefoot Rock, thence north-northeast to a shellfish demarcation sign on "The Bar", approximately 3000 feet west of the mouth of the Niantic River, exclusive of the area described in Area "F", which is closed seasonally and the Restricted (closed) area in the Niantic Bay Yacht Club boat basin and around the outlet from Davis Pond.

Note: Shellfishing is prohibited in leased aquaculture areas. These are shown on the map Shellfish Lease Areas on page 19.

4.6 Commercial Shellfishing—Traditional

Commercial harvesting of shellfish in East Lyme requires individual and vessel licenses from the state Department of Agriculture, Bureau of Aquaculture Division pursuant to Section Sec. 26-192c of the CT General Statutes.

All commercial shellfish vessels operating in East Lyme must be properly licensed pursuant to Sec. 26-212 of the CT General Statutes.

4.7 Commercial Aquaculture

4.7.1 Purpose

To protect the rights of the citizens of East Lyme to enjoy the use of the Town's shoreline, waterways and recreational shellfishing areas and to balance the public usage of Town waters with the usage of designated areas for commercial and non-commercial shellfishing operations. In balancing these interests, the Commission may consider: safety; hazards to navigation; noise and light pollution; water column and bottom pollution; and aesthetics.

4.7.2 Authority

This Aquaculture Management Plan is enacted in accordance with Section 26-257a of the Connecticut General Statutes.

4.7.3 Definitions

4.7.3.1 Category I Aquaculture

Traditional bottom culture without the use of containers or any grow-out structures.

4.7.3.2 Category II Aquaculture

Category II Aquaculture includes all on bottom shellfish and other aquatic organisms rearing devices (including cages and bags), and all off bottom suspended systems (including long lines, lantern nets, rafts, and associated work floats) for the culture of shellfish or seaweed and other aquatic organisms. Also included under this category is the installation of intake and discharge structures for land-based hatchery with once through circulation system. Category II aquaculture areas have been designated in the Management Plan as areas that are suitable for this type of activity. (Structures must be submerged in water at least 8 feet below Mean Low Water (MLW). Other areas may be considered by the Commission on a case-by-case basis.

4.7.3.3 Experimental Aquaculture

Experimentation is generally small in scale and short in duration. Experimentation is conducted with the intent of determining the probable success and/or feasibility of growing shellfish or other species, as a profitable venture. Experimentation may also be conducted for purely scientific research. Experimentation may often focus on, though is not restricted to, determining methodology, site location, and/or techniques for species being grown.

4.7.3.4 For Profit Aquaculture

Aquaculture for profit is generally larger in scale and longer in duration than experimental aquaculture.

4.7.3.5 Town Waters

The term "Town Waters" used throughout this document is defined as the waters under jurisdiction of the East Lyme Shellfish Commission, including the water column and lands below the surface of the water (bottom).

4.8 *Non-Commercial/Experimental Aquaculture*

Experimentation is generally small in scale and short in duration, but may be of Category I or Category II aquaculture. (See 4.7.3 Definitions, above).

4.8.1 Application Procedure

Interested parties may request an application from the Commission (Appendix 5.1). Once the application is completed, it may be submitted with all requested materials for review. Acceptance of an application does not signify approval of the proposed work.

Applicants may submit expansion plans as part of their application for aquaculture experimentation. The applicant may define an expected area for future anticipated aquaculture operations that would result from or be based upon the results of their

experimentation program. A site description and map, including Lat/Lon (GPS) coordinates must be submitted for review as part of the application.

Submission of expansion plans with an application does not constitute or imply any guarantee to the applicant. In those cases where expansion plans are filed as part of the application for aquaculture experimentation, the applicant will be given first right of refusal should any commercial aquaculture application be made that overlaps the expansion area.

The first right of refusal offer will expire if an Aquaculture for profit application is not submitted by the experimenter to the Commission for review within 60 days of their notification by the Commission of a conflicting application by registered letter.

Additional periods for further review may be granted by the Commission, as necessary.

4.8.2 Restrictions

The extent of an area of an experimental area shall not exceed 2 acres.

The duration of an experimental project shall not exceed 2 years, without renewal approval from the Commission.

4.8.3 Review Process

The Commission will review past experimentation efforts conducted in Town waters to determine if the proposed work has been wholly, or in part, conducted previously, or if their research will provide substantially new, different or useful information relevant to economically sustainable aquaculture ventures.

The Commission will assess impacts to other natural resources, particularly to eelgrass beds, to mitigate and/or avoid such impacts.

Permanent and temporary structures must meet all applicable state and federal statutory standards and must be fully permitted as required by state and federal law.

If new or non-native species are intended to be introduced to the shellfish area as part of the proposed work, the Commission requires that all appropriate State Agencies, including but not limited to the State of Connecticut Department of Agriculture, Bureau of Aquaculture and the State of Connecticut Department of Environmental Protection, review the proposed work and provide comment prior to the Commission's review of the application.

It is the applicant's responsibility to obtain all appropriate and applicable state and/or federal permits required to undertake the activities described in the application, including but not limited to permits from the Bureau of Aquaculture and all other agencies that the Bureau of Aquaculture determines are required to review and approve the application. The Commission will not conduct a final review of the application until these steps have been completed by the applicant.

4.8.4 Approval Process

If the application for experimental aquaculture is approved, a lease will be entered into and signed by the applicant and an authorized agent of the East Lyme Shellfish Commission.

A sample lease is attached to this document as Appendix 5.2.

A fee will be assessed for experimental aquaculture programs on an annual basis by the Commission. This fee will be included in the Commission's fee schedule and available at the Town Hall (Selectman's Office).

After entering into a lease, the lessee shall be required to file an annual report with the Commission, in accordance with the reporting requirements set forth by the Commission.

The reporting process will assist the Commission in making decisions regarding the appropriateness of the work, potential for conflict with other uses of the resource, and the desirability of allowing renewal or growth. The information provided will be kept on file and be used to inform future applicants for experimental work in Town waters.

Unless agreed upon by the applicant, either as a condition in their Lease or as negotiated during the course of the experimentation period, other work or efforts under the direction of the Commission will not be allowed in the area designated for the non-commercial/experimentation project. The Commission and the Lessee shall agree and specify any other work or efforts which will be allowed in the area designated for the non-commercial/experimental project. These shall be specified in the lease agreement.

Projects are generally non-renewable as they are designed to be short in their extent and intended to answer a specific question or questions related to successful aquaculture. In some instances however, there may be valid reasons to continue the experimentation process. In these instances, the renewal time frame shall not exceed a one-year period. If further time is desired, a new application for experimentation shall be submitted.

4.8.5 Rejection Process

Upon rejection of an application for a lease or experimental shellfish area, the applicant may appeal to the Commission for reconsideration of the decision within 30 days.

4.8.6 Termination

The Commission may terminate the Lease if any condition of the Lease is violated by the lessee. The Commission may also end the Lease due to other urgent commitment or need by either the Commission or the Town of East Lyme. In such case the lessee will be given at least a 2-month period within which to end the experimentation and clean up any gear and other materials at the site.

The Commission shall terminate the Lease if the work is not being carried out in accordance with the purpose specified in the preamble to the lease entered into by the parties.

4.8.7 Liability

The Town assumes no liability for any gear, shellfish product, effort or other investments made by the lessee under the terms of experimentation. The applicant is responsible for the complete removal of all gear and equipment associated with the project upon termination or expiration of the Lease, and will be billed for any clean up or gear removal activities that must be undertaken by the Commission or the Town, to restore the area to pre-experimental conditions and/or uses.

4.8.8 Transition from Experiment to Aquaculture for Profit

Transformation from experiment to culturing for profit may be pre-planned during the application process by definition of an Expansion Area by the applicant.

4.9 Commercial Aquaculture For- Profit

4.9.1 Introduction

The East Lyme Shellfish Commission allows the commercial growing of shellfish in Town waters. Commercial harvesters, unlike recreational harvesters must undergo licensing and permitting at the Federal and State level in order to operate an aquaculture system and harvest the shellfish product for resale. In addition, the Town may add restrictions and stipulations not required at State or Federal levels, such as restricting harvesting between certain hours or on certain days, and/or limiting the area within which shellfish can be grown and harvested.

There are several concerns that must be addressed in considering any proposal for conducting aquaculture in or on East Lyme shellfishing grounds. Because of the more invasive nature of actively growing shellfish, such as the introduction of underwater structures, the greater activity level by the lessee, and the potential for pollution of the leased grounds, the Commission intends to evaluate Category II applications more closely than Category I applications.

The Commission's main concerns are:

- a. Water Column and Bottom Pollution as the result of aquaculture operations.
- b. Hazards to Navigation
- c. Public Access
- d. Safety
- e. Aesthetics
- f. Noise and Lighting Pollution (Use of leased areas will be restricted to daylight hours)

4.9.2 Application Process and Requirements

Interested parties may request an application from the Commission (Appendix 5.1). Once the application is completed, it may be submitted with all requested materials for review.

Acceptance of an application does not signify approval of the proposed work.

Applications are dated and given an ID number upon receipt and are considered by the Commission in the order received.

Leases shall not be granted in areas where there are recreational shellfish beds and the water depth is less than 6 feet (Mean Low Water).

An application fee of \$100.00 will be levied upon the applicant to cover the cost to the Commission incurred as a result of processing the application. The fee may include, but is not limited to, costs associated with advertising a public notice, costs associated with documentation of public comment at the public hearing, copy costs and/or

production of maps necessary for distribution as part of the review process, and costs associated with updating the shellfish lease map maintained at Town Hall.

Any significant or major modification made to the application by the applicant not at the specific request of the Commission and/or other agencies, shall be denied without prejudice by the Commission.

