LONG ISLAND SOUND BLUE PLAN 2019

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BLUE PLAN

Sustainable Ecosystems - Compatible Uses

Long Island Sound Blue Plan

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Acronyms and Abbreviations

Abbreviations

Corp	Us Army Corp of Engineers
Ft	Foot
Inventory	Long Island Sound Resource and Use Inventory
Plan	Blue Plan
Sound	Long Island Sound
UConn	University of Connecticut

Acronyms

AIS	Automated Information Systems
AWOIS	Automated Wreck and Obstruction System
BP	Blue Plan
BPAC	Blue Plan Advisory Committee
CAD	Confined Aquatic Disposal or Computer Aided Design
CCMP	Comprehensive Conservation and Management Plan
CFR	Code of Federal Regulations
CGS	Code of General Statutes
CLEAR	Center for Land Use Education and Research
CT ECO	CT Environmental Conditions Online
CT	Connecticut
CT DEEP	CT Department of Energy and Environmental Protection
CT NDDB	CT National Diversity Database
CT OSA	CT Office of State Archaeology
CT SHPO	CT State Historic Preservation Office
CMA	CT Coastal Management Act
CZMA	Coastal Zone Management Act of 1972
DA/DB	CT Department of Agriculture, Bureau of Aquaculture
DLG	Digital Line Graph
DMMP	Dredge Material Management Plan
EC	Ecological Characterization
ECS	Ecological Characterization Summary
ECWT	Ecological Characterization Work Team
EEG	Ecological Experts Group
ENC	Electronic Nautical Chart
ESA	Ecologically Significant Area
FERC	Federal Energy Regulatory Commission
GARFO	Greater Atlantic Region Fisheries Office
GHG	Greenhouse Gases
GIS	Geospatial Information Systems
GLD	Geographic Location Description
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union on the Conservation of Nature
LIS	Long Island Sound

LIS RDT	Long Island Sound Regional Dredging Team
LISEA	Long Island Sound Ecological Assessment
LISMaRC	Long Island Sound Mapping and Research Collaborative
LISS	Long Island Sound Study
LISTS	Long Island Sound Trawl Survey
LNG	Liquefied Natural Gas
MARCO	Mid-Atlantic Regional Ocean Council
MDAT	Marine-life and Data Analysis Team
MHW	Mean High-Water
MLLW	Mean Lower Low Water
MSP	Marine Spatial Plan/Planning
NASA	National Aeronautics and Space Administration
NAVD88	North American Vertical Datum of 1988
NERACOOS	Northeast Regional Association of Coastal and Ocean Observation Systems
NERR	National Estuarine Research Reserve
NOAA	National Oceanic and Atmospheric Administration
NRDC	National Resource Defense Council
NROC	Northeast Regional Ocean Council
NUWC	Naval Undersea Warfare Center
NY	New York
NY DEC	NY Department of Environmental Conservation
NY DOS	NY Department of State
PA	Public Act
PDT	(Blue Plan) Plan Development Team
PGP	Programmatic General Permit
PM	Participatory Mapping
POSM	Protected Open Space Mapping
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
SAV	Submerged Aquatic Vegetation
SCORP	CT Statewide Comprehensive Outdoor Recreation Plan
SG	Sea Grant
SHUA	Significant Human Use Area
SSU	Special, Sensitive, and Unique Resources
TNC	The Nature Conservancy
TRI	Terrain Ruggedness Index
US EPA	US Environmental Protection Agency
USACE	US Army Corps of Engineers
USGS	US Geological Survey
UTM	Universal Transverse Mercator
VTR	Vessel Trip Report
WPCA	Water Pollution Control Act
WQS	Water Quality Standards

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Executive Summary

Purpose and Need for Marine Spatial Planning

Long Island Sound is an estuary located within a highly urbanized, highly populated area of the United States; an estimated 23.8 million people live within 50 miles of its shores (Long Island Sound Study, 2019). The Sound provides a variety of recreational opportunities to citizens living in the region while serving as an important habitat for fish and other marine wildlife, contributing an estimated $9.4 billion annually to the regional economy (Long Island Sound Study, 2019).

Long Island Sound is heavily utilized in some way by humans and wildlife alike, oftentimes in the same places. New offshore development and uses can sometimes cause harmful impacts to the plants and animals that live in the Sound, and can sometimes conflict with existing human uses as well. Some prior development proposals for the Sound, such as the Broadwater floating LNG (liquefied natural gas) facility, generated considerable controversy.

Today, other states in the region are already experiencing challenges associated with offshore wind development. While the waters of Long Island Sound will not likely experience the same wind development pressure as other states in the region, the cables associated with these neighboring offshore wind proposals could possibly enter the Sound. Further, other cross-Sound infrastructure projects and offshore uses like seaweed farms also have the potential to be located within Long Island Sound.

Historically, many of these pressures on the Sound have been reviewed on a case-by-case basis by several separate state and local regulatory programs, without a comprehensive plan to assess and understand the presence and distribution of ecological resources and human uses in the Sound. The lack of a plan is especially problematic when large-scale projects such as cables and pipelines, bridges, or liquefied natural gas installations are proposed offshore. With the creation of the Blue Plan, Connecticut now enjoys a legal basis for comprehensive, adaptive, and proactive management of the Sound, and no longer needs to simply react in a piecemeal fashion to individual issues and project proposals.

The Blue Plan Act

In an effort to establish a coordinated and integrated review process for new offshore uses in Long Island Sound, the Connecticut General Assembly passed Public Act 15-66, An Act Concerning a Long Island Sound Blue Plan and Resource and Use Inventory (codified in Connecticut General Statutes (CGS) § 25-157t), which requires the Connecticut Department of Energy and Environmental Protection to develop a marine spatial plan for Long Island Sound. Known as the "Blue Plan," its purpose is help the state effectively manage the Sound's public trust waters by providing science-based, fully formed, commonly planned goals, siting priorities, and standards that must be considered in the review of applications for offshore activities pursuant to the following existing regulatory programs:

- CGS § 16-50K, Certificate of environmental compatibility and public need

- CGS § 22-11h, Permits for aquaculture operations
- CGS § 22-11i, Licensing of aquaculture producers
- CGS § 22-11j, Planting and cultivating seaweed. Prohibition on interference with right of fishing or shellfishing
- CGS § 22a-6k, Emergency authorization for regulated activity. Temporary authorization for regulated activity
- CGS § 22a-359, Regulation of dredging, erection of structures, and placement of fill in tidal, coastal, or navigable waters. Sunken or grounded vessels.
- CGS § 22a-361, Permit for dredging, structures, placement of fill, obstruction or encroachment, or mooring area or facility. General permits. Removal of sand, gravel or other material.
- CGS § 22a-363b, Certificate of Permission
- CGS § 22a-363d, Emergency Authorization
- CGS § 22a-430, Permit for New Discharge
- CGS § 25-157b, Crossings of Long Island Sound. Evaluation of application's consistency with comprehensive environmental assessment plan.
- CGS § 26-194, Leasing of shellfish grounds. Fee. Utility lines and public use structures. Shellfish removal or relocation costs. Annual host payments for Long Island Sound crossings. Designation of shellfish areas to regional agricultural science and technology education centers.
- CGS § 26-257a, Local shellfish commissions
- Section 401 Federal Water Pollution Control Act, Water Quality Certification

As a marine "*spatial*" plan, the Long Island Sound Blue Plan identifies the "spaces" in the Sound that are currently used by humans (e.g., commercial and recreational boating and fishing areas, ferry transportation routes, electric and gas pipeline locations) and the "spaces" that are ecologically important (e.g., shellfish beds, cold-water corals, areas where seals rest on the rocks), and protects those spaces by establishing policies that avoid and reduce conflicts and impacts among human uses of the Sound, and between human uses and the Sound's natural resources.

Although the Long Island Sound Blue Plan statute was passed by the Connecticut General Assembly in 2015, that legislation was several years in the making. A Connecticut/New York Bi-State Marine Spatial Planning Working Group was formed in 2012 to set the stage for establishing a marine spatial plan for Long Island Sound. The concept of "Marine Spatial Planning" had already caught on in the northeast, mostly in response to offshore wind development proposals. Efforts at the federal level to develop a Northeast Ocean Plan had been underway (Northeast Ocean Planning, 2019), with the plan adopted in 2016 to guide federal

agency decisions in the region, and state ocean plans had been adopted in Massachusetts in 2009 (Massachusetts Office of CZM, 2019) and in Rhode Island (RI CRMC, 2019) in 2010.

The Bi-State Working Group was formed following a workshop convened by the Sea Grant programs in Connecticut and New York in 2010, and follow-up discussions about marine spatial planning, recognizing that, even in the absence of offshore energy proposals looming on the horizon, Long Island Sound is an intensely utilized, ecologically important waterbody that needed and deserved its own marine spatial plan.

The Bi-State Working Group did much of the heavy lifting in providing the background work necessary to support Connecticut's legislative effort to establish the Blue Plan legislation, and fostered cooperation and coordination of the States of Connecticut and New York in addressing marine spatial planning for the Sound. Their seminal Options for Developing Marine Spatial Planning in Long Island Sound: Sound Marine Planning Interim Framework Report provides much of the justification for the Long Island Sound Blue Plan effort (Connecticut-New York Bi-State MSP Working Group, 2016). Public Act 15-66 was signed by Governor Dannel P. Malloy on June 19, 2015 and went into effect on July 1, 2015. The legislation received unanimous bipartisan support in the Connecticut General Assembly.

Blue Plan Advisory Committee
Organizational Structure

A 15-member multi-stakeholder Blue Plan Advisory Committee (BPAC) was established by statute to assist the Commissioner of the Department of Energy and Environmental Protection in developing the Inventory and the Blue Plan. BPAC members are designees of state agencies identified by the legislation, and representatives from water-dependent industries, the gas and electric distribution industry, non-governmental organizations, local governments, and recreation and aquaculture interests appointed by Governor Dannel Malloy and the legislative leadership. The BPAC in place during development of the plan (January 2016 through January 2019) consisted of:

- **Robert Klee**, Commissioner, Connecticut Department of Energy and Environmental Protection, Chairman
- **Sylvain De Guise**, Connecticut Sea Grant; UConn marine sciences programs faculty member appointed by Governor Malloy
- **Catherine Finneran**, Eversource; gas and electric distribution industry representative appointed by Governor Malloy
- **Nathan Frohling**, The Nature Conservancy; conservation organization representative appointed by Governor Malloy
- **David Carey**, Department of Agriculture Bureau of Aquaculture; shellfish industry/commercial or recreational aquaculture representative appointed by Governor Malloy
- **Christine Nelson**, Town of Old Saybrook Town Planner; coastal municipality representative appointed by Governor Malloy
- **Evan Matthews**, Connecticut Port Authority; Connecticut Department of Transportation Commissioner Redeker's Designee

- **Jason Bowsza**, Connecticut Department of Agriculture, Commissioner Reviczky's Designee
- **Eric Lindquist**, Connecticut Office of Policy and Management, Secretary Barnes' Designee
- **Melanie Bachman**, Connecticut Siting Council
- **Leah Schmalz**, Connecticut Fund for the Environment/Save the Sound; conservation organization representative appointed by State Senate President Pro Tempore Martin Looney
- **William Gardella**, General Manager and Dockmaster, Rex Marine Center, Norwalk; commercial boating representative appointed by State Senate Majority Leader Bob Duff
- **Bruce Beebe**, Beebe Dock and Mooring Systems, Madison; marine trades representative appointed by State Senate Minority Leader Len Fasano
- **Mike Theiler**, commercial finfish industry representative appointed by Speaker of the House Brendan Sharkey
- **Alicia Mozian**, Town of Westport Conservation Director; coastal municipality representative appointed by House Majority Leader Joe Aresimowicz
- **Sidney J. Holbrook**, recreational fishing/hunting community representative appointed by House Minority Leader Themis Klarides

At the earliest stage of the planning process, the BPAC established a draft Vision and Goals statement to help guide the planning effort. While the vision and goals are comprehensive, the overarching goal can be boiled down in to the LIS Blue Plan's motto, *Sustainable Ecosystems - Compatible Uses*:

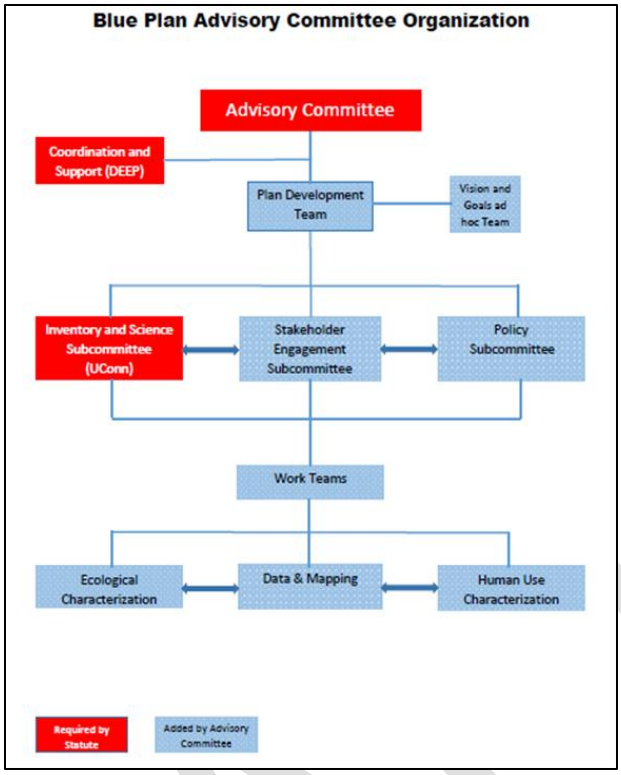
> ***Vision:*** *"Long Island Sound: a place where human uses and thriving marine life are compatible."*
>
> *We envision a Long Island Sound where new and existing traditional uses are mutually compatible with the habitats and natural features needed for marine life to thrive, assuring the wellbeing and prosperity of current and future generations.*
>
> **Goal 1: Healthy Long Island Sound Ecosystem**
> *Science-based planning and practices that consider both the environment and human uses will help us understand and protect Long Island Sound ecosystems and the services they provide*
>
> **Goal 2: Effective Decision-Making**
> *An inclusive, transparent, stakeholder-endorsed and science-based Blue Plan decision-making process that is consistent with other plans and legal requirements will lead to decisions supporting the long-term vision for compatibility of human uses and thriving marine life.*
>
> **Goal 3: Compatibility Among Past, Current, and Future Ocean Uses**
> *Science-based planning and practices that consider both human uses and the environment will sustain traditional and facilitate compatible new water-dependent uses*

to enhance quality of life and compatible economic development including maintaining the ecosystem services they depend upon.

Several objectives then flesh-out how the Blue Plan will meet each of these goals, and specific guiding principles were established for plan development, including

- *Meaningful public participation* so the plan reflects the knowledge, perspectives, and needs of all stakeholders whose lives are touched by Long Island Sound;
- *Sound science* in the form of accurate, relevant data and information to support planning and management of Long Island Sound resources and uses.
- *Transparent process* for plan development and implementation, utilizing multiple means to communicate with and seek input from all interested parties and ensuring adequate and informed representation of all stakeholders;
- *Government coordination and collaboration* among agencies and stakeholders based on a common vision, shared information sources, and transparent decision-making processes; and
- *Adaptive management* allowing for the planning and implementation process to be updated as traditional uses are better understood, new uses emerge, or as environmental, social, and economic conditions change.