Any application to the East Lyme Shellfish Commission for Category I and Category II Commercial Aquaculture shall include the following:

1. Latitude/longitude coordinates defining the area to be used for aquaculture.
2. NOAA Oceanographic/Navigation chart showing the approximate location and extent of the proposed aquaculture operation.
3. Description of the site, focusing on bottom condition of the area to be used, and particularly noting the existence of eelgrass and/or shellfish populations or other significant natural resources.
4. Specific methodology & timing of growing and harvesting.
5. Assessment of any known or anticipated conflict with other users or uses of Town resources as a result of the proposed aquaculture operation.
6. Species to be grown.
7. Intended buoyage.
8. Time frame of the proposed venture and if renewal would be anticipated.
9. Registration ID and photographs of all vessels to be used.
10. Certificate of Availability from the Town Clerk for the proposed site.
11. Name, address and Phone number of the applicant/corporation.
12. Signed affidavit that the applicant has read and understood the provided guidance to aquaculture applicants.

Any application to the East Lyme Shellfish Commission for Category II commercial aquaculture shall additionally include the following:

1. Type(s), Size(s), and Number(s) of Structures.
2. Method(s) of Structure Deployment.
3. Intended buoyage.
4. Plans to ensure that the Benthic Population is not Adversely Affected.
5. Detailed Charts showing the Area(s) to be Developed and Types of Activities in Each Area (e.g., Nets, long lines, cages, etc.)
6. Plan for remediation of impact caused by gear due to storm damage or other factors and assumption by applicant of liability for all operations.
7. Must be in an area designated for the type activity proposed by the applicant. A map showing areas which are suitable for Category II Aquaculture is shown on the map entitle "Potential Aquaculture areas on page 29.

For Category II aquaculture applications, the Commission will not approve open water upwellers.

Permanent and temporary structures must meet state and federal laws and regulations.

It is the applicant's responsibility to obtain all appropriate and applicable state and/or federal permits and licenses required to undertake the activities described in the application, including but not limited to permits and licenses from the Bureau of Aquaculture and all other agencies that the Bureau of Aquaculture determines are required to review and approve the application.

A lease will be developed and entered into by the Commission and the applicant, as the mechanism for the Town of East Lyme allowing temporary use of Town owned submerged lands. (See Appendix 5.2 for a sample lease.) Lease periods will not exceed a 5-year span.

4.9.3 Restrictions

Jurisdiction of all submerged lands used in any and all aquaculture operations is retained by the Town in perpetuity;

No application will be approved for implementation until copies of all approved State and/or Federal permits have been submitted to the Commission

An annual report of activities will be filed with the Commission in January of each of Calendar year.

The Commission, or its designated agent, has full right to enter and assess operations, conditions and activities on the aquaculture site.

Use of the aquaculture site for activities or purposes, or by parties other than those expressly stated in the Lease, will be grounds for termination of any and/or all agreements between the applicant and the Commission.

No activities are allowed between the hours of sunset and sunrise.

Aquaculture areas shall not be sublet to any other operator and shall not be worked by any other operator other than those defined in the Lease agreement.

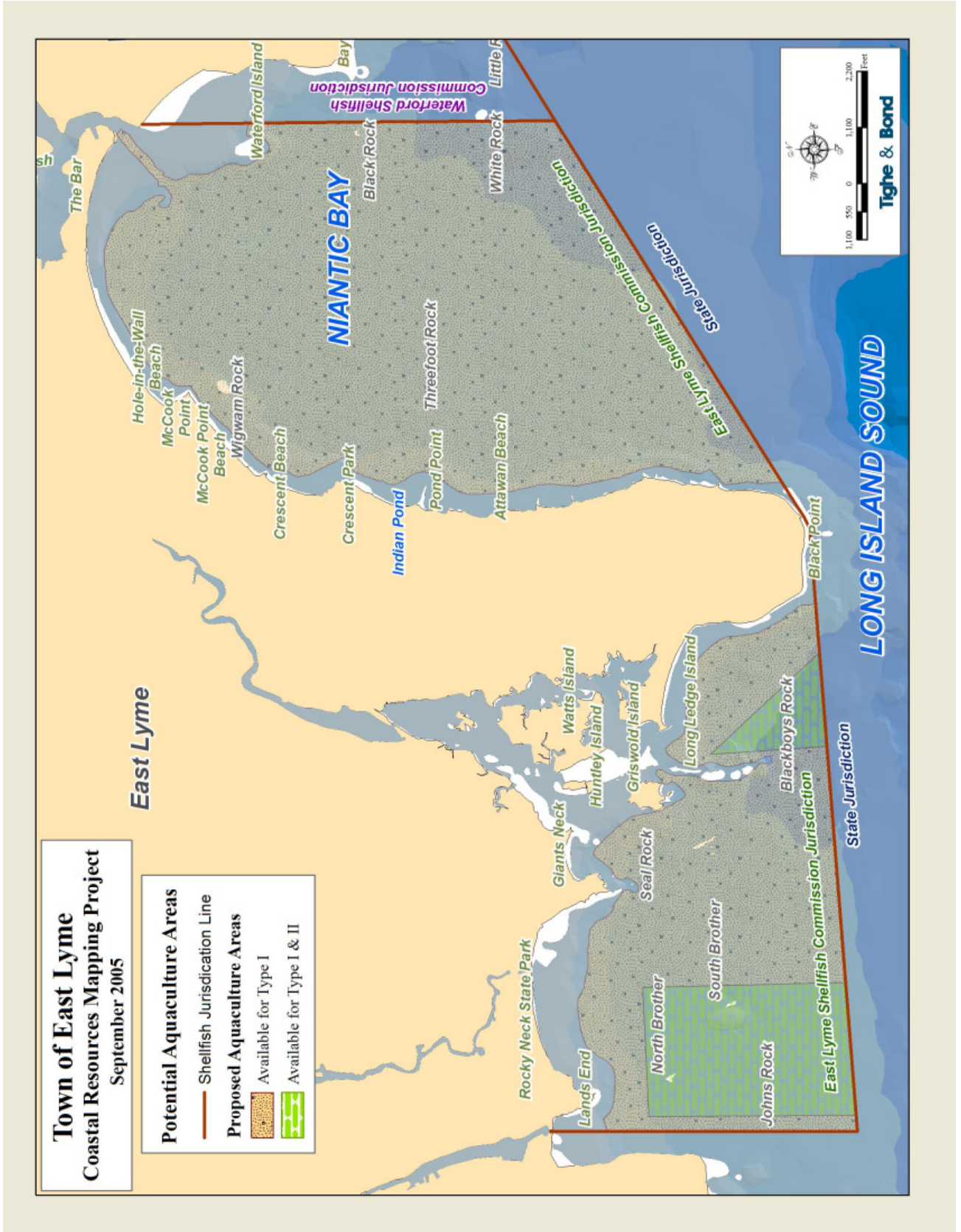
Agreements may be modified if both parties are in agreement.

4.9.4 Review Process

4.9.4.1 Preliminary Review

The Commission shall review the application to determine if it meets all criteria as set forth above and to determine if the proposed work conflicts with:

- any existing aquaculture operations
- any applications submitted to the Commission that are either pending review or are in the process of review
- any other activities conducted or supported by the Commission



If conflicting uses are found, the application will be returned, with explanatory text, for amendment or withdrawal by the applicant. Except under special circumstances, pending applications or applications under review take precedence over newly submitted applications. The review of pending or in review applications will not be influenced by new applications submitted for review.

The Commission will assess impacts to other natural resources, particularly to eelgrass and recreational interests, to mitigate and/or avoid such impacts.

A summary of all structures shall be submitted to the Commission for preliminary approval of the general concept of the project.

Permanent and temporary structures must meet all applicable state and federal statutory standards and must be fully permitted as required by state and federal law.

All structures and anchors placed or used in Town waters must be permitted by the State or Federal agency with jurisdiction. The East Lyme Shellfish Commission does not permit or accept liability for the design of any structures or anchoring methods.

Incomplete applications shall be returned to the applicant for modification and may be resubmitted when complete.

Category II projects may be proposed in non-designated areas, but will require a full review process, including a public hearing.

4.9.4.2 Full Review

A public hearing will be scheduled by the Commission. After the public hearing and public comment period have been closed and the Commission is satisfied that all its questions have been adequately addressed, it will vote on approval or rejection of the application.

The Commission shall render a decision within 60 days from the later of the closing date of the hearing, the public comment period, or from the time period imposed by the Commission for the applicant to answer questions raised by the Commission.

4.9.5 Approval Process

If the application for "For Profit Aquaculture" is approved, a lease will be entered into and signed by the applicant and an authorized agent of the East Lyme Shellfish Commission.

A sample lease is attached to this document as Appendix 5.2

The lease shall contain the following:

- an agreement setting forth the mechanism for submerged lands under the town's jurisdiction;
- the rate and form of payment to the Commission for the lessee's use of submerged lands under the town's jurisdiction;
- a description of the aquaculture area, including latitude and longitude coordinates, sufficient to define the exact boundaries of the leased area; and,
- the length of time the lease shall be in effect and binding upon the parties.

An annual report of activities will be filed with the Commission in January of each of Calendar year.

The reporting process will include assessing the extent of eelgrass, if any, within the leased area, on a bi-annual basis. The reporting process will assist the Commission in making decisions regarding the appropriateness of the work, potential for conflicting with other uses of the resource, and the desirability of allowing renewal.

Unless agreed upon by the applicant, either as a condition in their Lease or as negotiated during the course of renewal, other work or efforts under the authorities of the Commission will not be allowed in the area designated for the lease. The Commission and the Lessee shall agree and specify any other work or efforts which will be allowed in the area designated for the commercial project. These shall be specified in the lease agreement.

The Commission, or its designated agent, has full right to enter and assess operations, conditions and activities on the aquaculture site.

Leases shall not be granted in areas where there are recreational shellfish beds and the water depth is less than 6 feet (Mean Low Water).

In accordance with Sec. 26-240 of the CT General Statutes, fees for the lease of submerged lands for aquaculture shall be paid to the Shellfish Commission and shall be used by the Commission in managing, enhancing and promoting shellfish resources and their associated habitats in the Town of East Lyme.

Upon approval and signing of the Lease, the shellfish lease map and associated files kept on file at Town Hall will be updated to reflect the new use of submerged lands under the town's jurisdiction.

In accordance with Sec. 26-243 of the CT General Statutes, the lease will be recorded by the Town Clerk and the Shellfish Lease Map will be amended to reflect the lease area once the lease is validated and fees have been collected.

A Lease agreement may be amended during the lease period by either party and through mutual agreement of both parties, to reflect changes in gear, processes and other advancements in aquaculture and shellfish rearing/harvest technologies provided the proposed amendments do not significantly alter the purpose and/or extent of the aquaculture operation and do not present conflict with neighboring uses of coastal resources.

4.9.6 Denial Process

Upon rejection of an application, the applicant may appeal to the Commission for reconsideration of the decision within 30 days.

Applications denied by the Commission will be returned to the applicant and lose all standing in the application process. Applications, should they be revised and resubmitted, enter into the process of review as a newly submitted application

4.9.7 Renewal

The holder of an existing aquaculture site will be given first preference, assuming there is no reason not to give preference, for continuing use of the site through renewal in a manner similar to that of the original lease agreement.

The Commission is under no obligation to renew a lease upon its expiration. Renewal will be assessed based upon performance and adherence to original lease

specifications, details provided in the reporting and documentation process and overall agreeability of the working relationship between parties.

Renewals will not be subjected to public review or other approval outside that of the Commission provided that significant change has not been proposed to occur in use of the site from that designated and delineated in the original lease agreement.

If the lessee has met all requirements imposed by the Commission during the term of the lease, the lessee may have an option to renew the lease, subject to all applicable regulations, standards and policies in this plan.

4.9.8 Termination

The lease agreement can be terminated by the Commission, upon proper notification to the shellfish grower, if and when any stipulation(s) of the agreement is not carried out by the shellfish grower as stated in the agreement.

Use of the aquaculture site for activities or purposes, or by parties other than those expressly stated in the Lease, will be grounds for termination of any and/or all agreements between the applicant and the Commission.

The Town of East Lyme retains the right to terminate the lease agreement should an urgent, critical need, for the overall public good of the Town, state or nation, arise that would necessitate use of the area being used for aquaculture operations.

The lease agreement will be terminated by the Commission in any and all cases where the shellfish grower is not actively, consistently and continually working the designated aquaculture site in a manner that would reasonably lead to the growth and harvest of shellfish.

In the event of termination the shellfish grower will be given a reasonable amount of time within which to harvest, transplant and/or otherwise remove shellfish product and aquaculture gear from the site.

At termination of the lease, the lessee shall inform the Commission of the intent to terminate the agreement and shall remove all equipment.

Aquaculture areas will be rehabilitated or restored by the grower when the term of lease or agreed upon use is completed. This will entail, at a minimum, the removal of all aquaculture gear from the site and may include a requirement for replenishing an appropriate species of shellfish.

If the Commission determines that the actions of the lessee are creating a hazard or nuisance, the lessee shall be informed and shall have 30 days to correct the problem.

The lessee may terminate the lease prior to the full term, upon written notice to the Commission.

The Commission may terminate the lease upon failure of the lessee to comply with all applicable governmental laws and regulations.

4.9.9 Liability

The Town shall not be held responsible for any obligations, financial or otherwise, accrued by the applicant as a result of the permitted aquaculture operation nor shall it be held responsible for the value of any gear, shellfish product or other items associated with the aquaculture operations.

EAST LYME SHELLFISH COMMISSION MANAGEMENT PLAN December 2005

The Town assumes no liability for any gear, shellfish product, effort or other investments made by the applicant under the terms of the lease. The use and design of all gear is approved and permitted by state and federal regulatory agencies. The applicant is responsible for the complete removal of all gear and equipment associated with their project upon termination or expiration of the lease, and will be billed for any clean up or gear removal activities that must be undertaken by the Commission or the Town of East Lyme to restore the area to pre-existing conditions and/or uses.

5 APPENDICES

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5.1 Town of East Lyme Aquaculture Application

TOWN OF EAST LYME

East Lyme Harbor Management/Shellfish Commission
Application for Aquaculture

Applicant Name: _____

Business Name: _____

Mailing Address: _____

Town: _____ State: ____ Zip Code: _____

Home Phone _____ Business Phone _____ Cell _____

Purpose: Commercial ____ Research ____ Other _____

Species to be cultivated: _____

Source of Seed Stock (Must be DA/BA approved): _____

Length of Lease Requested: _____ (Not to exceed 5 years)

Location of Project – Attach map (List GPS coordinates in order for irregular plots):

Position 1: _____ Position 2: _____

Position 3: _____ Position 4: _____

Position 4: _____ Position 6: _____

Add additional reference points and description on back (Check here) _____

Total number of tract acres: _____

Water Classification: Approved ____ Conditional ____ Restricted Relay ____ Prohibited ____

Type of Aquaculture:

Category I: _____ (On bottom only) Category II: _____

If Category II is checked, specify all types that apply:

Raft ____ Suspended ____ Net Pens ____ Long Lines ____ Cages ____ Bags ____ Hatchery ____

Upweller ____ Predator Nets ____ Other _____

EAST LYME SHELLFISH COMMISSION MANAGEMENT PLAN December 2005

I certify that the above application and all submitted documentation are correct to the best of my knowledge. The applicant must receive approval from DA/BA for all operations and must conform to all requirements as specified in the Aquaculture section of the ELHMSFC management plan.

Date Applicant Signature

Town Clerk Approval:

According to the records of the Town of East Lyme, the grounds described above have not been previously designated

Date Town Clerk

Commission approval:

Date Chairman

5.2 East Lyme Sample Aquaculture Lease

WHEREAS, THE EAST LYME SHELLFISH COMMISSION, on _____, at the request of _____, doing business as _____, designated as _____ acres of Niantic Bay more particularly described in Exhibit "A" attached hereto as a suitable place for the growing, cultivating, transplanting, depurating and harvesting of clams on the terms and conditions hereinafter set forth;

NOW, THEREFORE, THE TOWN OF EAST LYME, acting herein by its SHELLFISH COMMISSION, (the "Lessor") hereby leases to _____, d/b/a _____ (the "Lessee") the area of Niantic Bay hereinafter described on the following terms and conditions:

1. Leased Premises. The bottom or bed or ground of Niantic Bay more particularly described in Exhibit "A" attached hereto. It is understood and agreed that the Lessee shall not place any structures on the Leased Premises, or make use of the water column above the Leased Premises, without the express consent of the Lessor.

2. Term. This lease shall be for a term of ___ year, from _____ to _____.

3. Rent. The Lessee shall pay to the Lessor the sum of _____ per acre, said amount to be paid upon the Lessee's signing of this lease.

4. Purpose of Lease. This Lease shall be for the sole purpose specified in the preamble to this Lease, and is conditioned upon the Lessee actually using the leased premises for such purpose and for no other purpose.

5. Assignment. This lease shall not be assigned or subleased without the prior consent of the Lessor.

6. Termination. This lease may be terminated by the Commission pursuant to Section 4.9.8 of the Regulations, as amended. such event, the Lessee agrees that the Lessor shall not be responsible for any financial or consequential damages, direct or indirect, that may be suffered by the Lessee as a result of the Lessor's termination of this Lease.

7. Conduct of Shellfishing Operations

(a) Clamming operations shall ___ shall not ___ be permitted between _____ and _____.

(b) Clamming operations will be suspended, and the Lessor will be notified immediately, if eelgrass is encountered in any portion of the leased premises during clamming operations.

(c) The Lessor shall have the right to inspect the Leased Premises during the term of this Lease.

(d) This Lease is accepted by said Lessee subject to all the provisions of the Connecticut General Statutes and any amendments thereto, and is also subject to any rule or rules now in effect or hereinafter made by the Lessor regarding the marking of said grounds by buoys or otherwise, and is also subject to such other and further rules as are now enacted and may hereafter be enacted by the Lessor.

(e) The Lessee agrees that he will cooperate with any educational and scientific projects now or hereafter operated in the area of the leased premises as fully as possible, consonant with his use thereof.

(f) Other conditions of clamming operations:

8. Disclaimer of Warranty. The Lessor expressly disclaims any warranty of title to the Leased Premises, or that the Leased Premises are fit for any specific use or particular purpose. The Lessee understands and agrees that the Leased Premises may be subject to such rights as may be possessed by littoral property owners.

9. Indemnification. The Lessee agrees to hold the Town of East Lyme Shellfish Commission harmless and indemnifies it from any claims that arise out of, relate to or result from the use of the Leased Premises.

10. Agreement With All Terms & Conditions. By signing the East Lyme Aquaculture Lease, the lessee agrees to all applicable terms and conditions as set forth in the East Lyme Shellfish Plan, ordinance and this lease.

11. Notice. Notices for each party to be sent to:

a. East Lyme Shellfish Commission
East Lyme Town Hall
108 Pennsylvania Avenue
P.O. Box 519
Niantic, CT 06357

b. _____

EAST LYME SHELLFISH COMMISSION MANAGEMENT PLAN December 2005

Dated at East Lyme, Connecticut, this _____ day of _____.

EAST LYME SHELLFISH COMMISSION

Donald F. Landers, its Chairman,
Duly authorized

_____, doing business as

STATE OF CONNECTICUT }

ss. New London

COUNTY OF NEW LONDON }

On this _____ day of _____ before me _____, the undersigned officer, personally appeared **Donald F. Landers**, Chairman of the East Lyme Shellfish Commission known to me to be the person described in the foregoing instrument, and acknowledged that he executed the same in the capacity therein stated and for the purposes herein contained. In witness whereof I hereunto set my hand.