During development of the Inventory and Blue Plan, the BPAC held quarterly meetings open to the public, and organized itself into six topic-related Subcommittees and Work Teams that conducted Inventory and Blue Plan work. Subcommittee membership was limited to Blue Plan Advisory Committee members, while membership of the Work Teams also included individuals from outside the Advisory Committee:



Blue Plan Organizational Chart

Subcommittees coordinated their activities through constant communications with other Subcommittees and with each Work Team. To assist in coordinating communication, DEEP staff and several Blue Plan Advisory Committee representatives were members of the Plan Development Team and every Subcommittee and Work Team.

Subcommittees served as the lead coordinating and managing entities, having responsibility for monitoring progress toward work plan deliverables and timelines through regular check-ins with individual Work Teams.

The Work Teams generated ideas and work products based on the work plans developed by the Subcommittees. Each Work Team was available to provide assistance and support to each Subcommittee as necessary (e.g., the Information and Mapping Work Team provided support and assistance to each of the three Subcommittees).

The BPAC will continue to function even after the Blue Plan is completed. Within six months of the Plan's approval by the Connecticut General Assembly, the BPAC must advise the Commissioner of DEEP on the operation, implementation, and updating of the Blue Plan and the Inventory, as applicable. The BPAC must also provide for the review and update of the Plan and the Inventory at least once every five years, and identify emerging issues and recommend any necessary or desirable alterations or improvements to the Plan and/or the Inventory. The BPAC is also required to hold at least one public hearing each year to receive comments and submissions from the public on the Plan and Inventory.

Elements of Blue Plan Development
Stakeholder and Public Outreach

The Blue Plan legislation requires that the Plan be developed by a transparent and inclusive process that includes widespread public and stakeholder participation and encourages public input in decision-making.

During the development of the Resource and Use Inventory, outreach focused on specific user-group communities, presenting relevant draft data products to them in webinars and meetings to review dataset validity for inclusion in spatial planning efforts. This sector-based approach was also maintained during the evaluation of draft Blue Plan policy, with a focus on walking each constituency through the policy document and hypothetical examples of how CT DEEP permitting review may proceed with a complete Blue Plan in place. Public information meetings and more formal Public Hearings were held at distinct phases in development to reach audiences that did not fall into particular sectors, and to offer formal opportunities to file comment.

All of these outreach opportunities provided invaluable insight to the PDT about the diverse concerns of the LIS user community. Public input has produced many improvements throughout the Plan document; some a change of a single key term, others an overhaul of an entire Inventory chapter. Several community members, in addition to those appointed to the Blue Plan Advisory Committee, have become key partners in connecting the PDT with their constituencies. This has allowed for candid conversation about Plan elements and capacities, and how to best represent sector interests.

In order to connect with various audiences, the PDT utilized a suite of tools and methods. First and foremost, the Stakeholder Engagement Subcommittee, described above, provided invaluable guidance on means and individuals to connect with in particular user groups. CT DEEP maintains a web page (www.ct.gov/deep/lisblueplan) hosting Blue Plan documents and development materials, as well as a listserv with over 400 members. In addition to the listserv, contact lists were developed for each use-sector; these were used to notify participants of relevant meeting events through phone and email.

In many cases partner organization's listservs and mailers were used to amplify Blue Plan listserv messages, forwarding these to their subscribed readerships. In some cases sector-relevant publications and other media were used to advertise for meetings and webinars. Moving into the final Public Comment phase, outreach sought to reach larger audiences using new tools such as a video interview series and municipality-based public forums to present the complete draft plan. Outreach events were held at times most convenient to the stakeholders and user groups.

The PDT made every effort to be inclusive of all views and knowledge contributed during the process, incorporating suggested changes and advise in all sections of the document. We believe that the document represents the shared vision for LIS, containing what we heard from participants.

However, it is important that those who use the Sound continue to be active in the curation of the

Blue Plan, and ensure that it remains an evolving collaborative tool to enhance all that we value in our urban sea.

Management Framework

Like the Long Island Sound ecosystem itself, the Blue Plan as a management mechanism will not exist in isolation. A number of issues related to LIS spatial planning, such as water quality and habitat restoration, have already been addressed in some form by a number of federal, regional, state and local agencies and institutions. In both planning and regulatory realms, many existing LIS-related agencies and organizations referenced in this chapter continue to contribute to understanding and managing the Sound's resources and uses, and the Blue Plan is intended to coordinate with these efforts.

The aspects of the LIS management framework most significant to Blue Plan implementation are the existing regulatory programs required to consider Blue Plan policies as factors in making permitting decisions. These programs have been specifically designated by CGS §25-157t(h), and will be supported and enhanced by Blue Plan policies that will provide up-front guidance and information on LIS resources and uses, and guide the decision making processes to help achieve the goals of the Blue Plan.

Perhaps the most fundamental legal or management principle underlying the Blue Plan is the public trust doctrine, through which the waters and submerged lands of Long Island Sound are owned by the states of Connecticut and New York in trust for the public. In addition to state ownership, an essential element of the public trust doctrine is that the state's submerged lands and waters are in trust for use by the general public. Subject to applicable regulations and permits, the general public may freely use these lands and waters, whether they are beach, rocky shore, or open water, for traditional public trust uses such as fishing, shellfishing, boating, sunbathing, or simply walking along the beach.

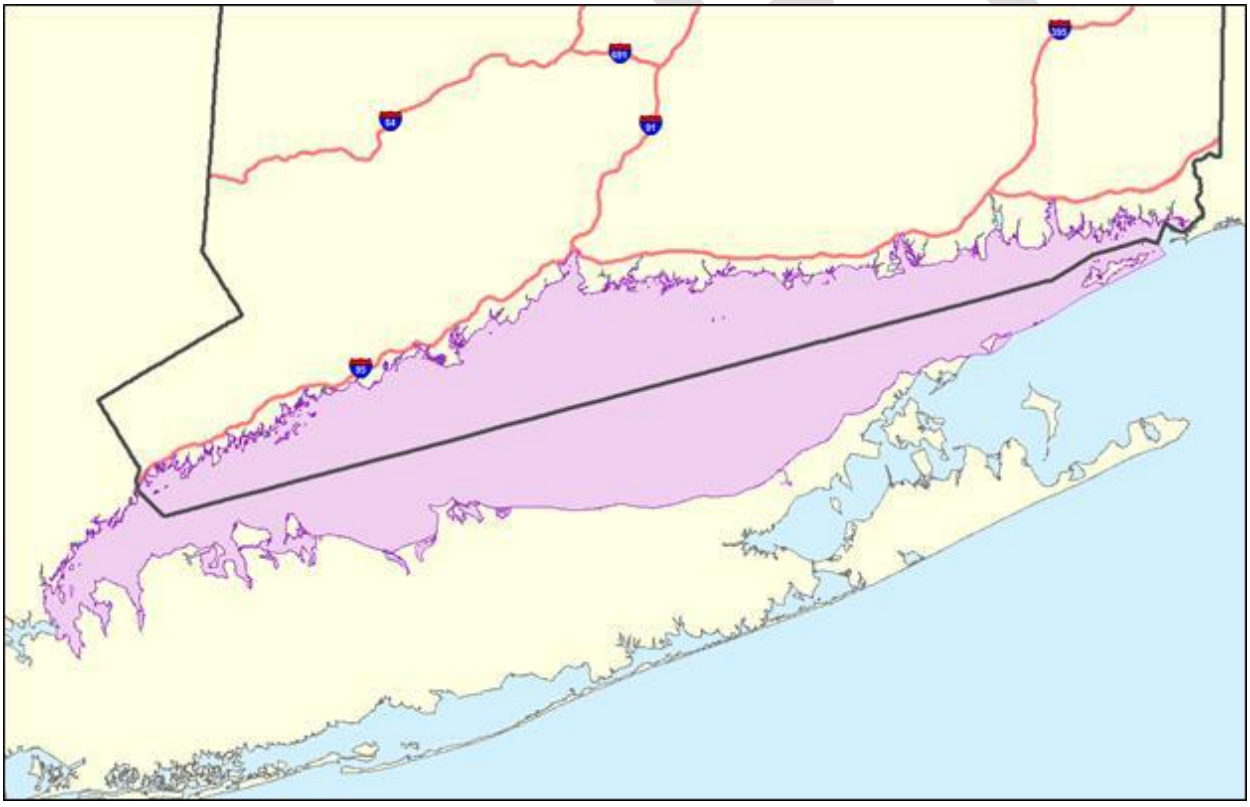
The status of Long Island Sound as state public trust waters has important implications for marine spatial planning, in that Connecticut and New York can manage their own waters and submerged lands more freely and with fewer constraints than they can regulate private property on land. The public trust doctrine offers an additional legal basis for the management and stewardship of Long Island Sound.

In addition to the Public Trust Doctrine and the regulatory programs which are charged with implementing the Blue Plan pursuant to CGS §25-157t(h), other provisions for managing Long Island Sound include other advisory entities (e.g., Bi-State LIS Committee; LIS Advisory Councils, Assembly, and Foundation), Connecticut statewide plans (e.g., State Plan of Conservation and Development, Statewide Comprehensive Outdoor Recreation Plan, Wildlife Action Plan), local government regulatory programs (e.g., coastal management, harbor management), federal authorities in Long Island Sound (e.g., federal consistency provisions under coastal management authority), and interstate, regional, and federal partnerships (e.g., Long Island Sound Study, Long Island Sound National Estuarine Research Reserve, regional ocean planning partnerships, LIS Dredged Material Management Plan).

The Blue Plan statute also calls for the Blue Plan to be "coordinated, developed and implemented, to the maximum extent feasible, with the state of New York." Apart from public outreach and stakeholder events, coordination with New York State in practical terms depends upon close cooperation with the two New York State agencies with primary responsibility for managing the New York waters of the Sound−the Department of State (DOS) and the Department of Environmental Conservation (DEC). Both agencies have designated representatives to the Blue Plan Advisory Committee and have monitored or participated in all stages of Blue Plan development.

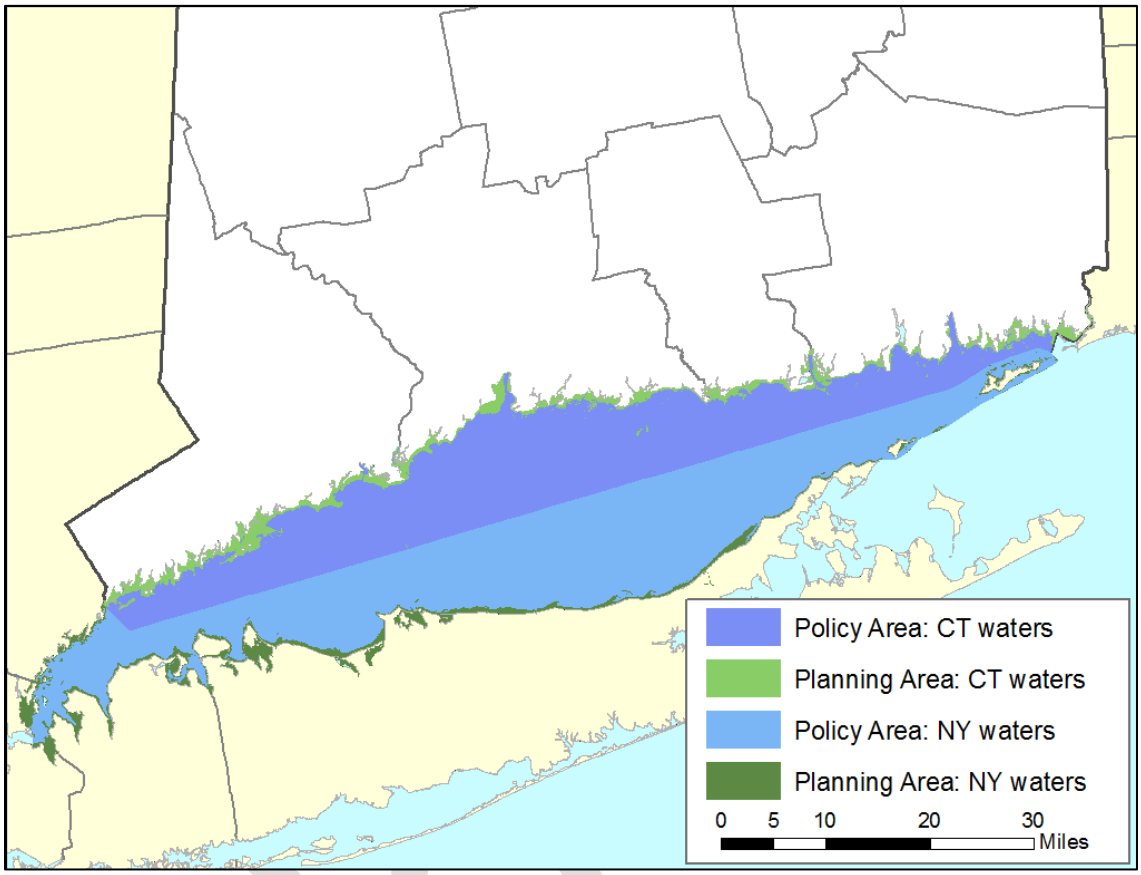
The Blue Plan in Long Island Sound
Long Island Sound Areas Subject to the Blue Plan

For plan development and plan implementation purposes, the Blue Plan legislation established two distinct areas of the Sound, one considered a "planning area" and the other a "policy implementation area." The area considered for planning purposes was more inclusive and comprehensive, allowing the planning team to consider nearshore areas at the Mean High Water Line and, in some cases, upland areas connected in some way to offshore areas.



The complete extent of the LIS Blue Plan Planning area

The area within which Blue Plan policies and standards would apply is the area located "seaward of the bathymetric contour of minus ten feet NAVD to the state's waterward boundaries with the states of New York and Rhode Island" [CGS §25-157t(c)]. This policy area also extends into the rivers that flow into the Sound up to the first motor vehicle bridge or railroad bridge. *Please see Chapter 3, Section 3.2 for maps and more details on how these areas are identified.*



The extent of the Blue Plan Policy and Planning Areas

Long Island Sound Resource and Use Inventory

The first step in the Blue Plan development process was the compilation of the Long Island Sound Resource and Use Inventory, overseen by the Inventory and Science Subcommittee chaired by the University of Connecticut. The Inventory provides a strong base of objective, science-based, and verifiable information on where different natural resources and human activities take place Sound, all of which helps inform decision-making. The Long Island Sound Resource and Use Inventory serves as the basis for developing the maps, policies, and standards that are contained in the Blue Plan to guide future uses of the Sound's waters and submerged lands, with the overall goals of identifying and protecting special, sensitive, or unique estuarine and marine life and habitats while also preserving and protecting traditional riparian and water-dependent uses and activities.

The Blue Plan statute requires that the Resource and Use Inventory "shall be comprised of the best available information and data regarding the natural resources within Long Island Sound and the uses of Long Island Sound," an exercise that had to be performed "within existing resources," that is, without additional state financial support to conduct new research.

In developing the Resource and Use Inventory, the subcommittee organized and grouped sectors identified in the Blue Plan statute, and mobilized sector-relevant members of the Blue Plan Advisory Committee and staff members to gather and review relevant information. Following an initial review of those datasets for technical quality, sector-specific experts and stakeholders were engaged in a review of associated map products for accuracy, representativeness, and relevance. Experts also helped identify significant data gaps, along with the existence of datasets not yet identified by the Blue Plan team that would help address such data gaps. In some cases, stakeholders and experts were directly engaged to summarize and integrate information and knowledge not previously available, or to complement existing information.

The result of this effort is a series of objective and extensively stakeholder- and expert- reviewed and endorsed geospatial information, summarized to the extent possible through a series of maps, along with an associated narrative, to "tell a story" about a given sector.