Notary Public
Commissioner

STATE OF CONNECTICUT }

ss. New London

COUNTY OF NEW LONDON }

EAST LYME SHELLFISH COMMISSION MANAGEMENT PLAN December 2005

On this _____ day of _____ before me _____, the undersigned officer, personally appeared _____, doing business as _____ known to me to be the person whose name is subscribed to the within instrument and acknowledged that he executed the same for the purposes therein contained. In witness whereof I hereunto set my hand.

Notary Public
Commissioner

5.3 A HISTORY OF SHELLFISHERIES IN EAST LYME

Shellfish have been an important resource in Connecticut for the past 10,000 years, ever since aboriginal Indians made summer camps along the shoreline to collect the various species of shellfish. The location of such camps is marked by huge piles, known as middens, of mixed oyster and quahog shells. When the European settlers arrived, they also took advantage of the plentiful shellfish of the region. Initially viewed as a 'common' food, shellfish, and oysters in particular, grew to be considered a delicacy, and thriving commercial shellfisheries developed. By the mid-1800's, commercial interests and competition had grown to the point where the State Senate passed legislation for the leasing and granting of grounds in State waters, to private individuals, for the purpose of raising oysters, and in 1855 passed legislation which permitted the same process to occur in Town waters. In the Town of East Lyme, oyster grounds were granted between 1894 and 1929 in various sections of the town's waters. Five grants, totaling approximately 60 acres, were laid out in the Niantic River between 1894 and 1931. Six grants were laid out in the waters of Long Island Sound surrounding Griswold Island in 1909, covering an area of about 12 acres. Mamacoke and Black Point Creeks had seven grants laid out between 1911 and 1929, totaling about 14 acres. There was a last grant or lease, made in 1949, which included 19 acres in Black Point Creek, 83 acres on the west shore of Niantic Bay and 55 acres off Rocky Neck State Park. In recent years, Robert Porter leased 17.2 acres in the Niantic Bay region, but then ended the lease and the area reverted to the town. With the involvement of private interests, oyster cultivation developed rapidly. The preference of oyster larvae for clean, hard substrates for settlement was noted and taken advantage of, either by placing clean, dry shell (cultch) or tree limbs into the rivers and estuaries during the summer spawning months. Quahogs were found to settle and grow preferentially under oyster beds, which led to a boom in the quahog fishery and the practice of oysterman selling the rights to the clams found under their beds after the oysters had been harvested.

Oyster and soft-shell clam fisheries were at their peak in Connecticut from the late 1800's into the early 1900's, with soft-shell clam landings reaching 750,000 pounds of meats annually, and the oyster landings reaching about 15 million pounds of meats annually. Both of these shellfisheries then went into declines, possibly due to excessive exploitation and years of poor settlement. All shellfisheries showed slight peaks in landing numbers between 1930 and 1940, due to increased demand during the Depression. In the 1940's and 1950's, pollution of the shellfish beds became a widespread problem, and many beds were closed, due to high bacterial levels or the presence of high levels of toxic substances such as mercury. By the late 1950's, there was no commercial soft-shell clam fishery in the state of Connecticut, and oyster landings had declined to under one million pounds of meats a year. The soft-shell clam industry has never recovered, but the oystering industry, with improved technology and the use of relaying and depuration programs, is slowly increasing its landings.

Hard-shell clam landings in the state have been highly variable, averaging 200,000 pounds of meats at the turn of the century, declining between 1900 and 1930, sharply increasing from 1930 to 1940, declining again, then increasing again in the 1960's. This last increase, and the presently increasing trend of this shellfishery, is due to new technology and improved cultivation techniques. By 1983, hard-shell clam landings were up to 450,000 pounds in the state of Connecticut. The hard clam is probably the most abundant species of shellfish available to the recreational shellfisher.

Bay scallops have also had variable landing records. The majority of scallops in Connecticut waters are found in the eastern half of the state, with the Niantic River having the most abundant population. The landings were quite low (under 50,000 pounds annually) until the 1930's, when the catch increased sharply (300,000 pounds were landed in 1935-36). Landing levels varied considerably over the next thirty years, until a dramatic decline in the early 1960's led to the ban of commercial scalloping in the Niantic River. Recreational permits continued to be issued, and it was estimated in 1982 that about 12,000 bushels were being landed annually under these permits, which translates into approximately 72,000 pounds of meats. In 1985, about 5200 bushels were landed, translating into roughly 31,000 pounds of meats.

Verbal histories from four long-time residents of East Lyme (Henry Avery, Olive Chendali, Paul Kumpitch, Sr., and Joseph Selden) all indicate that there have always been large quantities of shellfish in East Lyme waters, particularly in the Niantic River. Mr. Avery and Mr. Kumpitch both made the statement that "in the old days you could live off the river". All spoke of an abundance of oysters and softshell clams in the river region, and Mr. Avery, Mrs. Chendali and Mr. Kumpitch all agreed that there were few scallops in the river prior to the 1930's. The scallop population explosion occurred in 1932 and the river was described as having been "paved with scallops from Golden Spur to the highway bridge". The surface of the river was paved with boats collecting scallops to sell to the trucks coming in from New York and Rhode Island. The limit on scallops at that time was fifteen bushels per day per person, and there was no problem meeting the limit. Mr. Kumpitch (who was a shellfish warden in the early 1940's) spoke of accidentally sinking his boat because he had collected too many scallops. He also stated that there was not a single blade of eelgrass in the river, during this period of time and that the blight that killed it off extended up and down the Atlantic coast. Around 1940 the state planted some plugs of eelgrass in the river and the eelgrass beds grew from those plugs.

Outside of the river proper, oysters were plentiful on the rocks in Smith Cove and Mr. Avery and Mrs. Chendali spoke of going to the cove's edge with hammers and a bottle of ketchup to obtain a snack into the 1950's. Hard and softshell clams were also collected in the cove. In the Niantic Bay area, Mr. Kumpitch stated that the area around Waterford Island was noted for seed (hard) clam production and that it was common to go to that area and obtain several bushels of seed clams in the course of a few hours. He also said that the area at the mouth of Four Mile River and in front of Rocky Neck State Beach were also noted for having large quantities of seed clams.

As noted earlier, there was a large oyster industry in the Niantic and Pattagansett Rivers in the late 1800's to early 1900's. Mr. Selden indicates that the Pattagansett River area was probably abandoned when it became more economical to grow oysters in the Chesapeake Bay area. Mr. Kumpitch said that he had no recollection of anybody oystering in the Pattagansett River and that it had been closed to shellfishing for as long as he could remember. He also stated that the bottom had been so muddy when he was a boy that "if you went wrong you ended up in mud to your waist". Mrs. Robert Beckett said that her great-uncle used to oyster in the Pattagansett River during the Depression, and there is still a small oyster bed located just south of the Fair Haven Road bridge. Attempts in recent years to restore this bed have led to the discovery of the extremely high siltation rate in this river which may be linked to constriction of tidal flushing and fresh water diversion from the river.

Natural historic events such as large storms have been shown to affect shellfish beds through the movement of sand and water, leading to the burial or the beaching of large numbers of shellfish. Those shellfish that live above the sediment are

particularly prone to storm problems. Poor scalloping after the hurricane of 1938 was blamed on the disturbance of the bottom. Similarly, after hurricane Gloria in 1985, there were huge numbers of mussels washed onto the beaches shoreward of Bartlett's Reef. The storms do not have to be of hurricane magnitude to create these problems. If the bottom sediment is thoroughly disturbed, the shellfish in the sediment can also be killed. After the hurricane of 1938, hurricane Carol of 1955, and hurricane Gloria of 1985, the bottom was disturbed so greatly that the shellfish beds established at the time of the storms were destroyed. However, this disturbance also leads to a "fluffing" and cleaning of the bottom sediments which greatly enhances the conditions for settlement the following year. Thus major storms often lead to large sets and flourishing shellfisheries several years after the storm. Man-made disturbances, such as dredging and constriction of tidal flow, also destroy shellfish beds.

5.4 A RESOURCE ASSESSMENT OF SHELLFISHERIES IN EAST LYME

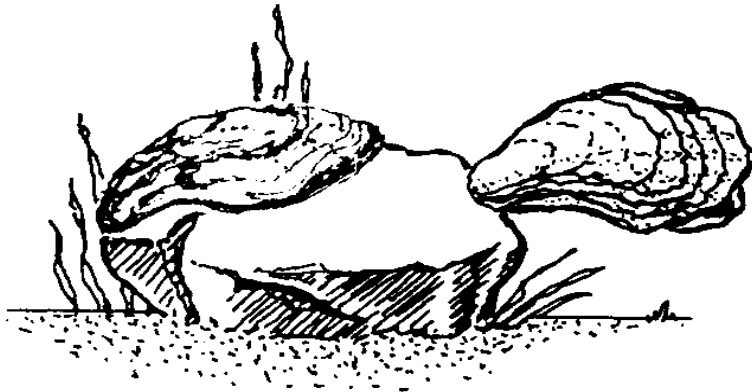
5.4.1 Life Histories of Harvestable Shellfish Species

In order to properly manage shellfish, it is important to understand their life histories and the environmental and ecological conditions that will effect the populations. Following are brief descriptions of the harvestable shellfish species found along the Connecticut coastline.

The American or Eastern Oyster, *Crassostrea virginica*

In order to properly manage shellfish, it is important to understand their life histories and the environmental and ecological conditions that will effect the populations. Following are brief descriptions of the harvestable shellfish species found along the Connecticut coastline-

1. The American or Eastern Oyster, *Crassostrea virginica*



The oyster is found from Maine to the Gulf Coast of Texas. It is found in a wide range of environments, from high-salinity coastal areas to the low-salinity areas of creeks and estuarine marshes. Oysters survive in salinities ranging from 10 to 28 part per thousand (ppt) (open ocean water has a salinity of 35 ppt), but are more frequently found in the lower salinity areas (below 15 ppt) as low salinity provides the oysters with a refuge from their principal predators.

Oysters are capable of withstanding wide ranges in temperature, from 32 to 85 degrees Fahrenheit. They are inactive at lower temperatures, and start feeding when the water temperature exceeds 48 degrees F. Oysters are filter feeders and filter large quantities of water to concentrate food particles. This process also leads to the concentration of pathogens or toxic chemicals which may be in the water, necessitating depuration of the oysters in certified clean water before their consumption by humans.

Oysters have separate sexes and spawning is temperature dependent, occurring when the water reaches about 70 degrees F. The eggs and sperm are released into the water and the resulting larvae float in the water column for a period of five days to two weeks and then settle to the bottom. The larvae must settle on a suitable hard substrate, as they are not capable of relocation after settling. If the larvae land in soft, silty sediments, they may die from

smothering by siltation or from lack of oxygen in the sediment-water interface. After settlement, the larvae grow rapidly, with the growth rate being dependent on temperature and food availability. An average oyster in good habitat can reach about 1.5 inches by the end of its first winter, almost 3 inches after two years, and about 5 inches after three years. Sexual maturity is generally reached in the second year, when the oysters reach about 2 inches in length. Oysters may live over ten years and reach 14 to 17 inches in length (Galtsoff, 1964; Blake and Smith, 1984; Visel, 1981).

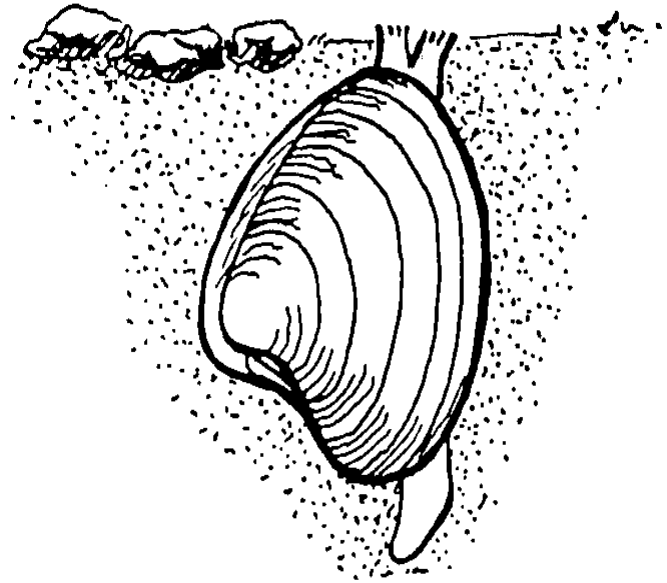
Principal predators of the oyster are humans, starfish, oyster drills and crabs. The oysters are also susceptible to water quality, as high levels of industrial pollutants and low levels of oxygen (due to excessive nutrient inputs) may be lethal. Residual levels of chlorine in treated sewage have been shown to be toxic to oyster larvae, which can also be killed after settling by overgrowth of various species of fouling organisms. There are several kinds of parasites that are capable of devastating oyster populations, including MSX, Nematosis ostreum, Hexamita nelsoni, and various trematode worms.

The Hard Clam or Quahog, *Mercenaria Mercenaria*

The quahog is found from Canada to Mexico along the Atlantic and Gulf coasts, both in deep, open waters and in protected bays and estuaries. The preferred bottom type is a firm, sandy mud, although quahogs are also found in soft mud-gravel bottoms and in silty muds. Quahogs tolerate wide ranges of both temperature (32 to 80 degrees Fahrenheit) and salinity (16 to 26 ppt), but are less tolerant of low salinities than other shellfish species. Larval quahogs require salinities of 22 ppt for proper development.

Quahogs are filter feeders, filtering large quantities of water through their gills to concentrate food particles which are then transferred to the digestive system. This process also concentrates any pathogens or toxic contaminants in the water, necessitating cleansing of the animals by depuration prior to human consumption. Filter feeding commences when the water temperature exceeds 48 degrees F.

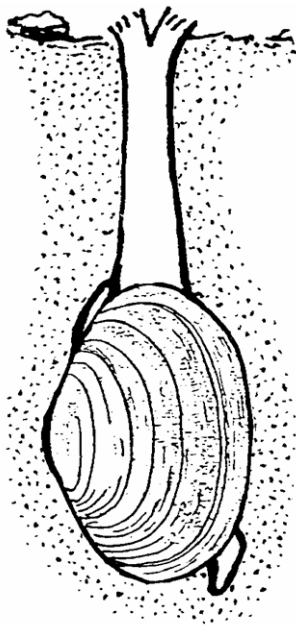
Quahogs are hermaphroditic, with a single individual capable of producing both eggs and sperm. Spawning occurs when the water temperature exceeds 65 degrees F. The resulting larvae float in the water column for two to three weeks, then settle to the bottom and burrow into the sediment. Growth is dependent on habitat conditions, but the average quahog can reach 2 inches in diameter in about six years, and sexual maturity is reached in the second or third year. After reaching sexual maturity, the growth rate slows significantly. The number of eggs and sperm produced by an individual is dependent on the size of the individual, with



larger clams contributing proportionately more larvae to the larval pool. Quahogs can live as long as fifty years and reach lengths greater than six inches (Carriker, 1961; MacKenzie, 1977; MacKenzie 1979; Visel, 1981).

Quahogs are preyed on by green crabs, mud crabs, starfish, oyster drills and moon snails, but are less prone to predation, as compared with oysters, due to being buried in the sediment. Flatfish have been observed to nip off the siphons as they are extended from the sediment for feeding. This species is fairly tolerant of high levels of pollution, so it can be raised in polluted areas where other shellfish species will not survive, then transplanted to clean areas for depuration and harvest.

The Soft-Shell Clam or Steamer, *Mya Arenaria*



Soft-shell clams are found from Labrador to the Carolinas on the Atlantic coast and are most commonly found in the intertidal regions. The preferred sediment type is a soft sand, although they are also found in gravelly deposits. Soft-shell clams do not do well in silty sediments or in sediments rich in organics as the acidity of such sediments weakens the thin shells. These clams tolerate a wide range of salinities, from 4 to 30 ppt, and seem to prefer sediments with a small amount of freshwater input, such as seeping groundwater, making them well adapted to the estuarine environment.

Soft-shell clams tolerate wide ranges of water temperature, from 32 to 75 degrees Fahrenheit. They are filter feeders, as are all bivalves, and concentrate food by filtering large quantities of water. Feeding commences when the water temperature rises above 37 degrees F, giving the soft-shell clam a longer feeding time frame than other shellfish.

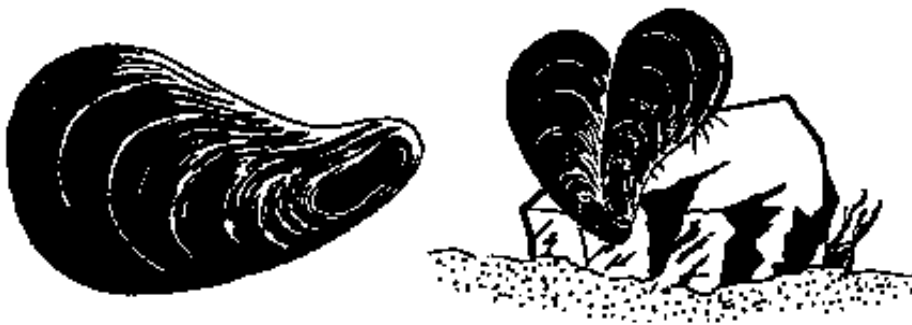
Sexes are separate in the soft-shell clams, and spawning occurs when the water temperature is between 65 and 70 degrees F. In Long Island Sound, there are frequently two spawning periods in one year, one in June and the other in late September. The eggs and sperm are released into the water and unite to form larvae which float in the water column for about two weeks. At the end of this period, a larva will form a shell, sink to the bottom and attach itself to the sediment with minute threads resembling the byssal threads of mussels. When the attached Juvenile reaches about 3/4 inches in length, it burrows into the sediment or moves to a more favorable site by extending its foot into the sediment and pulling itself along. The foot does not increase significantly in size after the first year, so the animal is then restricted to vertical movement within its burrow. Soft-shell clams become sexually mature after about one year, when they reach about 1.5 inches in length. These clams can live as long as twelve years and reach over a pound in weight (Brousseau, 1984; Visel, 1981).

Due to the fragility of their shells, and the relatively high exposure of the intertidal flats, soft-shell clams are quite prone to predation. Major predators include green crabs, ducks, gulls, oyster drills, some marine worms, and moon snails. These clams are also susceptible to a disease called hematopoietic

neoplasia, which can cause mass mortality within a population of clams, but which is not harmful to human consumers.

The Blue Mussel, *Mytilus Edulis*

Blue mussels are found from the Arctic Circle to North Carolina along the Atlantic coast. They are found attached to any firm substrate in the low intertidal or shallow subtidal regions, although mussel beds have occasionally been noted in deeper waters. Mussels are found attached to rocks, piers, jetties, mooring lines, compacted sediments, etc. They are very hardy animals and are capable of withstanding wide ranges of temperature (32 to 85 degrees Fahrenheit), salinity (15 to 36 ppt), and exposure to air. As filter feeders, mussels filter large quantities of water to obtain food and also concentrate pathogens or toxic materials found in the water, so that purification via depuration is required prior to human consumption. Filter feeding commences when the water temperature rises above about 40 degrees F.