The Inventory is based on the best available information and data on the Sound's plants, animals, habitats, and ecologically significant areas in nearshore and offshore waters and their "substrates" (surfaces where marine organisms grow). The Inventory also identifies the human uses of Long Island Sound's waters and substrates, including but not limited to boating and fishing, waterfowl hunting, shellfishing, aquaculture, shipping corridors, and energy facilities. Because the Inventory is based on the best information available at the time it was compiled, it is recognized that the document is not perfect, and data gaps are identified in each chapter. As resources permit and new data becomes available, the Inventory will be updated on an ongoing basis.

Designation of Ecologically Significant Areas and Significant Human Use Areas

Human activities and natural resources occur throughout the Sound. The Blue Plan recognizes that Long Island Sound is unique as a whole—no single resource or use is more valuable than all others—and that maintaining a productive estuary is best for the species and people that depend on it. Certain places in the Sound, however, do stand out as having attributes that set them apart from similar areas, and should receive special recognition and protections. Without an effort to recognize those "special places," there would be no way for a planning process to recognize areas of intense, unique, and special use or with characteristics of particular importance for natural resources.

In an effort to identify these special areas within the Sound, data from the Resource and Use Inventory was interpreted and analyzed to help select the most important natural resource and human use areas to help prioritize areas in the Blue Plan. These priority areas were designated as "Ecologically Significant Areas" (ESAs) and "Significant Human Use Areas" (SHUAs), areas upon which many Blue Plan policies are based.

ESAs are locations of unique environmental conditions or species concentrations. Most SHUAs are unique concentrations of a particular type of activity or activities, locations that support a large number of participants in that use. These areas support the livelihoods or recreation of

many individuals, but most had no special protections prohibiting other uses from degrading their unique qualities.

In general, the term "*significant*" in the context of both ESAs and SHUAs is relative to the larger goal of sustaining the features and functions of the Long Island Sound ecosystem and the scope of existing human uses over time. The ESAs and SHUAs do not attempt to measure, calculate, or specify what level of damage or adverse impact would represent an unacceptable diminishment or undermining, whether from a single impact or cumulatively over time. The ESAs and SHUAs point to the elements that are considered important or significant for sustaining the LIS ecosystem and key human uses. These areas, by generally representing the highest levels, qualities, or other traits of LIS marine life and key human uses, identify places where adverse alteration is arguably more likely to result in tangible, identifiable, or measurable impacts, even if the full ramifications to the overall systems are not immediately known.

Both ESAs and SHUAs are important, more than any random location in the Sound, to particular species or communities and need to be recognized as such. The processes for identifying these important areas were different, but similar in that they are groundbreaking for Long Island Sound. The intent of both processes was not to prove that *all* of Long Island Sound is important for one reason or another. In fact, the effort was quite the opposite: to determine, of all of the vibrancy in the Sound, what places are truly unique and, therefore, truly worth establishing specific siting and performance standards for. A good understanding of the most important places to pay attention to helps preserve the Sound and its resources while enabling sustainable economic growth.

ESAs and SHUAs are spatial and represent the locations of ecological significance and locations of where we use the Sound. This means the ESAs and SHUAs are represented on maps, distinguishing one geographic area from another. While ESAs and SHUAs are both depicted on maps, they are specifically defined by criteria that were developed to define them as objectively as possible. These criteria were based on assessing other similar criteria established for marine spatial plans in the Northeast (e.g., the Northeast Regional Ocean Plan, Massachusetts Ocean Plan, and Rhode Island Ocean Special Area Management Plan) along with considering the characteristics of Long Island Sound. They provide an ongoing basis and definition of what is meant by an ESA or SHUA, establishing a stable reference point so that differences in the extent and feasibility of data and/or changes in data over time, can be accounted for.

It is very important to note that *the criteria prevail over a given ESA or SHUA map*, in recognition of the potential shortcomings of data and associated maps and the dynamic nature of the Sound. The Blue Plan process has discovered, assembled, utilized, and integrated a remarkable extent of data and information about marine life, their ecosystem, and the myriad ways we use and rely on Long Island Sound. Many of the maps stem from current and complete information. Other maps depict high quality information but only where observations have been taken. Additionally, the Sound is a dynamic system and climate change is accelerating the rate of change. Data that we have at this time will not necessarily represent change that is inevitable.

ESAs and SHUAs represent an ambitious and thorough scientific effort to characterize the significant ecological and human use areas of the Sound and the results are credible on the basis

of the information that we have now. However, there remains much we do not know and there is little doubt that other areas exist that we have not identified because we do not yet have the data and/or methods to reveal them.

Both the ESAs and SHUAs are directly connected to Blue Plan Policy. In some cases, there are not any siting or performance standards beyond general Blue Plan policies. In other cases, there are siting and performance standards associated with the specific ESAs and SHUA layers/criteria in additional to the general policy.

The ESAs and SHUAs are also relevant to both the Planning area and the Policy area. The planning area includes up to and, where appropriate, upland of the mean high-water line of Long Island Sound. The Policy area is the 10-foot depth contour and deeper. Although Blue Plan policies will only apply within the Policy areas, important places in the coastal zone were also included in the ESAs and SHUA. The decision to represent these places involved a desire to present a more holistic view of the Sound. For example, these places can provide connection to biological and ecological processes in the offshore environment. Coastal wetlands and submerged aquatic vegetation are prime examples. Similarly, activities in the Policy area may affect human uses outside of it; in-water structures may present a visual impediment to scenic resources as viewed from access points along the shore.

The Blue Plan statute PA 15-66 specifically requires that ESAs be established as part of the Blue Plan process to help carry-out official policy for the management of new uses in Long Island Sound. There was no similar specific provision for the identification of SHUAs in PA 15-66, but the Plan Development Team felt strongly that the human uses in Long Island Sound required a similar level of attention. The establishment of ESAs and SHUAs is unprecedented for Long Island Sound.

ESAs and SHUAs do not by themselves represent a full description of the Long Island Sound ecosystem or human uses. Rather, ESAs and SHUAs call attention to priority areas, the Sound's overall ecological integrity and the ways in which people use the Sound remains important. By recognizing an area as an ESA or SHUA does NOT mean non-ESA or non-SHUA areas are unimportant. It is the full collection of interacting elements, features, and uses of Long Island Sound that allow it to be as ecologically and economically vital as it is. It is also this "full collection" that allow the many specific characteristics of the Sound to be recognized and appreciated. Blue Plan policy decisions will not only take into account the ESAs and SHUAs but will continue to address the need to protect Long Island Sound overall.

Ecologically Significant Areas

The Long Island Sound Ecologically Significant Areas are defined based on two specific criteria that represent the areas where these features exist (e.g., areas of coastal wetland) or the top 20% of the range and distribution of the feature (e.g. top 20% of seafloor complexity). In addition to being based on criteria used for other marine plans in the Northeast, these criteria, taken together, are meant to capture two major ecological considerations both of which are deemed essential for sustaining the features and function of the LIS ecosystem: (1) representation of the major and multiple marine life expressions in the Sound, particularly its species, natural communities, and

habitats, and to capture the best of this broad spectrum. The approach includes attention to those species, communities, and habitats that are sensitive, vulnerable, and/or rare; and (2) capturing the habitats, communities, or places that embody or provide key ecological processes and roles that serve or support the healthy functioning of the Long Island Sound ecosystem.

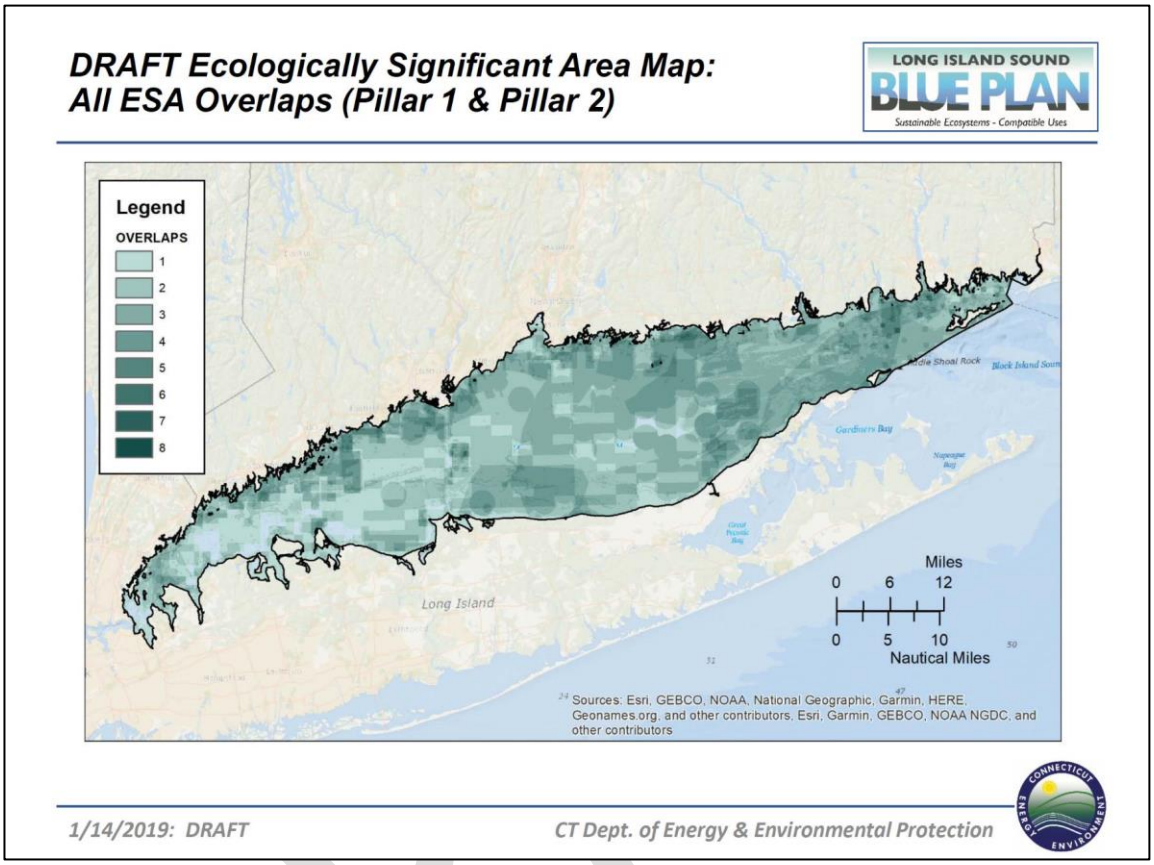
The following Ecologically Significant Areas have been established for the Blue Plan:

Criterion Pillar 1: Areas with rare, sensitive, or vulnerable species, communities, or habitats including:

Hard bottom and complex sea floor	Areas of hard bottom are characterized by exposed bedrock or concentrations of boulder, cobble, pebble, gravel, or other similar hard substrate distinguished from surrounding sediments and provide a substrate for sensitive sessile suspension-feeding communities and associated biodiversity. Complex seafloor is a morphologically rugged seafloor characterized by high variability in neighboring bathymetry around a central point. Biogenic reefs and man-made structures, such as artificial reefs, wrecks, or other functionally equivalent structures, may provide additional suitable substrate for the development of hard bottom biological communities. Areas of hard bottom and complex seafloor are areas characterized singly or by any combination of hard seafloor, complex seafloor, artificial reefs, biogenic reefs, or wrecks and obstructions.
Areas of submerged aquatic vegetation	Areas where submerged aquatic vegetation, e.g., eelgrass (*Zostera marina*), etc., are present or have been found to be present.
Endangered, threatened, species of concern or candidate species listed under state or federal ESA, and their habitats	The species listed by federal or state statutes (e.g., the US Endangered Species Act, the CT Endangered Species Act, the NY Endangered Species Act) as endangered, threatened, species of concern, or candidates for listing, and their associated habitats, recognizing that detailed spatial data depicting the distribution and abundance for these marine species in Long Island Sound are potentially unavailable.
Areas of cold water corals	Areas where cold-water corals have been observed or where habitat suitability or other scientific models predict they occur.
Coastal wetlands	According to Connecticut General Statutes (CGS) § 22a-29: "Those areas which border on or lie beneath tidal waters, such as, but not limited to banks, bogs, salt marshes, swamps, meadows, flats, or other low lands subject to tidal action, including those areas now or formerly connected to tidal waters, and whose surface is at or below an elevation of one foot above local extreme high water; and upon which may grow or be capable of growing some, but not necessarily all, of [a list of specific plant species found in CGS section 22a-29(2)]." Long Island Sound Blue Plan policies do not apply to areas landward of the 10-foot contour, and therefore, while considered Ecologically Significant Areas, Coastal Wetlands and any associated existing statutes or policies relevant to Coastal Wetlands are not within the scope of the Long Island Sound Blue Plan.

Criterion Pillar 2: Areas of high natural productivity, biological persistence, diversity, and abundance, including areas important for supporting or exhibiting such features relative to the following characteristics or species:

Cetaceans (marine mammals)	Areas where cetaceans occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support cetaceans (e.g., particular feeding areas, nursery grounds).
Pinnipeds (seals)	Areas where pinnipeds occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support pinnipeds (e.g., particular haul-out locations, feeding areas).
Sea turtles and other reptiles	Areas where sea turtles and other reptiles occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support sea turtles and other reptiles (e.g., particular feeding areas, nesting grounds, hibernation areas).
Birds	Areas where birds are abundant or diverse including feeding areas; areas of high bird productivity including nesting areas.
Fish	Areas of high weighted fish persistence and high fish abundance and concentration.
Mobile invertebrates (e.g., American lobster)	Areas of high mobile invertebrate (e.g., lobster, other crustaceans, squid) abundance and concentration.
Sessile-mollusk-dominated communities (e.g., blue mussels)	Areas where wild, natural sessile mollusk-dominated communities occur.
Managed shellfish beds	Locations of commercial and recreational shellfishing harvest areas, including shellfish restoration activities and areas closed to shellfishing.
Soft-bottom benthic communities	Areas of soft-bottom seafloor communities where natural productivity, biological persistence, diversity, and/or abundance of marine flora and fauna are high, as well as areas of soft-bottom seafloor communities known to support important life history or important ecological functions of mobile species (e.g., migratory stopovers and corridors, feeding areas, and nursery grounds).



A "roll-up" map for all ESAs together.

Significant Human Use Areas

As a corollary to the statutorily mandated designation of Ecologically Significant Areas, the Blue Plan Development Team (PDT) decided to identify Significant Human Use Areas (SHUA) for policy considerations.

The first step in identifying SHUAs was to determine what activities or locations needed to be recognized as such. While the majority of these are in-water activities such as fishing and boating, the PDT felt it was necessary to include some landside features such as working waterfront infrastructure, parks, and historic artifact discovery locations. New in-water projects may impact these upland sites either directly (e.g., horizontal drilling and grid link associated with a cable) or by simple proximity (scenic view degradation), so project proponents should be aware of all uses they may impact.

Through the Resource and Use Inventory data vetting process, the PDT connected with user communities in the Sound and determined what types of activities and areas are of particular concern to each constituency. Initially the PDT identified over 50 specific use criteria (e.g.,

Connecticut State Managed aquaculture beds, boat launches, recreational fishing areas) across 12 broadly defined activity types (e.g., aquaculture, boating, fishing), and conducted an assessment process to identify and organize the most appropriate representations of human use data and develop descriptions for them.

It is these descriptive criteria that matter the most to the Blue Plan policy. Maps are the backbone of any spatial-planning exercise, as they are incredibly useful visual tools for communicating place-based information. But they can only be based on existing data, which may become out-of-date or change. A written definition of each use can exist without any spatial data, and can more easily shift to match future conditions.

As with the establishment of Ecologically Significant Areas, the PDT determined it was desirable to create overarching criteria to pull similar uses together. Four categories were defined to group SHUAs together in a way that integrates information between sectors so that they may be more easily interpreted and visualized, both digitally and in hardcopy.

The following Significant Human Use Areas have been established for the Blue Plan:

Criterion Pillar 3: Areas with features of historical, cultural, educational, or research significance

Areas associated with lighthouses and other historic areas	Lighthouses, waterfront historic districts, or in-water structures of historical significance, excluding wrecks, and areas of Long Island Sound immediately adjacent to such resources.
Shipwrecks	Wrecks of historical or cultural significance.
Visual and Scenic Resources	Views of Long Island Sound's scenic resources from publicly accessible coastal land.
Submerged and Coastal Archaeological Areas	Submerged or coastal locations of archaeological sensitivity and/or significance.
Areas of Tribal Significance	Submerged or coastal locations recognized by Tribes as having historical or cultural significance.
Discrete Areas for Research, Education, and Monitoring	Areas actively and consistently used for research activities, including but not limited to long term monitoring sites, and Sound-dependent experiential educational programming.

Criterion Pillar 4: Areas of substantial recreational and/or "quality of life" value

Sailing or Rowing Races	Areas consistently used by organized clubs and associations. Including but not limited to racing and training areas, and long-distance sailing race routes.
Marine Events	Recurring marine events including those described in 33 CFR 100.100 Table.

High Activity Recreational Boating Areas	Approximate areas where the density of recreational boating is substantially higher than the overall mean for LIS.
Mooring Fields and Anchorage Areas	Formally designated or traditional mooring fields and anchorages, as designated or managed by NOAA, municipal Harbor Management, or other organizations.
Marinas, Yacht Clubs, and Boat Launches	Locations of marinas, yacht clubs, and boat launches that are within the Blue Plan planning area.
Waterfowl Hunting Areas	Areas in Long Island Sound important for waterfowl hunting, including sea duck habitat.
Dive Sites	Locations in Long Island Sound important for SCUBA activities.
Coastal Public Use Areas	Areas important for public access and use of Long Island Sound for recreational activities including but not limited to swimming, paddling, and wildlife watching.

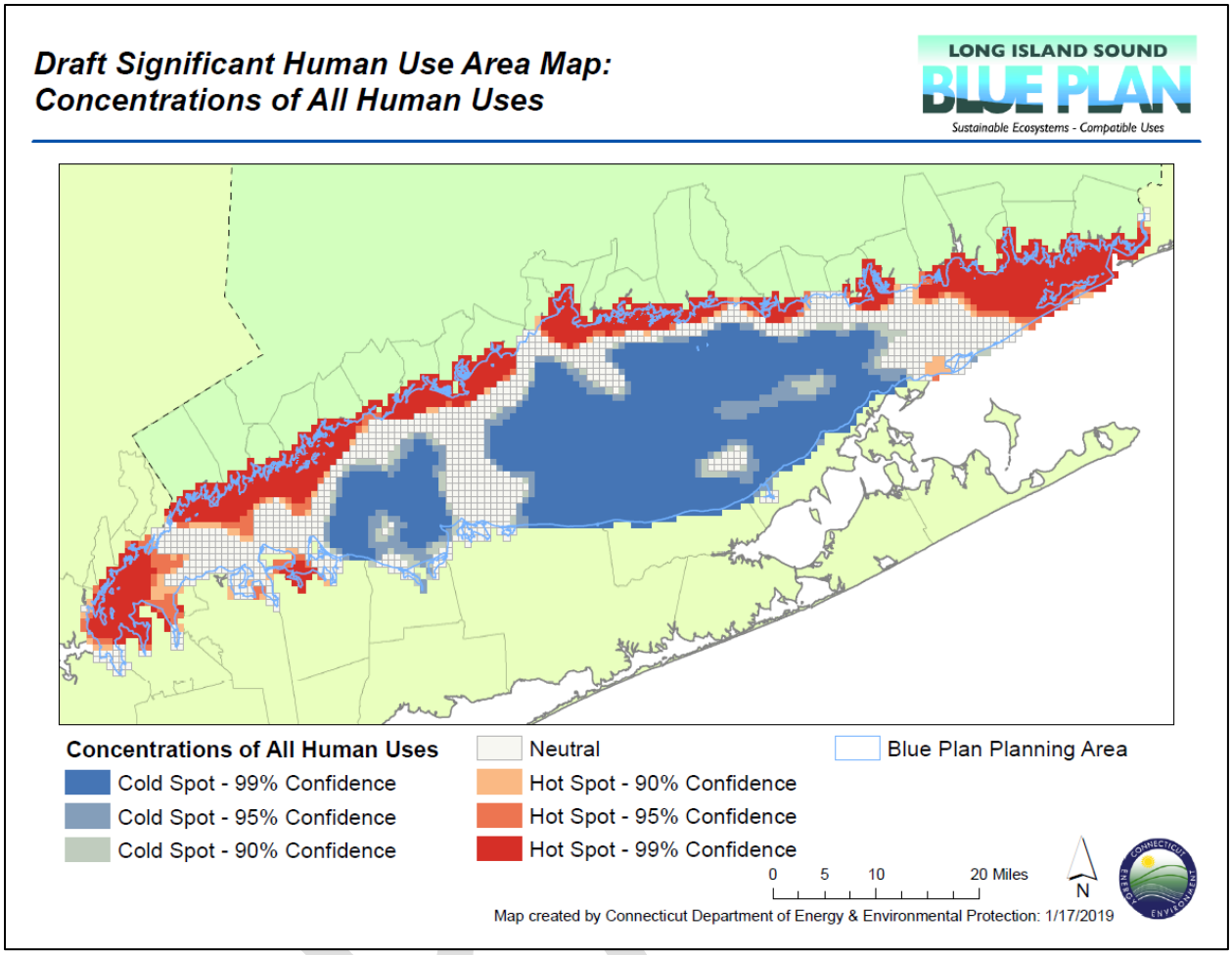
Criterion Pillar 5: Areas important for navigation, transportation, infrastructure, and economic activity

Working Waterfronts, Ports, and Marine Commercial Areas	Commercial facilities that are water-dependent, or service water-dependent uses on Long Island Sound, including but not limited to onshore and offshore terminals and port facilities.
Designated Navigational Channels, Fairways, and Basins	Designated and maintained navigational channels as they appear on the NOAA-published charts and USACE management plans. Also includes authorized privately maintained navigational channels, fairways, and basins, excluding facilities for individual residential use.
Designated Anchorage Areas	Anchorage areas as they appear on the NOAA charts, and are generally used by commercial vessels.
Security Zones and other Designated Areas	Security zones and other operational zones, as designated by the Coast Guard or other appropriate authority.
Areas of Lightering Activity	Areas designated by the Coast Guard for ship-to-ship transfer (lightering), and other areas regularly used for such transfers.
Vessel Traffic Areas	Areas of high traffic use by vessels with AIS transponders including but not limited to ferries and commercial ships. High traffic use is defined by areas that exceed the mean value of transit counts.
Dredged Material Disposal Areas (Active and Historic)	Material disposal sites as they appear on the NOAA charts, in the LIS DMMP, or designated by EPA. Includes areas currently and historically used. Also includes confined aquatic disposal (CAD) cells.
Cables, Pipelines, and Cable/Pipeline Areas	Submerged cable and pipeline infrastructure areas, including but not limited to those indicated on NOAA navigational charts.

Coastal Energy Generating and Transmission Facilities	Coastal energy generating and transmission facilities and associated infrastructure, including areas of Long Island Sound adjacent thereto.

Criterion Pillar 6: Areas important to Fishing and Aquaculture

Recreational Fishing	Areas significant for recreational fishing, as identified by DEEP Fisheries and the recreational fishing community of Long Island Sound.
Commercial Fishing	Areas of substantial value to the commercial fishing community in Long Island Sound.
Charter and Party Boat Fishing	Areas of substantial value to the charter and party boat industry in Long Island Sound.
Recreational Shellfish Areas	Town and/or state managed recreational shellfishing areas.
Commercial Aquaculture Locations	Shellfish leases, seaweed leases, gear areas, designated natural beds, and any other type of authorized aquaculture venture in CT and NY as applicable.



Final concentrations (Hot Spots) of all Significant Human Uses in Long Island Sound

Blue Plan Policies and Standards

Blue Plan Policies are established to identify areas and standards that avoid conflicts and impacts, and encourage sustainable and compatible development. In general, proposed uses and activities subject to the Long Island Sound Blue Plan are not prohibited outright. Rather, project proponents are encouraged to develop their applications to avoid, minimize, and mitigate conflicts and impacts on Long Island Sound's natural resources and traditional human uses.

Part I: Sound-Wide Policies

Sound-wide policies are the highest level policies contained in the Long Island Sound Blue Plan, as they are intended to apply everywhere in the Sound. This section includes a list of broad policies and criteria for the applicable regulatory programs, incorporating the statutory policy criteria of CGS §25-157t(b)(2) as integrated through the Vision & Goals Statement.

Goal 1: Healthy Long Island Sound Ecosystem

Science-based planning and practices that consider both the environment and human uses will help us understand and protect Long Island Sound ecosystems and the services they provide, now (a.) and in the future (b.):

Policies:

a. Any activity proposed within the Blue Plan policy area shall avoid, minimize, and mitigate[3] adverse impacts to natural resources in general, including ecosystem services and water quality, and Ecologically Significant Areas in particular, pursuant to CGS §25- 157t(h).

b. Any activity proposed within the Blue Plan policy area shall consider the future effects of climate change, including but not limited to water quality impacts, changes in species composition, and sea level rise, in accordance with scenarios established pursuant to CGS §25-68o as amended by PA 18-82; and pursuant to CGS §25-157t(h).

Goal 2: Effective Decision-Making

An inclusive, transparent, stakeholder-endorsed and science-based Blue Plan decision-making process that is consistent with other plans and legal requirements will lead to decisions supporting the long-term vision for compatibility of human uses and thriving marine life.

Policies:

a. The Blue Plan "shall establish the state's goals, siting priorities and standards for ensuring effective stewardship of the waters of Long Island Sound held in trust for the benefit of the public."(CGS §25-157t(b)).

b. The Inventory, Blue Plan, and policies, including the maps, data, and descriptions therein, are meant to provide guidance and direction to project proponents/applicants, regulators, and the general public on how the state is to interpret and implement its existing authority including permit and decision- making responsibilities pursuant to CGS §25-157t(h).

c. Any proposed regulated activities shall provide site-specific information necessary to evaluate consistency of the activities with existing regulatory criteria, as may be further informed by Blue Plan policies. Blue Plan policies do not approve or prohibit any specific regulated activity, nor do they pre- determine the outcome of any individual regulatory process.

[3] When applied to policies in chapter four, use of the term "avoid" shall include the minimization of unavoidable adverse impacts and the mitigation of remaining minimized impacts.

Goal 3: Compatibility among Past, Current, and Future Ocean Uses

Science-based planning and practices that consider both human uses and the environment will sustain traditional and facilitate compatible new water-dependent uses to enhance quality of life and compatible economic development, including maintaining the ecosystem services they depend upon.

Policies:

a. Public Trust:

The Blue Plan recognizes that Long Island Sound belongs to the people of Connecticut and New York, and its waters and submerged lands are held in Public Trust by those States for the people. Management of the Sound shall utilize spatial planning for the benefit of the general public, and the pursuit of traditional public trust uses including but not limited to aquaculture, fishing, recreation, and navigation.

The Sound's Blue Plan policy area includes surface and air, water column, and benthos and substrate, and shall be left as open and unrestricted as possible. New uses of the policy area shall not unreasonably restrict public access except where necessary for resource protection, public health and safety, and national security.

Multiple-use areas shall be preferred, and permanent physical or visual obstructions or encroachments shall not be allowed unless providing a substantial public benefit[4] and where necessary for water-dependent uses, resource protection/enhancement, public health and safety, or national security.

a. Any activity proposed within the Blue Plan policy area shall avoid, minimize, and mitigate conflicts with traditional public trust uses, including Significant Human Use Areas, pursuant to CGS §25-157t(h).

b. Offshore structures shall be minimized to the extent practicable in physical scope and visual profile.

c. New non-water-dependent uses, including offshore industrial, commercial, or residential uses, shall not be placed within the Blue Plan policy area unless:

    a. There are no significant adverse impacts to natural resources, including ecosystem services and water quality, and to existing human uses; and

[4] "Public benefit" means a material positive impact to the well-being of the Long Island Sound ecosystem or of the general public, as opposed to any particular benefits to individual firms or economic actors, and shall definition will include facilities in the national interest defined by CGS 22a-93(14), and facilities in support of the State's Comprehensive Energy Strategy (CT DEEP, 2018) and the State Plan of Conservation and Development (Office of Policy and Management, 2005-2010).

b. There is a substantial public benefit that outweighs occupation of public trust lands and waters and any unmitigated adverse impacts; and

c. There is no feasible[5] and less environmentally damaging land-based alternative to the proposed use.

d. Artificially created or enhanced habitats, such as artificial reefs, islands constructed of dredged material, or barges used for seabird nesting may be authorized if:

a. any adverse impacts to existing resources are avoided, minimized, and mitigated, and

b. any adverse impacts to existing resources are avoided, minimized, and mitigated, and

c. any adverse impacts to existing resources are avoided, minimized, and mitigated, and

e. New permanent cross-Sound transportation infrastructure (e.g., bridges and tunnels) shall be avoided except in cases of significant public benefit where adverse impacts, including visual, have been minimized and mitigated to the maximum extent practicable.

f. Offshore structures intended for flood and storm protection (e.g., tidal barriers and flood walls) shall be avoided except in cases of significant public benefit and where adverse impacts, including but not limited to changes to the Sound's tidal processes and water quality, have been minimized and mitigated to the maximum extent practicable.

b. Vistas and Visual Impact

A prominent and characteristic visual feature of Long Island Sound is the unobstructed views from shore to shore; in Connecticut, across to Long Island and Fishers Island, and to the smaller islands and lighthouses which serve as visual landmarks to the public.

Accordingly, no new activity may be allowed with significant permanent effect on vistas from public viewing points of state or regional significance, such as state parks or prominent viewing areas.

a. Artificial illumination shall be kept to the minimum necessary for the functioning of a water-dependent use, except for temporary exhibitions such as fireworks displays and as legally required for public health and safety.

[5] Feasible uses the same definition as CGS §22a-38(17).

b. Municipal authorities are encouraged to implement Connecticut Coastal Management Act policies to identify and protect coastal and inshore visual resources that are visible at the local or neighborhood level.

c. Applicants for visible in-water or on-water activities are required to provide a visual impact analysis, including day and night digital simulations of different development scenarios, when the regulatory agency administering the programs listed in CGS §25-157t(h) determines such analyses are necessary to review the potential visual impact of a regulated activity.

Part II: General ESA and SHUA Policies

The Blue Plan identifies a series of Ecologically Significant Areas (ESAs) and Significant Human Use Areas (SHUAs) in Long Island Sound. This section is comprised of policies that aim to protect the value of ESAs and SHUAs and is separated into two parts where more specific siting and performance standards are written based on ecological or human use category.

Policies:

1. Development, preservation, or use of Long Island Sound shall proceed in a manner consistent with the capability of the Sound's natural resources to support development, preservation, or use without significantly disrupting either the natural environment or existing human uses of the Sound;

2. In regards to new applications; preference shall be given to new uses that avoid adverse impacts on the Sound's natural resources, and avoid conflicts with existing human uses of the Sound:

    a. New activities in the Blue Plan policy area of Long Island Sound shall maintain, preserve, or enhance the values of an ESA and/or SHUA.