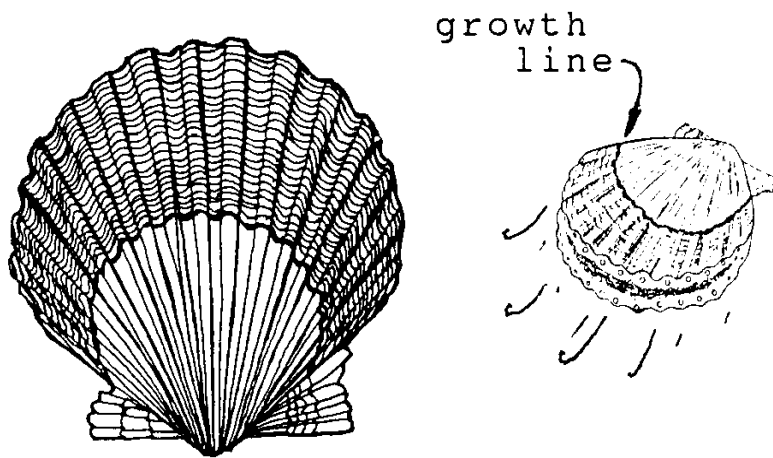
Mussels generally have separate sexes, although individuals with both male and female gonads have been found. Spawning occurs when the water temperature rises above about 60 degrees F, and in Long Island Sound waters, mussel populations can have two spawning periods in one year, one occurring in June, and the other in late September. Gametes are released into the water and fuse to form larvae which spend two weeks in the water column, after which they settle and attach themselves to a hard substrate with byssal threads. Because of this form of attachment, mussels are capable of some degree of movement after settling by alternately cutting and attaching the threads. Once settled, the growth rate is generally rapid, but is dependent on temperature and food availability. Sexual maturity is reached at the end of the first year when the animals are about two inches in length. Mussels are difficult to age, but are believed to live over ten years and can reach 5 to 6 inches in length (Fairfield, 1987; Kelly, 1988).

Due to their exposed habitat, mussels are subject to heavy predation. Major predators include crabs, lobsters, waterfowl and starfish. Mussels are also prone to parasites, including various species of trematode worms, a parasitic copepod, and a small crab known as a pea crab or mussel crab. Because they need to live on a hard substrate, mussels must compete for space with other "fouling organisms" such as, barnacles, tunicates, limpets and seaweed. Their residence in the intertidal environment also makes them prone to other causes of mortality such as freezing, ice shear, storm impacts and dehydration.

The Northern Bay Scallop, *Aergopecten Irradians*

The bay scallop is found from Cape Cod, Massachusetts to Florida, and is divided into a northern and a southern subspecies. The northern bay scallop is found in

several types of habitats, including: bare sand, sand with gravel/shell, eelgrass beds, macroalgae stands, and eelgrass detritus, but appears to be most successful in moderately dense eelgrass beds and least successful on bare sand. Areas with good tidal circulation seem to have larger populations of scallops, but if the currents are too strong, the scallops may be swept away. Scallops are generally found either lying free on the bottom or attached to plants or debris by byssal threads similar to those of the mussels. They are unique among the bivalves in that they are capable of propelling themselves through the water column by clapping their valves together. They are not very tolerant of salinity extremes, with the acceptable range being 20 to 36 ppt, with mortality occurring if the salinity drops below 15 ppt for more than 24 hours (Tettelbach .1985). Scallops do exhibit high levels of tolerance to water temperature (32 to 80+ degrees Fahrenheit). They are filter feeders like other bivalves. Feeding commences when the water temperature exceeds 40 degrees Fahrenheit. Depuration is not required prior to the consumption of scallops, as the digestive system is not consumed.

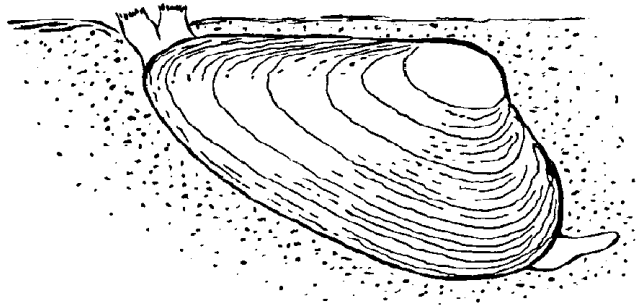


Scallops are functionally hermaphroditic, but the sperm and eggs are released at slightly separated intervals, so self-fertilization is a rare occurrence. Spawning appears to be related to the availability of food rather than the water temperature. Northern bay scallops generally release their gametes between mid-June and mid-July, just before the water temperature peaks. The larvae remain in the water column for about one week, then settle and attach to various substrates with byssal threads. In the earlier stages of settling, scallop spat tend to attach to objects in the upper levels of the water column. They remain attached until they reach 20 to 30 millimeters in diameter, then may cut their threads and settle to the bottom. Growth is rapid until December, when the juvenile scallops will have reached about 40 millimeters in diameter. Scallops have a life span of 15 to 24 months, so the scallops that settle and survive the first winter provide the set for the following year (Tettelbach, 1985; Blake and Smith, 1984).

Mortality is heavy during all phases of a scallop's life. They have several predators, including man, waterfowl, and most species of crabs. Mortalities also occur due to low salinities, burial by shifting sands and stranding above the waterline, and these non-predator deaths are the major cause of mortality once a scallop exceeds 40 millimeters in diameter.

The Surf Clam, *Spisula solidissima*

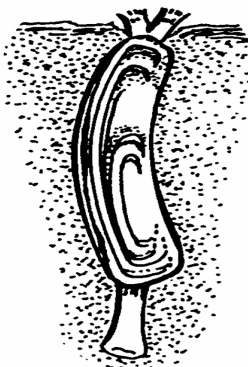
The surf clam is found from the southern Gulf of St. Lawrence to Cape Hatteras, N.C. It is found in water depths ranging from the shallow subtidal to approximately 60 meters (78 feet), but generally inhabits the shallower water, near-shore environments. Surf clams tend to be found in areas of sandy sediment, although they are also found in sand-gravel and sand-silt habitats. The animals are tolerant of wide ranges of salinity, but are not as tolerant of the upper temperature ranges.



Sexes are distinct in the surf clam, although lone cases of hermaphroditism have been found and frequency varies with the site sampled. It appears that hermaphroditism may be induced by adverse conditions (such as proximity to a dump site), but there is no definite evidence at this time. Spawning tends to occur when the water temperature reaches about 12 degrees Centigrade (54 degrees Fahrenheit), usually somewhere in the month of June. Spawning continues through the summer intermittently, with a second spawning Peak around September. The larvae remain in the water column for one to two weeks, then settle, but the stimulus for settling is unknown. Average growth in the first Year is 20 millimeters. The fastest growth rate is seen in the first three years, but individuals can live up to eleven Years in inshore populations and twenty-five to thirty Years in offshore populations, reaching up to 200 millimeters in length (Desbonnet, personal communication).

Major predators of the surf clam are crabs, starfish, moon snails, winter flounder, and waterfowl. These predators mostly consume clams under 50 millimeters in length, and it is unclear whether this is due to the difficulty of opening the larger clams or to the fact that the larger clams tend to be buried more deeply in the sediment. Man is also an important predator. Surf clams have been commercially harvested in the United States since the 1940's, and the catch accounts for a large percentage of all clam products harvested in the U.S.

The Atlantic Jackknife or Razor Clam, *Ensis Directus*



The razor clam is found along the Atlantic Seaboard from Labrador to South Carolina with possible pockets as far south as Florida. It is generally found in low intertidal and shallow subtidal regions. It prefers coarse sandy sediment, and is quite commonly found in the sand flats of New England. These animals are fairly tolerant of temperature and salinity variations.

Razor clams have the same reproductive strategies as the other bivalve mollusks. Eggs and sperm are broadcast into the water where they unite to form the larvae. After a one to two week period in the plankton, the larvae settle to the bottom and burrow into the sand.

Growth is rapid, and mature individuals can reach lengths of 250 millimeters (10 inches).

A razor clam has a large, powerful foot that enables it to burrow in a rapid, vertical manner. Their shape and speed cause the burrow opening to have a readily identifiable, keyhole-like shape. Because of their speed, they are not commonly harvested by man on either a commercial or a recreational basis. Natural predators include various waterfowl and flatfish, but these predators mainly consume the smaller individuals in the population.

5.4.2 Review of Past studies in East Lyme Waters

Niantic Bay Region - Most studies in the Niantic Bay area have concentrated on the scallop population in the Niantic River, and are not applicable to this management plan. The State shellfish concentration map shows hard clam populations along the perimeter of the bay, and has no information for the middle of the bay. A survey of the hard clam populations in the Bay area was conducted by Joe Gilbert of Briarpatch Enterprises, Inc. and Heather Crawford on September 15, 1988. A series of 25 trawls with hydraulic dredging equipment, ranging in length from five to fifteen minutes, uncovered a widely dispersed population of old clams (average size 4 inches). A significant number of the clams collected showed indications that they had not been completely buried in the sediment (attached macroalgae), indicating an extremely hardpacked bottom or a period of heavy bottom scouring.

An environmental study by Northeast Utilities provides some information about the sediment type in the Great Neck region of the shoreline. The study reported the average sediment grain size to be 0.5 millimeters in diameter, classifying the sediment as fine sand. The percentage of silt-clay in the sample was 0.25%, and the organic content was also very low. Such sediment would be capable of supporting several varieties of shellfish, dependent on other environmental conditions (NU 1985).

5.4.3 Shellfish Surveys

In order to manage a shellfish resource, it is vital to have knowledge of both the natural shellfish population and of the existing habitat conditions. As indicated in the life history summaries, different species of shellfish thrive in different environments. Sediment size, porosity, pH and percent organic matter, as well as temperature and salinity ranges of the sediment and overlying water and the presence or absence of vegetative cover, all affect the distribution patterns and survival of shellfish. By determining the habitat types found within the town's Jurisdiction, as well as the present shellfish resources, informed decisions can be made about subjects such as: placement of depuration and relay areas for recreational shellfishing, areas which would most benefit from cultivation and restoration efforts, optimal sites for seeding new stock, and areas of optimal habitat which may require protection through zoning regulations and careful monitoring for potential pollution problems.

Due to the lack of current information on shellfish populations in the waters under the jurisdiction of the ELSC, it is recommended that all areas be surveyed as rapidly as possible. If the Commission wishes to emphasize recreational shellfishing initially, these surveys should concentrate on areas where the water is classified as open for shellfishing and on closed areas that might be used to restock such open areas.