3. A proposed activity may be located within an ESA and/or SHUA provided that it has been demonstrated, through site-specific survey, scientific data, and analysis submitted pursuant to the applicable regulatory program under CGS §25- 157t(h) that:

    a. The project will cause no significant adverse impacts to the ESA and/or SHUA pursuant to the Ecologically Significant Areas siting and performance standards in Part IIa and the Significant Human Use Areas siting and performance standards in Part IIb, or

    b. There is no feasible, less damaging alternative and all reasonable mitigation measures and techniques have been provided to minimize adverse impact, and the public benefits of the project outweigh the harm to the ESA and/or SHUA resource, use, or value.

4. Each SHUA and ESA sub-criterion will have a map or a group of maps associated with it that will designate the best available information on the current extent of that resource or use. These maps are not enforceable standards, because the best known current extent will likely change over time with new information. The maps are meant to assist state and local governments, applicants, stakeholders, and the public by showing current SHUA and ESA locations. The ESA and SHUA policies and protection standards are applicable pursuant to the most up-to-date extent of the ESA and SHUA.

    a. Some ESAs and SHUAs are located outside the policy area, i.e., landward of the 10 ft depth contour up to the coastal boundary as defined by CGS §22a-94(b). Policies associated with such ESAs and SHUAs may only be applied within the proximate policy area.

Part IIa: Siting and Performance Standards for ESAs

This section describes the siting and performance standards applicable to each ESA criteria, based on the location of potential impact either in Air and Surface (AS), Water Column (WC), and Benthos & Substrate (BS). The General ESA and SHUA policies also apply to all the following siting and performance standards.

ESA Siting and Performance Standards			
Significant Ecological Resource Criteria	Air and Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
1. Areas with rare, sensitive, or vulnerable species, communities, or habitats			
1.1. Hard bottom and complex sea floor	No specific standards applicable. General policies apply.	No alteration, including changes in sedimentation or turbidity that would significantly adversely impact ecological characteristics and function.	No alteration that would significantly adversely impact ecological characteristics and function.
1.2. Areas of submerged aquatic vegetation	No structures or activities that would substantially shade or otherwise adversely impact growth.	No alteration, including physical impacts or changes in sedimentation or turbidity that would significantly adversely impact vegetation.	No bottom disturbance to existing vegetation. Protection and enhancement activities are encouraged pursuant to 22a - 92(c)(2)(A).

1.3. Endangered, threatened, species of concern, and candidate species listed under state and federal Endangered Species Act and their habitats	No specific standards applicable. General policies apply. Comply with applicable state and federal policies to avoid adverse impacts to designated species and habitats.		
1.4. Areas of cold water corals	No specific standards applicable. General policies apply.	No alteration, including changes in sedimentation, turbidity, or acidity that would significantly adversely impact corals.	No bottom disturbance to existing corals.
1.5. Coastal Wetlands	The Blue Plan only has jurisdiction in waters 10 feet and deeper, therefore please refer to the Connecticut Tidal Wetlands Act [CGS § 22a-28 as referenced by CGS §§ 22a-92(a)(2), 22a-92(b)(2)(E), 22a-92(c)(1)(B), and 22a-92(b)(1)(B)] and the Connecticut Coastal Management Act [CGS §§ 22a-93(15)(H) and 22a-93(15) (G)] for appropriate policies and standards.		
Significant Ecological Resource Criteria	Air & Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
2. Areas of high natural productivity (HNP), biological persistence, diversity, and abundance, including areas important for supporting or exhibiting such features, relative to these characteristics or species:[6]			
2.1. Cetaceans	No specific standards applicable. General policies apply. Comply with Marine Mammal Protection Act and other applicable federal law.		
2.2. Pinnipeds	No activities that would significantly or permanently impair use of an area by these species. Comply with Marine Mammal Protection Act and other applicable federal law.		
2.3. Sea Turtles and other Reptiles	No specific standards applicable. General policies apply. Comply with Endangered Species Act and other applicable federal law.		

[6] Areas where natural productivity, biological persistence, diversity, and abundance are high, as well as migratory sanctuaries, stopovers and corridors, nesting areas, feeding areas, and nursery grounds for cetaceans, pinnipeds, sea turtles, marine birds, fish, mobile invertebrates, sessile-mollusk-dominated communities, managed shellfish beds, and soft-bottom benthic communities.

2.4. Birds	No activities that would significantly adversely impact diversity or abundance of species, including but not limited to interference with migratory patterns or foraging, in these areas. Comply with Migratory Bird Treaty Act and other applicable federal law	
2.5. Fish	No activities that would significantly adversely impact diversity, persistence, or abundance of species in these areas. Comply with Endangered Species Act and other applicable federal law.	
2.6. Mobile Invertebrates	No specific standards applicable. General policies apply.	
2.7. Sessile-mollusk dominated communities	No specific standards applicable. General policies apply.	No activities that would significantly adversely impact diversity, persistence, or abundance of species in these areas.
2.8. Managed Shellfish Beds	No specific standards applicable. General policies apply.	No activities that would significantly adversely impact ecosystem services of managed shellfish beds, except for those activities related to such shellfish management.
2.9. Soft-bottom benthic communities	No specific standards applicable. General policies apply.	

Part IIb: Siting and Performance Standards for SHUAs

This section describes the siting and performance standards applicable to the SHUA criteria, based on the location of potential impact either in Air and Surface (AS), Water Column (WC), and Benthos & Substrate (BS). The General ESA and SHUA policies also apply to all the following siting and performance standards.

SHUA Siting and Performance Standards			
Significant Human Use Criteria	Air and Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
3. Areas with features of historical, cultural, or educational significance			
3.1. Areas associated with lighthouses and other offshore historic buildings	No activity that would significantly restrict physical or visual access to the site.	No specific standards applicable. General policies apply.	

3.2. Shipwrecks	No permanent fixed or floating structures that affect the shipwreck site or access to it. Site marker buoys may be allowed.	No permanent fixed or floating structures that may affect the shipwreck site or access to it.	No bottom disturbance, including deposition or shifting of sediments.
3.3. Areas of significance, submerged archaeological sites, and submerged areas of sensitivity	No permanent fixed or floating structures that affect submerged natural or cultural resources. Site marker buoys may be allowed.	No permanent fixed or floating structures that affect submerged natural or cultural resources.	No bottom disturbance.
3.4. Discrete areas important for research, education, and monitoring	No activity that would significantly adversely affect the use of the area for such purposes.		
Significant Human Use Criteria	**Air and Surface (AS)**	**Water Column (WC)**	**Benthos & Substrate (BS)**
4. Areas of substantial recreational and/or "quality of life" value			
4.1. Sailing and Rowing Races	No fixed or floating structures that would interfere with racing activity during the season.	No activity that would interfere with racing activity during the season.	
4.2. Marine Events	General policies apply. Consult with event organizers to avoid or minimize conflict.		
4.3. High Activity Recreational Boating Areas	No fixed or floating structures that would interfere with vessel traffic.	No activity that would interfere with navigation.	

4.4. Mooring and Anchorage Areas	No fixed or floating structures that would interfere with moored vessels or anchored vessels or vessel traffic.	No activity that would interfere with moored vessels or anchored vessels or vessel traffic.	No activity that would interfere with moored vessels or anchored vessels, or the placement of mooring tackle.
4.5. Marinas, Boat Launches, and Yacht Clubs	No fixed or floating structures that would interfere with authorized facilities and associated boating activities, including access to and maintenance of navigational channels and marina infrastructure.	No activity that would interfere with authorized facilities and associated boating activities, including access to and maintenance of navigational channels and marina infrastructure.	
4.6. Waterfowl Hunting	No fixed or floating structures that would interfere with seasonal hunting activity or waterfowl habitat.	No specific standards applicable. General policies apply.	
4.7. Dive Sites	No permanent fixed or floating structures that adversely affect submerged natural or cultural resources, or unreasonably restrict divers. Site marker buoys may be allowed.	No in-water activities or structures that interfere with diver access.	No bottom disturbance that would adversely affect submerged natural or cultural resources, including deposition or shifting of sediments.
4.8. Coastal Public Use Areas	No structures or activities that would interfere with coastal public use activities.		

Significant Human Use Criteria	Air and Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
5. Areas important for navigation, transportation, military, infrastructure, and economic activities			
5.1. Working Waterfronts	No activities, or permanent fixed or floating structures that would interfere with maritime and water-dependent activities, including access to navigational channels and infrastructure. Fishing and boating activities allowed subject to operations.	No activities, or permanent fixed structures that would interfere with maritime and water-dependent activities, including navigational channels and infrastructure. Aquaculture and fishing allowed subject to operations.	No on-bottom structures or disturbance that would interfere with operations, including access to and maintenance of navigational channels and infrastructure.
5.2. Designated Navigation Channels	No permanent fixed or floating structures that interfere with navigation or channel maintenance.	No permanent structures that would interfere with navigation or channel maintenance.	No permanent bottom or sub-bottom structures that interfere with navigation or channel maintenance. Potentially appropriate to co-locate cables, pipelines, and other uses that may require bottom disturbance during installation, given the need for periodic dredging.
5.3. Commercial anchorage areas, security zones, and other designated areas	Activities shall be consistent with the regulations for that designated area.		

5.4. Areas of Lightering Activity	Activity shall comply with applicable Coast Guard and other regulations. No potentially conflicting activity during lightering operations.	No specific standards applicable. General policies apply.	
5.5. Vessel Traffic Areas	No activity or permanent fixed or floating structures that interfere with vessel traffic and navigation, including maneuvering.	No activity or permanent structure that would interfere with navigation. Fishing activities allowed subject to vessel traffic.	No specific standards applicable. General policies apply.
5.6. Dredged Material Disposal Areas: Active	No activity or permanent structures that interfere with disposal operations.		No excavation. No bottom disturbance, except as incidental to disposal operations, scientific activities, or remediation activities.
5.7. Dredged Material Disposal Areas: Historic/Closed	No specific standards applicable. General policies apply.		No excavation. No bottom disturbance, except for scientific or remediation activities.
5.8. Cables, pipelines, and cable/pipeline areas	No specific standards applicable. General policies apply.		No activities that would significantly disturb existing cables and pipelines, except that new facilities may be co- located within corridors, as appropriate to avoid impact to adjacent areas.

5.9. Coastal Energy Generating and Transmission Facilities	No activities that would interfere with facility operation or access.		No on-bottom structures or disturbance that would interfere with operations, including access to the facility by cables or pipelines.
Significant Human Use Criteria	Air and Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
6. Areas important to fishing and aquaculture			
6.1. Recreational Fishing	Permanent displacement of recreational fishing and related activity by other activity, or permanent structures shall be avoided to the maximum extent practicable.		
6.2. Commercial Fishing	Permanent displacement of commercial fishing and related activity by other activity, or permanent structures shall be avoided to the maximum extent practicable. Consultation with sector is required commensurate with intensity of commercial fishing activity potentially being impacted.		
6.3. Charter & Party Boat Fishing	Permanent displacement of charter and party boat fishing and related activity by other activity, or permanent structures shall be avoided to the maximum extent practicable.		
6.4. Recreational Shellfish	No permanent structures or activity that unreasonably restricts access to designated shellfish beds or recreational shellfishing activity.		
6.5. Commercial Aquaculture	No permanent structures or activity that significantly restricts access to commercial aquaculture activity.		

Part III: Lenses for Consideration

A series of six "lenses" are meant to be taken under consideration when applying the various policies and standards presented above. The lenses are meant to assist the applicant or agency when determining the suitability, location, and timing of a proposed project, and if that project calls for additional information and data collection. Lenses may also have additional resources associated with them that are meant to assist the user in considering the lens.

1. Other Applicable Laws

Review and consider any other legal authorities that are not listed in (Section 4.1) that may apply to a specific area or activity. Examples may include the Endangered Species Act, Marine

Mammal Protection Act, Federal Energy Regulatory Commission, and Connecticut or New York State Fisheries Regulations.

2. Degree of Conflict

Review and consider the degree of conflict a proposed project may have with various natural resources, including ecosystem services, and human uses present in Long Island Sound. Please see Appendix 4: Conflict and Compatibility Matrices for a series of conflict and compatibility matrices that outline whether two uses or a use and resource are synergistic, compatible, conditionally compatible, or in conflict.

3. Reliability of Data

Review and consider the reliability of certain data sets or map products when siting a proposed project. For instance, navigational channels will likely remain constant, while recreational boating and fishing areas may change by season or year. Utilizing data that is more fluid may require additional surveying or outreach. Please see Appendices 2 and 3 and the Inventory for more information on the data utilized in this Plan and any current gaps (LIS Inventory and Science Subcommittee, 2019).

4. Duration, Permanence, and Seasonality of Resource or Use

Review and consider the duration, permanence, and seasonality of the resource or use that may be impacted, and the duration and permanence of the new use proposed. For example, duck hunting and sailboat races occur seasonally while uses like ferry trips occur throughout the year.

5. Social, Community, and Generational Equity

Long Island Sound is a public trust resource and shall be shared between different stakeholders, communities, and multiple generations. Review and consider how a new use may impact the greater population of Long Island Sound users, now and in the future. Applicants should also consider how their proposed project will differentially impact various users. Please view the CT DEEP Environmental Justice policies for more information (CT DEEP, 2009).

6. Climate Change Resilience and Mitigation

Climate change is already evident on a global scale, and locally in Long Island Sound, including such impacts as rising air and water temperatures, increasing sea levels, extreme storm events, changes in species composition and habitat utilization, and water acidification. Further effects of climate change are anticipated in the future, and could be exacerbated by 1) natural changes from coastal processes, and 2) changes in human development patterns. In an effort to adapt to evolving knowledge and understanding of the marine environment, including adaptation to climate change and sea level rise, it is vital for future activities and projects within the Blue Plan policy area to consider a changing climate in their design by enhancing the resiliency of the proposal and, where possible, mitigating any contributions to a changing climate. Please see the CT DEEP Climate Change policies and reports for more information (CT DEEP, 2019).

Implementation and Adaptive Management

As the Long Island Sound Blue Plan is implemented and utilized over time, it is also important that the Plan adapts and improves. CT DEEP, with the assistance of the BPAC, should monitor

progress in Blue Plan implementation, revise areas that could be improved, and adapt to changing environmental and social conditions, including the availability of new datasets.

Stakeholders and members of the public are encouraged to continue to provide feedback and comment on Blue Plan Implementation. Stakeholders and the public may submit comments directly to CT DEEP via email at deep.blueplanlis@ct.gov, or mail:

> Long Island Sound Blue Plan
> Connecticut Department of Energy and Environmental Protection
> Land and Water Resources Division: Blue Plan
> 79 Elm Street
> Hartford, CT 06106

Within available resources, CT DEEP will track the initial applications that are proposed within the Blue Plan policy area and are thus required to comply with the Blue Plan. CT DEEP will monitor any strengths and weaknesses of the Blue Plan as applied to these initial proposals. Within available resources, CT DEEP will also monitor any changing trends in the Blue Plan planning and policy areas, including changing distributions of natural resources and human uses. CT DEEP will also track if and when new data to inform the Blue Plan becomes available.

CT DEEP will regularly report on the progress and performance of the Blue Plan to the BPAC, which will hold at least one public hearing to receive comments and suggestions on Blue Plan implementation.

Adapting the Blue Plan

Pursuant to CGS §25-157t(h), "the Commissioner of Energy and Environmental Protection shall provide for the review and update of such inventory and plan at least once every five years and any revision to such inventory and plan shall become effective upon approval by the General Assembly, in accordance with subsection (g) of this section." The Blue Plan may also undergo changes prior to the mandated five-year review and update if the BPAC finds it appropriate to do so. The Commissioner also has the authority and discretion to include new and updated data and maps into the Inventory and Blue Plan, at any time.

Although DEEP has the mandate to fulfil this adaptive management provision, duty also falls to the people of Connecticut to bring forth changes that they believe must be made to the Blue Plan documents, and information to support these changes. As is noted earlier in this document, it is important that those who know the Sound best be active participants in the evolving management and stewardship thereof.

Topics for Future Consideration

Long Island Sound will change over time, both in terms of the environmental resources and human uses. In addition to these ordinary changes over time, there will likely be future policy drivers, considering topics like a changing climate and economic development that encourage new and different uses of the Sound.

For instance, in addition to the ongoing rise of a nascent farmed seaweed industry, other potential new human uses may include:

- Renewable Energy Infrastructure such as transmission cables or tidal power facilities
- Bio-extraction projects using shellfish beds or seaweed farms
- Artificial Reefs or Eternal Reefs
- Transportation Infrastructure such as bridges, tunnels, or ferry facilities

Further, shifts in climate around Long Island Sound could have tremendous implications for the resources and use of the Sound, as well as how the Blue Plan is implemented.

Legislative considerations that may assist the implementation and adaptation of the Blue Plan over time include earmarked funding for Blue Plan implementation and revision, and submerged land leasing provisions to allow Connecticut to operate programs under which submerged public trust lands are leased for private use.

Areas for Future Consideration

A topic for future consideration and analysis may be to develop "priority use areas" to encourage similar types of uses to cluster within an area or region, such as Pipeline and Cable Corridors or Tidal Energy Areas. Another topic is the need to establish a consistent method to notify the public or certain stakeholder groups of new projects that are being proposed in the Blue Plan policy area. Finally, data gaps are identified in the Inventory, and the Blue Plan Advisory Committee may wish to establish priorities for future research to fill data gaps in cooperation with UConn.

Chapter 1 Introduction

1.1 Purpose and Need for Marine Spatial Planning

If you were to ask Connecticut residents to identify the state's most important natural resource, there's an excellent chance that their response would be "Long Island Sound." That's because the Sound is a unique estuary[7] that improves our overall quality of life, providing countless recreational opportunities, serving as an important habitat for fish and other marine wildlife, and contributing an estimated $9.4 billion annually to the regional economy (Long Island Sound Study, 2019).

As one of the region's greatest natural resources, however, Long Island Sound also runs the risk of being "loved to death." The Sound is located in a highly urbanized, highly populated area of the United States, with an estimated 23.8 million people living within 50 miles of its shores (Long Island Sound Study, 2019). As such, just about every square inch of the Sound is used in some way by humans and wildlife, oftentimes in the same places (for example, people usually go fishing in places where there are abundant fish). The Sound also feels the pressure of new offshore development and new uses that can sometimes conflict with and cause harm to the plants and animals that live in the Sound, and can sometimes conflict with existing human uses as well. An example of new development pressure can be seen in the ocean areas in our neighboring states of Rhode Island and Massachusetts, where alternative energy facilities like offshore wind turbine installations are being proposed.

While the waters of Long Island Sound will not likely experience this same offshore wind development pressure (believe it or not, it isn't windy enough), there could be the potential for cables associated with these neighboring offshore wind proposals to enter the Sound. In addition to energy uses, other new offshore uses are proposed in Long Island Sound every day. For example, seaweed farms are permitted with greater frequency in the Sound, the New York Department of Transportation released a 2017 Long Island Sound Crossing Feasibility Study for a bridge/tunnel between New York and Connecticut (WSP, 2017), although a formal proposal for such a project is not moving forward at this time, and, perhaps most well-known, was the 2007 Broadwater proposal that could have resulted in a liquefied natural gas terminal being constructed right in the middle of Long Island Sound (CT Citing Council, 2008).

Historically, many of these pressures on the Sound have been reviewed on a case-by-case basis by several separate state and local regulatory programs, without a comprehensive plan to assess and understand the presence and distribution of ecological resources and human uses in the Sound. The lack of a plan especially problematic when large-scale projects such as cables and

[7] An estuary is a body of water where salt water from the ocean mixes with freshwater from upland rivers. Long Island Sound is an estuary because the salt water from the Atlantic Ocean mixes here with the freshwater coming downstream from the Thames, Connecticut, Quinnipiac, and Housatonic Rivers, as well as from smaller local rivers and streams.

pipelines, bridges, or liquefied natural gas installations are proposed offshore. A comprehensive plan would better organize the analysis of and response to large, complex projects like these, so that such new uses don't conflict with the broad diversity of existing uses or natural resources.

One way to develop a science-based, fully formed, commonly planned vision for Long Island Sound is through a process known as "Marine Spatial Planning," which brings multiple users of marine waters together to make informed and coordinated decisions about how to manage marine resources and distribute human uses.

The Long Island Sound Blue Plan is Connecticut's effort to develop a comprehensive marine spatial plan for Long Island Sound to guide future development and permitting of the Sound's waters and submerged lands. The Blue Plan will coordinate existing state and local regulatory programs, addressing the development pressures we know about today, and planning for the emerging issues and development pressures of tomorrow. And because Long Island Sound is a shared waterbody, the Blue Plan planning process has been closely coordinated with the State of New York.

Many of the ways in which humans use Long Island Sound can compete with and sometimes conflict with one another. For example, fixed fishing gear located in a shipping channel would create problems for marine transportation within that channel. Some uses can adversely impact sensitive species and important habitats, in part because no one knows that those species or habitats are there.

On the other hand, some human uses of the Sound are totally compatible with each other and/or with resource areas. For example, seaweed farming in the winter won't necessarily conflict with recreational boating activities in the summer, and SCUBA divers can dive in areas with an abundance and variety of marine life on the seafloor without harming those ecosystems.

As a marine *"spatial"* plan, the Long Island Sound Blue Plan identifies the *"spaces"* in the Sound that are currently used by humans (e.g., commercial and recreational boating and fishing areas, ferry transportation routes, electric and gas pipeline locations) and the *"spaces"* that are ecologically important (e.g., shellfish beds, cold-water corals, areas where seals rest on the rocks), and protect those spaces by establishing policies that avoid and reduce conflicts and impacts among human uses of the Sound, and between human uses and the Sound's natural resources.

1.2 Origin of the Marine Spatial Planning Process

❖ Bi-State Marine Spatial Planning Group

Although the Long Island Sound Blue Plan statute was passed by the Connecticut General Assembly in 2015, that legislation was several years in the making. A Connecticut/New York Bi-State Marine Spatial Planning Working Group was formed in 2012 to set the stage for establishing a marine spatial plan for Long Island Sound. The concept of "Marine Spatial

Planning" had already caught on in the northeast, mostly in response to offshore wind development proposals knocking at the door. Efforts at the federal level to develop a Northeast Ocean Plan had been underway (Northeast Ocean Planning, 2019), with the plan adopted in 2016 to guide federal agency decisions in the region, and state ocean plans had been adopted in Massachusetts in 2009 (Massachusetts Office of CZM, 2019) and in Rhode Island (RI CRMC, 2019) in 2010.

The Bi-State Working Group was formed following a workshop convened by the Sea Grant programs in Connecticut and New York in 2010, and follow-up discussions about marine spatial planning, recognizing that, even in the absence of offshore energy proposals looming on the horizon, Long Island Sound is an intensely utilized, ecologically important waterbody that needed and deserved its own marine spatial plan.

As an "unofficial," voluntary effort, the Working Group was made up of participants from state and federal agencies (e.g., the Connecticut Department of Energy and Environmental Protection, the New York Department of State, the New York Department of Environmental Conservation, the United States Environmental Protection Agency, the National Oceanic and Atmospheric Administration); regional ocean governance entities (e.g., the Northeast Regional Ocean Council and the Northeast Regional Planning Body); trade organizations such as the Connecticut Marine Trades Association; and other user interests including the Coastal Conservation Association, conservation organizations such as The Nature Conservancy and the Connecticut Fund for the Environment, and the Connecticut and New York Sea Grant programs.

The Working Group developed a report on the purposes and potential guiding principles for marine spatial planning in the Sound, and identified the types of data and information necessary for such a planning effort, as well as the potential options for shaping and implementing a marine spatial planning process in Long Island Sound.

The Bi-State Working Group did much of the heavy lifting in providing the background work necessary to support Connecticut's legislative effort to establish the Blue Plan legislation, and fostered cooperation and coordination of the States of Connecticut and New York in addressing marine spatial planning for the Sound. Their seminal Options for Developing Marine Spatial Planning in Long Island Sound: Sound Marine Planning Interim Framework Report provides much of the justification for the Long Island Sound Blue Plan effort (Connecticut-New York Bi-State MSP Working Group, 2016).

❖ Legislative Support for the Long Island Sound Blue Plan

After several years of the background work and marine spatial planning research in Connecticut and New York, conducted in large part by the Bi-State Marine Spatial Planning Working Group, Public Act 15-66, An Act Concerning a Long Island Sound Blue Plan and Resource and Use Inventory was signed by Governor Dannel P. Malloy on June 19, 2015 and went into effect on July 1, 2015. The legislation received unanimous bipartisan support in the Connecticut General Assembly.

Governor Malloy sponsored the Blue Plan legislation, recognizing that Long Island Sound is critical for Connecticut's economy and the millions of people who use and enjoy its resources, yet Connecticut did not have any existing authority to plan for the Sound's future use and protection on an overall basis. The Blue Plan legislation enhanced and expanded the work of the Connecticut/New York Bi-State Working Group, authorizing the Connecticut Department of Energy and Environmental Protection to develop a comprehensive, coordinated regional plan and strategy to ensure that future uses of the Sound are balanced with resource protection, compatible with existing traditional uses, and minimize conflicts among uses.

Preparing a Blue Plan for Long Island Sound is about protecting what we cherish and helping sustain a critical, publicly-owned natural resource that, in turn, sustains us all, said Nathan Frohling. With a Blue Plan, Connecticut can assure new uses of the Sound are compatible with traditional values and resources. We will be able to better balance new uses, while protecting such things as commercial and recreational boating and fishing, the maritime beauty and environmental values that make the Sound such a desirable place.

- Nathan Frohling, Blue Plan Advisory Committee Member, Chair of the Blue Plan Stakeholder Engagement Subcommittee, and Director Coastal and Marine Initiatives, The Nature Conservancy

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1.3 The Blue Plan Act

❖ Highlights of the Long Island Sound Blue Plan

The Blue Plan legislation, codified in Connecticut General Statutes § 25-157t, sets forth the process that Connecticut used to develop the Long Island Sound Blue Plan to establish the state's goals, siting priorities, and standards for ensuring effective stewardship of Long Island Sound's public trust waters. The Blue Plan promotes science-based management practices that take into account the existing natural, social, cultural, historic, and economic characteristics of Long Island Sound. A significant benefit of the Blue Plan is the identification of appropriate locations and performance standards for activities, uses, and facilities that are regulated by specific state and local regulatory programs identified in the statute, and the establishment of responsible measures and policies that will guide the siting of those uses in ways that are consistent with the Plan.

For plan development and plan implementation purposes, the Blue Plan legislation established two distinct areas of the Sound, one considered a "planning area" and the other a "policy implementation area." The area considered for planning purposes was more inclusive and comprehensive, allowing the planning team to consider nearshore areas at the Mean High Water Line and, in some cases, upland areas connected in some way to offshore areas. The area within which Blue Plan policies and standards would apply is the area located "seaward of the

bathymetric contour of minus ten feet NAVD to the state's waterward boundaries with the states of New York and Rhode Island" [CGS § 25-157t(c)]. This policy area also extends into the rivers that flow into the Sound up to the first motor vehicle bridge or railroad bridge. Please see Chapter 3, Section 3.2, for maps and more details on how these areas are identified.

The first step in the Blue Plan development process was the compilation of the Long Island Sound Resource and Use Inventory (Inventory), overseen by the Inventory and Science Subcommittee chaired by the University of Connecticut (LIS Inventory and Science Subcommittee, 2019). Relevant state agencies, academic institutions, and stakeholders were convened and tasked with compilation of the Inventory. The document is based on the best available information and data on the Sound's plants, animals, habitats, and ecologically significant areas in nearshore and offshore waters and their "substrates" (surfaces where marine organisms grow). The Inventory also identifies the human uses of Long Island Sound's waters and substrates, including but not limited to boating and fishing, waterfowl hunting, shellfishing, aquaculture, shipping corridors, and energy facilities.

The Inventory serves as the basis for developing the maps, policies, and standards contained in the Blue Plan to guide future uses of the Sound's waters and submerged lands. The overall goals of the Inventory and Plan identified in the Blue Plan statute are to identify and protect special, sensitive, or unique estuarine and marine life and habitats including, but not limited to, scenic and visual resources, while also preserving and protecting traditional riparian and water-dependent uses and activities.

The legislation also established the Blue Plan Advisory Committee (BPAC), comprised of representatives from various relevant stakeholder groups. The BPAC assisted the Commissioner of DEEP with the drafting of the Long Island Sound Blue Plan, but its function doesn't end once the Plan is approved. In fact, within six months of the Plan's approval by the Connecticut General Assembly, the BPAC must advise the Commissioner of DEEP on the operation, implementation, and updating of the Blue Plan and the Inventory, as applicable. The BPAC must provide for the review and update of the Plan and the Inventory at least once every five years, and identify emerging issues and recommend any necessary or desirable alterations or improvements to the Plan and/or the Inventory. The legislation also requires the BPAC to hold at least one public hearing each year to receive comments and submissions from the public on the Plan and Inventory.

Recognizing that Long Island Sound is a shared waterbody, the Blue Plan legislation requires that development and implementation of the Plan must be coordinated with the State of New York, and with local, regional, and federal planning entities and agencies including the Connecticut/New York Bi-State Marine Spatial Planning Working Group, the Long Island Sound Study, and the Northeast Regional Planning Body established by the National Ocean Policy.

The Plan must also be consistent with the Connecticut's State Plan of Conservation and Development and the goals and policies contained in the Connecticut Coastal Management Act.

The legislation also ensures that the Blue Plan will remain "fluid," adapting as necessary to our ever-evolving knowledge and understanding of the Sound's marine environment, recognizing

current issues like climate change impacts while anticipating and addressing future emerging issues. In meeting this goal, the legislation provides for the ongoing acquisition and application of up-to-date resource and use data, as resources allow.

Finally, the Blue Plan legislation requires that the Plan be developed by a transparent and inclusive process that includes widespread public and stakeholder participation and encourages public input in decision-making.

1.4 Vision and Goals of the Blue Plan

Before the planning process began, the BPAC established a draft Vision and Goals statement to help guide the effort. While the vision and goals are comprehensive, the overarching goal can be boiled down into the Long Island Sound Blue Plan's motto: *Sustainable Ecosystems - Compatible Uses*.

- **Vision:** "*Long Island Sound: a place where human uses and thriving marine life are compatible."*

We envision a Long Island Sound where new and existing traditional uses are mutually compatible with the habitats and natural features needed for marine life to thrive, assuring the wellbeing and prosperity of current and future generations.

- **Goal 1: Healthy Long Island Sound Ecosystem**

Science-based planning and practices that consider both the environment and human uses will help us understand and protect Long Island Sound ecosystems and the services they provide.