A survey of the shellfish resources and the mapping of habitat types may be accomplished simultaneously, but such a survey should be divided into two parts: a

survey of the shallow waters, and one of the deeper waters. The division of these two areas should fall roughly at the mean low water depth of 5 feet as this is the depth of water to which most recreational shellfishers will be restricted, and which can be surveyed in a land-based operation. The shallow water survey will require a minimum of two people, although three people would be the more efficient size for the work group. Equipment required will include:

- transect lines and stakes
- quarter meter square (50cm x 50cm) sampling quadrat
- coring tubes
- graduated mesh sieves
- measuring tapes or rulers
- pH meter or paper
- thermometer
- logbook for data (waterproof) and pencil
- salinity measurement device (refractometer or salinometer)
- shovels
- hydraulic pump/rubber dinghy (optional survey method)
- jars for sediment samples

Such surveys may be best accomplished on an ebbing tide and should start at the mean high water mark. Transect lines should be laid out to parallel a section of the shoreline, and samples taken every twenty feet along the transect line. If the transect is less than twenty feet, or if there is more than ten but less than twenty feet at the end of the transect line, another sample should be taken at the end of the transect. With the transect lines spaced ten feet apart, the sampling resolution is 200 square feet, which should be fine enough to locate any existing shellfish beds. An alternate sampling strategy is to place the transect line and then roll die to determine randomly the distance between samples. This is a very intensive sampling scheme, and the distance between transects can be adjusted to a maximum of 100 feet with a slight loss of accuracy.

At each interval the sampling quadrat is laid on the surface of the sediment, and two sediment cores are taken. If the site is under water when sampled, the salinity, temperature and depth of the water should be recorded. Percent vegetative and bacterial mat cover should be determined. The quadrat should then be dug out to a depth of about one foot and the contents passed through a 2-millimeter mesh sieve. An alternative to this method is excavation via hydraulic pump. The pump forces water into the sediment and creates a slurry so that all shellfish float to the surface of the sediment and can be scooped up. The advantage of pump surveying is the lack of damage to the animals. All shellfish found should be identified and measured to the nearest millimeter. Any empty shell pairs should be counted, measured, and noted separately. Information from the size ranges of live versus dead shellfish can be used to determine whether areas experience regular or irregular settlement and whether an area would benefit from cultivation. Areas with populations composed primarily of old, large shellfish in silty bottoms would benefit greatly from an extensive harvesting and cultivation effort. Harvesting will both thin out the older adults and prepare the

bottom for settlement. It is important however, to not remove all of the older shellfish as a spawning stock is necessary for the continued reproductive success of a shellfish bed. If large beds are involved, an area can be set aside as a spawning sanctuary or some limit should be placed on the percentage of older stock that can be removed from the bed. A well-managed healthy shellfish population will have a normally-distributed range of sizes, while a neglected or poorly situated population will have skewed, size range distributions. Any shellfish predators (crabs, moon snails, starfish, etc.) In the area should also be noted.

The sediment cores are used to determine sediment size and type, pH, and percent organic matter if desired. Size, type, and pH may be determined in the field, but percent organic matter requires laboratory facilities.

Deep water surveys may be carried out in several ways: by SCUBA divers, by boat-based grab operations, or by contracting with a commercial shellfisher. Diving operations require extensive amounts of time but are capable of accurately mapping all species of shellfish as well as the habitat. Grab operations require less time, but more manpower, expensive equipment, and/or contracting with the owner of an appropriately equipped boat. The most feasible method for deep water surveys is to reach an agreement with a commercial shellfisher with a hydraulic dredge and an appropriate permit for transplantation of shellfish from polluted waters. The shellfisher runs transacts for the Commission with observers on board to count and measure shellfish, and the shellfisher either gets to keep the catch or receives a modest fee. Little information on bottom type can be gained in this manner, but areas of concentration are observable. A separate study would have to be done to survey scallop and mussel populations as different gear types are required.

Surveys are most conveniently carried out in the summer and fall seasons when the water temperature is warmest. An added advantage to surveying in the fall is that the success of the summer set may be determined directly, as the juvenile shellfish will be large enough to collect and quantify. Oyster settlement is best determined by hanging spat collectors from pilings and floats in appropriate areas. Such collectors should be put out at intervals during the summer so that there will be clean shell available when the spat is ready to settle. If areas with large quantities of spat or juvenile shellfish are located, it may be wise to re-sample the area in the early spring to determine if the site is suitable for over-wintering of juvenile shellfish. Some sites are appropriate for settlement of shellfish spat but inappropriate for their growing out.

5.5 *Water Classification System*

The Department of Agriculture, Bureau of Aquaculture, in the interests of protecting public health, has the power to close areas to shellfishing due to various forms of pollution [§26-192d(3)] and [§26-192b]. The state regulations are based on the guidelines of the Interstate Shellfish Sanitation Conference (ISSC), which have recently been revised. There are now four classifications of water quality relating the harvest of shellfish: approved, conditionally approved, restricted, and prohibited. The ISSC guidelines for the designation of shellfishing areas are as follows:

1. APPROVED (= OPEN) – “Areas may be designated as approved when the sanitary survey or other monitoring program data indicate that fecal material, pathogenic microorganisms, radionuclides, harmful chemicals, and marine biotoxins do not reach the area in harmful concentrations and this is verified by laboratory findings whenever the sanitary survey or other monitoring programs indicate the need. Shellfish may be taken from approved areas for direct marketing and recreational harvesting”.

Approved areas are in compliance when the area is "not so contaminated with fecal material, radiological and harmful chemicals, and marine biotoxins that the shellfish might be contaminated". The Connecticut Department of Agriculture presently tests the bacteriological quality of the water by using a fecal coliform standard under which the geometric mean fecal coliform MPN level may not exceed 14/100 ml, and/or not more than 10% of the samples have total coliform levels exceeding 28 MPN/100ml. This standard must be met In those portions of the, approved area most probably exposed to fecal contamination during the most unfavorable hydrographic and pollution conditions.

2. CONDITIONALLY APPROVED - "Areas that are subjected to intermittent microbiological pollution may be classified as conditionally approved. This option may arise when the suitability of an area for harvesting shellfish for direct marketing is dependent upon the attainment of an established performance standard by waste water treatment facilities discharging effluent, directly or indirectly, into the area. In other cases the sanitary quality of an area may be affected by seasonal population, rainfall, non-point source pollution, or sporadic use of a dock or harbor facility, and these intermittent pollution events are predictable." Such areas must be much more strictly regulated than the approved areas. Shellfish may be taken from open conditionally approved areas for direct marketing or recreational harvesting.

To have a conditionally approved area, a sanitary survey must show that the area will meet the approved area classification criteria for long periods of time and that the factors that cause a failure to meet these criteria are known, predictable, and able to be fit into a reasonable management plan. Any waste water treatment facilities affecting the area must have established performance standards and should be designed, constructed and maintained so that the chances of failure to meet the performance standards are minimized. A written management plan for each conditionally approved area must be developed jointly by the state and local agencies, and should be based on an evaluation of each potential source of pollution of the area, and their correlation with meteorological and hydrographical conditions. The plan should include performance standards for waste water treatment facilities, procedures for inspecting and monitoring pollution sources, adequate patrol to prevent illegal harvesting, and an alert system for notification of proper authorities of any adverse change in pollution sources. Criteria and procedures for area closure and reopening should be described. A prohibited area should be established between the

conditionally approved area and the source of pollution to allow time to stop shellfish harvesting in the conditionally approved area when the performance standards are not met. If the criteria established to keep the area open are not met, the area is immediately closed and remains closed until the approved growing standards are again met, plus the time required for natural purification of the shellfish. The frequency and thoroughness with which conditionally approved areas must be reassessed will be stated in the area's management plan, and all data pertaining to the operation of the area, including reappraisal reports, and opening and closure notices will be maintained in a central file.

3. RESTRICTED (= CLOSED) - "An area may be classified as restricted when a sanitary survey indicates a limited degree of fecal pollution. This option may arise when there are no levels of fecal pollution or toxic chemicals which would make it unsafe to market the shellfish after purifying or relaying. Alternatively the area may be classified as prohibited. Restricted areas will require much closer surveillance than prohibited areas. State shellfish control authorities should establish a restricted area only when they have sufficient technical and administrative resources necessary to survey the area, monitor pollution sources, and control harvesting". An area may be designated restricted if it complies with the following standards: sanitary surveys and reappraisals of the same nature and frequency as for approve areas are made; the level of fecal contamination of the area is such that the shellfish will not be hazardous after purification or relaying; there is no level of toxic chemical pollution that would make shellfish consumption hazardous there is an effective system for assuring that shellfish are not harvested except by special permit and that such shellfish are not marketed without effective controlled purification or relaying, all data on the operation of the restricted area is maintained in a central file.

4. PROHIBITED (= CLOSED)

An area shall be classified prohibited if the sanitary survey or other monitoring program data indicate that fecal material, pathogenic microorganisms, toxic chemicals, marine biotoxins or radionuclides may reach the area in excessive concentrations. The taking of shellfish from such areas for direct marketing shall be prohibited. Relaying or other salvage operations shall be carefully supervised to insure against polluted shellfish entering trade channels. Actual and potential growing areas which have not been subjected to sanitary surveys shall be automatically classified as prohibited". Areas must be classified as prohibited if the area is contaminated with levels of radionuclides or toxic chemicals that may make consumption of the shellfish hazardous, or if the median total coliform count exceeds 700/100ml or more than 10% of the samples have coliform MPN in excess of 2300/100ml, or the concentration of paralytic shellfish poison equals or exceeds 80 micrograms/100 grams of edible portion of raw shellfish, or there are detectable levels of neurotoxic shellfish poison. Shellfish shall not be harvested except by special permit, and any areas in which there have been no sanitary surveys, or which were approved, but have been determined to have undergone detrimental changes and have not been resurveyed within one year, are automatically classified as prohibited.