Objectives: The Blue Plan shall[8]

1. Reflect the value of biodiversity and ecosystem health in regard to the interdependence of ecosystems;
2. Identify and protect special, sensitive or unique estuarine and marine life and habitats, including, but not limited to, scenic and visual resources; and
3. Adapt to evolving knowledge and understanding of the marine environment, including adaptation to climate change and rise in sea level.

[8] The Objectives listed here are taken directly from wording in the Blue Plan Statute PA 15-66. It is expected that the specifics which better define each objective will be spelled out as part of the planning process. "The Blue Plan shall" in the heading is wording that applies to each objective and is intended to make the connection to the statute clearer.

❖ Goal 2: Effective Decision-Making

An inclusive, transparent, stakeholder-endorsed and science-based Blue Plan decision-making process that is consistent with other plans and legal requirements will lead to decisions supporting the long-term vision for compatibility of human uses and thriving marine life.

Objectives: The Blue Plan shall

1. Establish the state's goals, siting priorities and standards for ensuring effective stewardship of the waters of Long Island Sound held in trust for the benefit of the public;
2. Be consistent with the Long Island Sound Resources and Uses Inventory, with provision for the ongoing acquisition and application of up-to-date resource and use data, including seafloor mapping;
3. Be coordinated, to the maximum extent feasible, with local, regional and federal planning entities and agencies, including, but not limited to, the Long Island Sound Study and National Ocean Policy's Northeast Regional Planning Body and the Connecticut-New York Bi-State Marine Spatial Planning Working Group;
4. Be coordinated, developed and implemented, to the maximum extent feasible, with the state of New York;
5. Be developed through a transparent and inclusive process that seeks widespread participation of the public and stakeholders and encourages public participation in decision making;
6. Identify appropriate locations and performance standards for activities, uses and facilities regulated under existing state permit programs, including, but not limited to, measures to guide siting of uses in a manner compatible with said Long Island Sound Blue Plan;
7. Be consistent with the state plan of conservation and development and the goals and policies described in section 22a-92 of the general statutes; and
8. Reflect the importance of planning for Long Island Sound as an estuary that crosses state boundaries, including the identification of potential measures that encourage such planning.

❖ Goal 3: Compatibility among Past, Current, and Future Ocean Uses

Science-based planning and practices that consider both human uses and the environment will sustain traditional and facilitate compatible new water-dependent uses to enhance quality of life and compatible economic development including maintaining the ecosystem services they depend upon.

Objectives: The Blue Plan shall

1. Promote science-based management practices that take into account the existing natural, social, cultural, historic and economic characteristics of planning areas within Long Island Sound;
2. Preserve and protect traditional riparian and water-dependent uses and activities;
3. Promote maximum public accessibility to Long Island Sound's waters for traditional public trust uses, such as recreational and commercial boating and fishing, except when necessary to protect coastal resources, preserve public health, safety and welfare, or when it is in the interest of national security;
4. Reflect the importance of the waters of Long Island Sound to the citizens of this state who derive livelihoods and recreational benefits from boating and fishing;
5. Analyze the implications of existing and potential uses and users of Long Island Sound with a focus on avoiding potential use conflicts;
6. Foster sustainable uses that capitalize on economic opportunity without significant detriment to the ecology or natural beauty of Long Island Sound;
7. Support the infrastructure necessary to sustain the economy and quality of life for the citizens of this state.

❖ **Guiding Principles for Plan Development:**

Meaningful public participation. The plan shall ultimately reflect the knowledge, perspectives, and needs of all stakeholders whose lives are touched by Long Island Sound.

Sound science. The plan shall use accurate, relevant data and information, from traditional and empirical knowledge to cutting-edge science and innovative mapping technologies to support planning and management of Long Island Sound resources and uses.

Transparent process. The plan development and implementation process shall be open and transparent, utilizing multiple means to communicate with and seek input from all interested parties and ensuring adequate and informed representation of all stakeholders.

Government coordination and collaboration. The plan shall ensure collaborative and coordinated planning among agencies and stakeholders based on a common vision, shared information sources, and transparent decision-making processes.

Adaptive management. The planning and implementation process will be updated as traditional uses are better understood or new uses emerge and as environmental, social and economic conditions change.

1.5 Process for Developing the Blue Plan

1.5a. Organizational Structure

A 15-member multi-stakeholder Blue Plan Advisory Committee (BPAC) was established by statute to assist the Commissioner of the Department of Energy and Environmental Protection in developing the Inventory and the Blue Plan (CT DEEP, 2019). BPAC members are designees of state agencies identified by the legislation, and representatives from water-dependent industries, the gas and electric distribution industry, non-governmental organizations, local governments, and recreation and aquaculture interests appointed by Governor Dannel Malloy and the legislative leadership. The BPAC in place during development of the plan (January 2016 through January 2019) consisted of:

- **Robert Klee**, Commissioner, Connecticut Department of Energy and Environmental Protection, Chairman
- **Sylvain De Guise**, Connecticut Sea Grant; UConn marine sciences programs faculty member appointed by Governor Malloy
- **Catherine Finneran**, Eversource; gas and electric distribution industry representative appointed by Governor Malloy
- **Nathan Frohling**, The Nature Conservancy; conservation organization representative appointed by Governor Malloy
- **David Carey**, Department of Agriculture Bureau of Aquaculture; shellfish industry/commercial or recreational aquaculture representative appointed by Governor Malloy
- **Christine Nelson**, Town of Old Saybrook Town Planner; coastal municipality representative appointed by Governor Malloy
- **Evan Matthews**, Connecticut Port Authority; Connecticut Department of Transportation Commissioner Redeker's Designee
- **Jason Bowsza**, Connecticut Department of Agriculture, Commissioner Reviczky's Designee
- **Eric Lindquist**, Connecticut Office of Policy and Management, Secretary Barnes' Designee

- **Melanie Bachman**, Connecticut Siting Council

- **Leah Schmalz**, Connecticut Fund for the Environment/Save the Sound; conservation organization representative appointed by State Senate President Pro Tempore Martin Looney

- **William Gardella**, General Manager and Dockmaster, Rex Marine Center, Norwalk; commercial boating representative appointed by State Senate Majority Leader Bob Duff

- **Bruce Beebe**, Beebe Dock and Mooring Systems, Madison; marine trades representative appointed by State Senate Minority Leader Len Fasano

- **Mike Theiler**, commercial finfish industry representative appointed by Speaker of the House Brendan Sharkey

- **Alicia Mozian**, Town of Westport Conservation Director; coastal municipality representative appointed by House Majority Leader Joe Aresimowicz

- **Sidney J. Holbrook**, recreational fishing/hunting community representative appointed by House Minority Leader Themis Klarides

During development of the Inventory and Blue Plan, the BPAC held quarterly meetings open to the public, and organized itself into six topic-related Subcommittees and Work Teams that conducted Inventory and Blue Plan work (CT DEEP, 2019) (Figure 1-1).

Subcommittees coordinated their activities through constant and effective communications with other Subcommittees and with each Work Team. To assist in coordinating communication, DEEP staff and several Blue Plan Advisory Committee representatives were members the Plan Development Team and of every Subcommittee and Work Team.

Subcommittees served as the lead coordinating and managing entities, having responsibility for monitoring progress toward work plan deliverables and timelines through regular check-ins with individual Work Teams.

The Work Teams generated ideas and work products based on the work plans developed by the Subcommittees. Each Work Team was available to provide assistance and support to each Subcommittee as necessary (e.g., the Information and Mapping Work Team provided support and assistance to each of the three Subcommittees).

Subcommittee membership was limited to Blue Plan Advisory Committee members, while membership of the Work Teams also included individuals from outside the Advisory Committee.

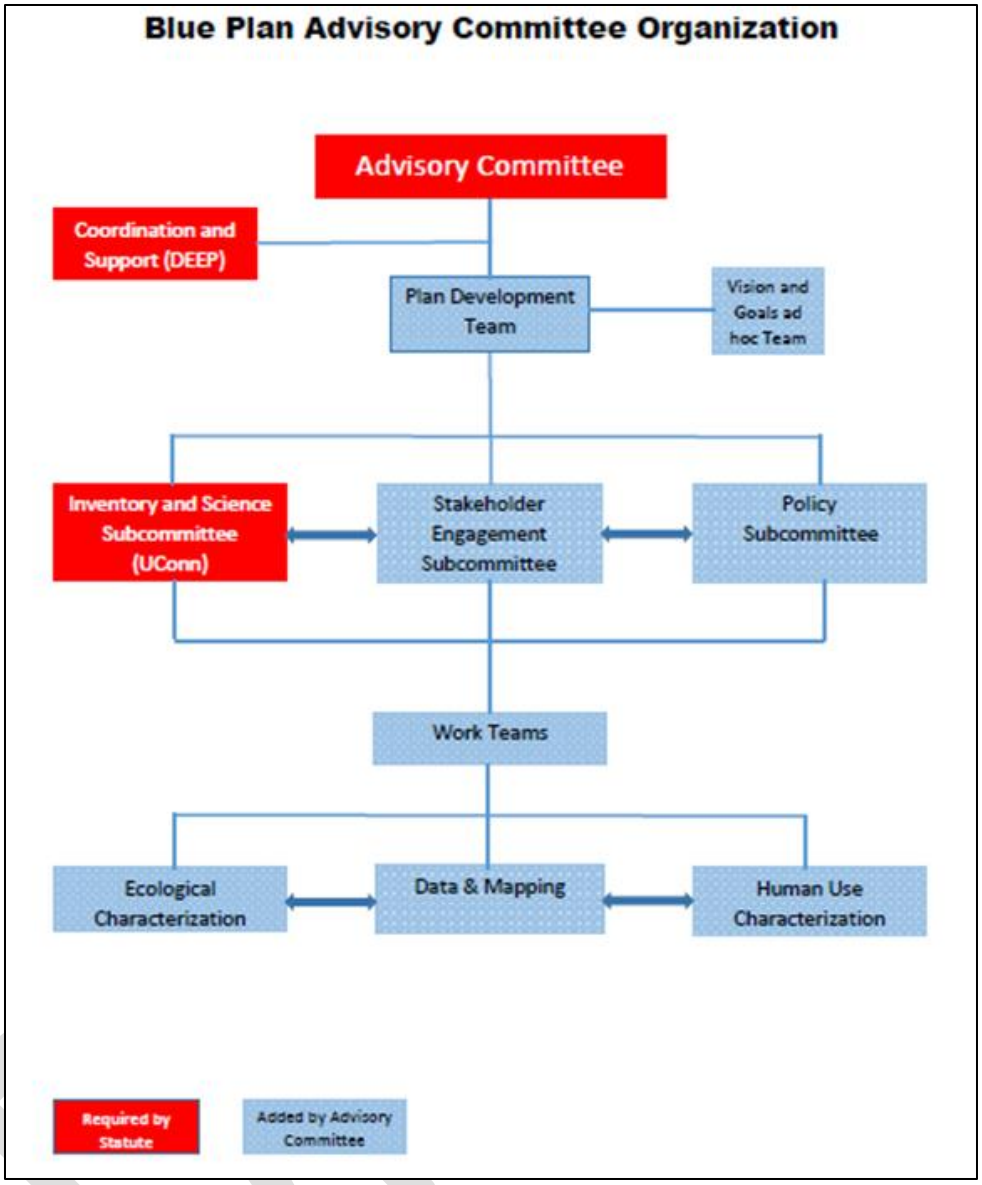


Figure 1-1. Blue Plan Advisory Committee, Subcommittees, and Work Teams Organization

Blue Plan Advisory Committee: a 15-member body representing various stakeholders and user groups, appointed by statute, the Governor, and the legislative leadership, to assist the Commissioner of Energy and Environmental Protection in the development of the Inventory and the Long Island Sound Blue Plan.

Advisory Committee Coordination and Support: overall administrative assistance and support were provided by DEEP Land and Water Resource Division staff and entailed scheduling and advertising Advisory Committee meetings and public hearings, drafting of meeting agendas and minutes, publishing public notices, providing content for and maintenance of the Blue Plan website and the Blue Plan listserv, and Inventory and Blue Plan document development and

coordination. Additional support came from BPAC members and through grants; there was no state funding appropriated to develop the Blue Plan.

Plan Development Team (PDT): oversaw planning-related matters and established the procedures necessary to complete projects, processes, and tasks.

Vision and Goals Ad Hoc Team: subset of the PDT that drafted an initial Vision and Goals document based on the goals identified in the Blue Plan statute; all members of the Advisory Committee reviewed and provided input on the draft, and ultimately approved the final draft of the Vision and Goals statement.

Subcommittees:

- **Inventory and Science Subcommittee**: convened by the University of Connecticut in accordance with the Blue Plan legislation to complete an inventory, based on the best available information and data, of the Sound's plants, animals, habitats, and ecologically significant areas in nearshore and offshore waters and their "substrates" (surfaces where marine organisms grow), as well as the human uses of Long Island Sound's waters and substrates, including boating and fishing, waterfowl hunting, shellfishing, aquaculture, shipping corridors, and energy facilities and interests such as electric power lines, gas pipelines, and telecommunications crossings. This subcommittee also identified data gaps and research needs.

- **Stakeholder Engagement Subcommittee**: oversaw development of various methods and procedures to meet the Blue Plan legislation's requirement; that the Inventory and Plan be developed by a transparent and inclusive process that includes widespread public and stakeholder participation and encourages public input in decision-making. This subcommittee developed a Stakeholder Engagement Program which frames the processes by which all interested parties (e.g., the general public, stakeholders, experts, and New York counterparts) were engaged in Blue Plan development (Blue Plan Stakeholder Engagement Subcommittee, 2017). The Program provides different strategies for specific stakeholder engagement that were undertaken as the Blue Plan process unfolded, all within available resources. Furthermore, having the specific members of the subcommittee involved gave the outreach process not only insight but also a heightened level of credibility with some use communities during initial contact.

- **Policy Subcommittee**: developed and coordinated the policies and standards contained in the Long Island Sound Blue Plan.

Work Teams:

- **Ecological Characterization**: conducted the Ecological Characterization and Assessment for incorporation into the Blue Plan. The Work Team included Advisory Committee members, DEEP staff, scientists, ecological experts, and consultants all participating in describing the state of ecological knowledge of Long Island Sound and meet the legislative requirements; that the Inventory and Blue Plan reflect the value of biodiversity and ecosystem health in the Sound and identify special, sensitive or unique estuarine and marine life and habitats.

    - **Ecological Experts Group**: assisted the Ecological Characterization Work Team and the consultants in identifying Ecologically Significant Areas (ESAs). Membership included marine ecologists, researchers, and other ecological experts who were selected based on their particular area of expertise to ensure sufficient representation of the range of ecological topics to be addressed in identifying ESAs.

- **Data and Mapping**: compiled and reviewed existing data on Long Island Sound's natural resources and human uses and developed "Map Templates" to provide an overview of that data as well as descriptive information as to what the data means and how it was developed, all of which was included in the Inventory. The data and map templates were then reviewed by the Blue Plan Advisory Committee and scientific and human-use experts to provide input on whether the data was relevant, accurate, and representative of the state of the Sound and which data would be included in the final Blue Plan document.

- **Human Use Characterization**: designated Significant Human Use Areas for activities identified in the Blue Plan legislation (e.g., recreational and commercial boating and fishing) and engaged user groups to review human use data and help analyze the implications of existing and potential uses and users of Long Island Sound to avoid potential use conflicts.