5.6 Public Outreach/Participation

Town of

P.O. Drawer 519
E.L. Harbor Management
& Shellfish Commission



East Lyme

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Niantic, Connecticut 06357
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Minutes: Public Meeting 9/07/04

The Commission held a public informational meeting/workshop on 9/07/04 to explain the process of updating the Shellfish Management Plan and leasing program to interested town officials, fishermen, residents and the general public. The meeting began at 7 p.m. and adjourned at 9 p.m. Draft GIS mapping products were available in a PowerPoint presentation provided by Yankee Planning Group, project consultant. Notice of the meeting was published by legal notice, press release, agenda and articles in local papers.

Don Landers began with an overview of the process. Steve Dinsmore explained existing conditions and existing areas jurisdiction and regulation by the Commission.

Dan Rothenberg then lead a planning/public participation exercise with assistance from the Commission whereby meeting participants identified 10 "most" important issues in this planning process and then, spent \$40. of "play" money on those issues each felt were the most critical. Issues were discussed in detail, debated, aggregated and "whiteboarded." This non-scientific method was designed to encourage active participation and help the Commission to focus the forthcoming plan update. The following lists the 10 most important issues as determined by workshop participants followed by the amount of money "spent" on each by the group in total.

Preliminary Issue Identification

- Need to balance competing uses – moorings, shellfishing, navigation, recreational and commercial fishing, public access \$275.
- Boating Issues: Moorings, transients, seasonal, navigation \$175
- Aquaculture Concerns: Gear conflicts with other uses, environmental benefits and potential adverse impacts \$170.
- Water Quality: Need to maintain and improve WQ for shellfish. Concerns with geese/fecal coliform, and nonpoint source pollution from runoff \$145.
- Permitting Criteria & Process: Need to define, if possible, what can and should be done, and where. Streamline existing processes \$80.
- Economic Development, downtown revitalization \$60

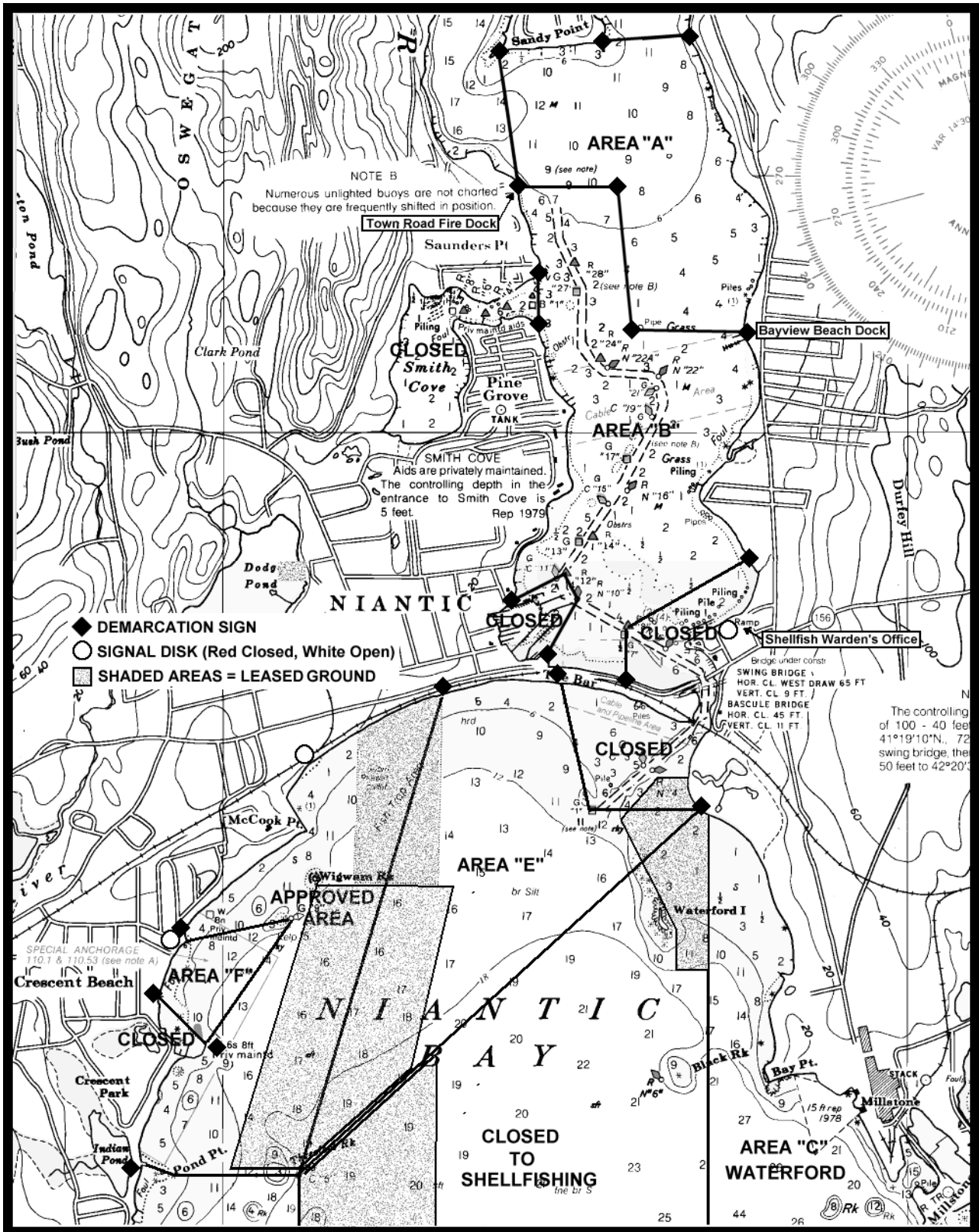
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- Aesthetics, esp. with respect to aquaculture structures \$60.
- Jurisdictional Issues: local vs. state vs. federal, multitown jurisdiction over river and bay areas \$50
- Public Access, esp. small craft launching \$45
- Waterfront Development \$35

\$1095 total "clam bucks" spent on issues to rank overall importance by participants.

Submitted by: Dan Rothenberg, Yankee Planning Group, LLC. 9/9/04

5.7 Shellfishing Areas Map



5.8 LITERATURE CITED

- Barlow, GL Jr. C. Cahoon, R. Cahoon, D. Flynn. 1981. Hydraulic harvesting of soft-shell clams: a report of the first 6 months. New Fisheries Series No. 1. Bourne-Sandwich Shellfish Assoc., Inc.
- Blake, MM and EM Smith. 1984. A Marine Resources Plan for the State of Connecticut. DEP. Division of Conservation and Preservation, Bureau of Fisheries, Marine Fisheries Program.
- Brousseau, DJ, and JA Baglivo. 1984. Sensitivity of the population growth rate to changes in single life history parameters: its application to Mya arenaria. Fishery -Bulletin 82(3): 537-541.
- Carriker, MR. 1961. Interrelations of functional morphology, behavior, and autecology in early stages of the bivalve Mercenaria. J. Elisna Mitchell Sci.Soc. 77: 168-241.
- DEP.-1979. Shellfish Concentration Areas. 1 map. Planning and Coordination/Coastal Management Unit, DEP, Hartford, CT.
- Galtsoff, PS. 1964: The American Oyster. Fishery Bulletin of the Fish and Wildlife Service. 64:1-480.
- Getchis, T.S. and Connecticut Department of Agriculture, Bureau of Aquaculture. 2004. A Guide to Recreational Shellfishing in Connecticut. Connecticut Sea Grant College Program. Groton, CT. CTSG-04-06. 7 pp.
- Goode, GB. 1887. The Fisheries and fishery industries of the United States. Government Printing Office. Washington.
- Guilford Shellfish Commission. Sample recreational shellfish permit.
- Hsiao, Y, JE Easley Jr, and T Johnson. 1987. Testing for harmful, effects of clam and scallop harvesting techniques in the North Carolina bay scallop industry. N. Am. J. Fish. Man. 7:187-193.
- Inter-state Shellfish Sanitation Conference. 1988. Draft text for management of shellfish monitoring and regulations
- Kelly S. 19E38.-Masters thesis. University of Connecticut. Storrs, CT.
- MacKenzie, CL Jr. 1977. Predation on hard clam (Mercenaria mercenaria) populations. Trans. Am. Fish. Sac. 106:530-537.
- MacKenzie, CL Jr. 1979. Management for increasing clam abundance. Mar. Fish. Rev. 42:10-22.
- Madison Shellfish Commission. 1984. Sample depuration permit.
- Malinowski, S and RB Whitlatch. 1988. A theoretical evaluation of shellfish resource management. J. Shellfish Research. 7(1):95-100.
- Medcof and MacPhail. 1962. A new hydraulic rake for softshell clams. Proc. Nat. Shellfish Assoc. 53:11-31.
- Northeast Utilities Service Company. 1985. Monitoring the marine environment of Long Island Sound at Millstone Nuclear Power Station, Waterford, CT. Annual Report, 1984.

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Pleasant Bay (MA) Chapter 8. Shellfishing and Finfishing.

Roberts, MF. 1984. Pearl Makers: The Tidemarth Guide to Clams, Oysters, Mussels and Scallops. The Saybrook Press. Old Saybrook, CT

Tettelbach, S. 1985. PhD. dissertation. University of Connecticut, Storrs, CT.

Town of East Lyme Land Grant records.

Town of Providence (RI) Regulations for Aquaculture Grants, Adopted by the Board of Selectmen March 26, 1990 (Amended June 12, 2000)

Town of East Lyme, Minutes of Selectmen's Meetings.

Town of Fairfield Shellfish Management Plan (Plan), May 2003, prepared by the Fairfield Shellfish Commission. 1987. Proposed shellfish management plan for Fairfield, CT.

Visel, TC. 1981. Environmental Fishery Management plan for the fisheries of Old Saybrook, CT. Part I: Oysters, Part II: Hard Clams, Part III: Soft-shell clams. University of Rhode Island.