1.5b. Elements of Blue Plan Development

❖ Stakeholder and Public Outreach

A major component of Blue Plan development has been proactive outreach to the Long Island Sound (LIS) user community and the public of Connecticut and New York. This outreach has occurred throughout the process and is a central component of any Marine Spatial Plan. The Blue Plan Statute calls for "*a transparent and inclusive process that seeks widespread participation of the public and stakeholders and encourages public participation in decision*

making." In addition to filling this mandate, the Plan Development Team (PDT) has focused on relationship-building throughout this process, with the hope that sector involvement with the Blue Plan will continue long after the current PDT moves on. Furthermore, the Blue Plan would not be as comprehensive, detailed, or factually precise as it is without the involvement of many passionate LIS community members who have contributed their knowledge and time to the formation of this document.

Consistent with the Statute, the overarching goal of Blue Plan outreach has been to provide a transparent process in which stakeholder input is pivotal to the formation and outcomes of the Plan. Building on this, specific outreach efforts and methods evolved over time. Early outreach associated with the Bi-State Marine Spatial Planning Working Group was intended to educate the public on the value a marine spatial plan would have for Long Island Sound. When the focus of plan development turned to forming the Inventory, outreach shifted to specific use communities, and brought relevant draft data products before these communities in webinars and meetings to review dataset validity for inclusion in spatial planning efforts. This sector-based approach was maintained in draft policy evaluation, with a focus on walking each constituency through the policy document and hypothetical examples of how CT DEEP permitting review may proceed with a complete Blue Plan in place. Public information meetings and more formal public hearings were held at distinct phases in development to reach audiences that did not fall into particular sectors, and to offer formal opportunities to file comment. Table 1-1 below shows the number and type of meetings hosted in the Blue Plan development process.

All these outreach opportunities provided invaluable insight to the PDT about the various concerns of the LIS user community. Public input has produced many improvements throughout the Plan document; some a change of a single key term, others an overhaul of an entire Inventory chapter. Several community members, in addition to those appointed to the Blue Plan Advisory Committee, have become key partners in connecting the PDT with their constituencies. This has allowed for candid conversation about Plan elements and capacities, and how to best represent sector interests.

To connect with various audiences, the PDT utilized a suite of tools and methods. First and foremost, the Stakeholder Engagement Subcommittee, described above, provided invaluable guidance on means and individuals to connect with user groups. CT DEEP maintains a web page hosting Blue Plan documents and development materials, as well as a listserv with over 400 members. In addition to the listserv, contact lists were developed for each use-sector and were used to notify participants of relevant meeting events through phone and email. In many cases, partner organizations' listservs and mailers were used to amplify Blue Plan listserv messages, forwarding these to their subscribed readerships. In some cases, sector-relevant publications and other media were used to advertise for meetings and webinars. Moving into the final public comment phase, the PDT sought to reach larger audiences using new tools such as an interview video series, which profiled sector specific stakeholders about why they find the Blue Plan important, and municipality-based public forums to present the complete draft plan. Outreach events were held at times most convenient to the target audience: professional entities, such as the Coast Guard, were met with during working hours, while recreational groups, such as the

boating community, were convened in the evening. When possible, the PDT presented at existing constituency meetings, often at the request of the host organization (including the Southern New England Fishman's and Lobstermen's Association, and Connecticut and New York based Scuba clubs).

Since the Blue Plan, like Long Island Sound, ultimately belongs to the people of Connecticut, outreach efforts were always made to proactively demystify the planning process and invite participants to be involved in forming the document. This was a new paradigm for many groups, who frequently only can react to a completed permit or rule change, rather than help inform the policies and supporting information as they come together. The PDT has made every effort to be inclusive of all views and knowledge contributed during the process, incorporating suggested changes and advise in all sections of the document. We believe that the document represents the shared vision for LIS, containing what we heard from participants. However, it is important that those who use the Sound continue to be active in the curation of the Blue Plan and ensure that it remains an evolving collaborative tool to enhance all that we value in our urban sea.

Table 1-1 Outreach events of the Blue Plan process. Select meeting materials area available online at the Blue Plan webinar and Mapbooks web page. (CT DEEP, 2018).

Blue Plan Outreach Events				
Date	Meeting Type	Number of Participants	Venue Location	Audience
Nov. 17, 2016	Blue Plan Introduction, featuring Ocean Frontiers Screening	> 200	Norwalk	Public
April 4, 2017	Blue Plan Introduction, featuring Ocean Frontiers Screening	200	Avery Point, Groton	Public
Nov. 4, 2017	Data Vetting	11	Essex	Connecticut Marine Trades Association
Nov. 5, 2017	Data Vetting	25	Quaker Hill	Scuba: SECONN Dive Club
Nov. 16, 2017	Data Vetting	6	Webinar	Scuba
Nov. 21, 2017	Data Vetting	4	Webinar	Scuba

Nov. 21, 2017	Data Vetting	9	Webinar	Recreational Fishing and Waterfowl Hunting
Nov. 30, 2017	Data Vetting	18	Webinar	Recreational Boating
Dec. 1, 2017	Data Vetting	10	East Haven	US Coast Guard
Dec. 5, 2017	Data Vetting	8	Webinar	Other Non-Consumptive Recreation
Dec. 13, 2017	Public meeting		Greenwich Town Hall	Public
Dec. 14, 2017	Data Vetting	10	Niantic	Connecticut Charter and Party Boat Association
Dec. 18, 2017	Data Vetting	9	Webinar	Marine Transportation, Navigation, and Infrastructure
Dec. 18, 2017	Data Vetting	20	Webinar	Energy and Telecommunications
Dec. 19, 2017	Public meeting	30	UCONN Avery Point Campus	Public
Jan. 24, 2018	Data Vetting	10	Sub Base New London	US Navy
Feb. 1, 2018	BP Introduction	15	Webinar	Non-data groups
Feb. 8, 2018	Data Vetting	2	Webinar	with NUWC
Feb. 12, 2018	Participatory Mapping	3	DEEP Marine HQ	Discuss what PM would look like with anglers
Feb. 22, 2018	Blue Plan Introduction, featuring Ocean Frontiers Screening	15	Old Saybrook	Public
Mar. 1, 2018	Panel Discussion	20	Oyster Bay, NY	Friends of The Bay
Mar. 5, 2018	Data Vetting	10	Hartford	Native American Heritage Advisory Council at State Historical Preservation Organization

Mar. 14, 2018	BP Introduction	30	Westchester, NY	Scuba Sports Club of Westchester NY
April 3, 2018	Participatory Mapping	5	DEEP Marine HQ	Anglers mapping at DEEP
April 4, 2018	BP Introduction	15	New Haven	Connecticut Harbor Management Association
April 6, 2018	BP Introduction	10	Hartford	Hartford Hunting and Fishing Show
April 17, 2018	BP Introduction	3	Mystic	Bureau of Ocean Energy Management
May 8, 2018	Public Hearing	15	DEEP Marine HQ	First Public Hearing
May 31, 2018	BP Introduction	17	Port Jefferson, NY	First Public Meeting in NY
June, 2018	BP Update	60	Meeting	Aquaculture Industry: DA/BA mandatory meeting
June 18, 2018	Participatory Mapping	6	DEEP Marine HQ	Sail Racing Mapping
July 27, 2018	Panel Discussion	50	Rockland, ME	Practical Seaweed Farmer Conference
Aug 28, 2018	Participatory Mapping	3	The Nature Conservancy, New Haven	Anglers Mapping
Sept. 24, 2018	BP Introduction	12	Stonington	Southern New England Fisherman's and Lobsterman's Association
Oct. 2, 2018	Policy Discussion	6	Avery Point, Groton	CT Commercial Fishers
Oct. 4, 2018	Policy Discussion	6	Hartford	Connecticut Siting Council and Energy Sector
Oct. 9, 2018	Policy Discussion	15	Rocky Hill	Connecticut Conservation Advisory Council
Oct. 22, 2018	Policy Discussion	2	Hartford	CT State Historical Preservation Organization
Oct. 30, 2018	Public Meeting	20	DEEP Marine HQ	Public Meeting to Discuss Policy

Nov. 1, 2018	Policy Discussion	6	Webinar	Scuba
Nov. 6, 2018	Participatory Mapping	4	The Maritime Aquarium, Norwalk	Anglers Mapping
Nov. 8, 2018	Public Hearing	8	Stamford Government Center	Second Public Hearing
Nov. 26, 2018	Policy Discussion	0	Port Jefferson, NY	Second Public Meeting in NY
Nov. 27, 2018	Policy Discussion	13	Webinar	Rec. Boating community
Nov. 28, 2018	Policy Discussion	6	Webinar	Marine Transportation and Infrastructure
Dec. 4, 2018	Policy Discussion	10	Webinar	Marine Trades
Dec. 6, 2018	Policy Discussion	8	Webinar	Energy Sector
Dec 11, 2018	ESA Presentation	24	Avery Point, Groton	Public ESA Meeting
Dec. 12, 2018	ESA Presentation	12	Stony Brook University, NY	Public ESA Meeting
Dec. 18, 2018	ESA Presentation	11	Bridgeport City Hall	Public ESA Meeting

❖ Data Gathering and Analysis

The data gathering effort sought out and considered information from a variety of sources. While the most common source of information was geospatial in nature (e.g., maps and similar), other non-spatial sources (e.g., non-map based) were acknowledged as important and were collected as time and resources allowed. These sources included Connecticut and New York state-agencies, web-based regional ocean planning repositories that hosted and shared related data, assorted research and academic institutions, and non-governmental organizations. Key data sources included but were not limited to:

- Northeast Ocean Data Portal
- Mid-Atlantic Region Coastal Ocean Data Portal
- NOAA Marine Cadastre National Viewer
- New York Geographic Information Gateway

- Connecticut Aquaculture Mapping Atlas
- Mystic Aquarium
- Riverhead Foundation
- The Cornell Lab or Ornithology eBird database
- CT Department of Energy & Environmental Protection
- CT Department of Agriculture/Bureau of Aquaculture
- NY Department of Environmental Conservation

The information presented from these and other relevant sources were initially reviewed by the Data & Information Work Team for consolidation. Since the sources provided a wide array of information relative to coastal and ocean topics, these were initially screened to focus on data that were:

- readily available geospatial data (map products);
- within, near, or overlapping with the general Blue Plan area as defined in statute; and
- reasonably applicable to ecological and human uses.

This initial collection of data was subjected to a readiness assessment that first organized the information by sectors – Natural Resources and Humans Uses - each with various sub-sectors reflecting groups of similar themes. The Workgroup then assessed information on their accuracy, relevancy, and representativeness to support the Blue Plan goals. These efforts addressed WHAT the map product was about, WHO was the source or point of contact, HOW the map product should be used, and WHEN the data was produced.

The result was a first-draft of data meeting a basic set of standards suitable for review. Experts and stakeholders selected from a large pool of potentially interested parties, with input from the Blue Plan Advisory Committee as well as the various work groups, were engaged to provide guidance on moving forward. Through a series of webinars and meetings based on the sectors and subsectors, these experts provided feedback and recommendations on the utility and applicability of the data to the Blue Plan, identified key elements regarding the context and importance of the sectors to the ecology and uses of Long Island Sound, and helped identify gaps and information that might help fill them.

These efforts yielded the Inventory - a synthesis document that presented vetted, objective information through a series of maps, narratives, and historical/socio-economic context, to "tell a story" about a given sector. The Inventory represented more than the handful of illustrative maps, but rather the sum of the information collected. A more robust description of the Inventory process can be found in Chapter 3, Section 3.3.

The data collected and presented in the Inventory served as the basis for two substantive analysis efforts. Both centered on using the data presented in the Inventory, (augmented with new data or newer versions of existing data not available during the Inventory process) to describe and delineate Ecologically Significant Areas (ESAs) and Significant Human Use Areas (SHUAs) within Long Island Sound. The identification of ESAs, called out specifically within the Blue Plan statute, were guided by an Ecological Experts Group convened as a subset of scientists and resource experts involved with or recommended by the group that helped vet the data for the Inventory. While not explicitly specified with the statutory language, the PDT felt strongly that a corresponding effort to identify areas of human uses was critical to the planning effort. Accordingly, the PDT, in concert with input from human use stakeholder groups and sector experts undertook an effort to identify SHUAs. The specifics of both analyses are described in detail in Chapter 3, Section 3.4, but generally included:

- Refinement of the Inventory to focus on data that could best support specific policies and standards developed by the Policy Team;
- Addition of newer versions of existing data or brand-new data as needed;
- Modification/Re-configuration of source data (e.g., combination of similar data from various sources, establishing thresholds, etc.) to support the delineation of significant areas; and
- Iterative review both internally and publicly with external expert and stakeholder groups.

The data and information gathered through the Inventory process and refined and finalized into map products that define the ESAs and SHUAs are critical components of the Blue Plan effort and will be shared with the public to help support the implementation of the Plan. The Inventory along with associated public record reports and transcripts are currently available through the Blue Plan website (CT DEEP, 2019). The spatial data used to develop the ESAs and SHUAs and documentation describing them will be available in March 2019 on a web-based map viewer to be developed and hosted by UCONN's Center for Land Use Education and Research (CLEAR) (UConn, 2019).

❖ Policy and Plan Development

As noted in the Vision and Goals Statement, the main pillars of the Blue Plan are to protect ecological resources, protect traditional human uses, and reduce future conflict. In an effort to reach these goals, the PDT and the Policy Subcommittee, which is comprised of BPAC members, policy experts, and external stakeholders, looked to other state and regional ocean planning efforts. These plans include the:

- Northeast Regional Ocean Plan

- Mid-Atlantic Ocean Plan
- Rhode Island Special Area Management Plan
- Massachusetts Ocean Management Plan
- Washington Marine Spatial Plan

The PDT and Policy Subcommittee analyzed these efforts to develop Blue Plan policies, designate significant use and ecological areas, and proceed with plan implementation. Using the background knowledge gained from these plans and understanding Long Island Sound specific interests, the PDT and Policy Subcommittee has designed a policy framework that will 1) protect the characteristic of the Sound as a whole, 2) protect designated areas of significant ecological or human use value, and 3) guide decision making through a series of "lenses". As part of this policy framework, the PDT, with the assistance of ecological and human use experts, were required to designate and write policies to protect Ecologically Significant Areas (ESAs), and chose to pursue a parallel effort in identifying and protecting Significant Human Use Areas (SHUAs).

Overall, the Blue Plan provides data, spatial information, policies, and standards to Long Island Sound planners, project proponents, and decision makers. The Plan accomplishes this by providing an overview and characterization of the:

- Existing Management Structure of Long Island Sound
- Significant Areas of Ecological and Human Use Value
- Implementation of Blue Plan Spatial Data and Information, Policies, and Standards
- Adaptive Management (Revision and Improvement) Goals of the Blue Plan
- Future Considerations of the Blue Plan

Chapter 2 Management Framework

2.1 Introduction

Like the Long Island Sound (LIS) ecosystem itself, the Blue Plan as a management mechanism will not exist in isolation. Several issues related to LIS spatial planning, such as water quality and habitat restoration, have already been addressed in some form by a number of federal, regional, state and local agencies and institutions. In both planning and regulatory realms, many existing LIS-related agencies and organizations referenced in this chapter continue to contribute to understanding and managing the Sound's resources and uses, and the Blue Plan is intended to coordinate with these efforts.

The aspects of the LIS management framework most significant to Blue Plan implementation are the existing regulatory programs required to consider Blue Plan policies as factors in making permitting decisions. These programs have been specifically designated by CGS § 25-157t(h) and are described in Section 2.5 of this chapter in Table 3-1. As discussed further in Chapter 4, the Blue Plan policies will support these existing regulatory programs by providing up-front guidance and information on LIS resources and uses, and by directing the decision making processes to help achieve the goals of the Blue Plan.

2.2 The Public Trust Doctrine

Perhaps the most fundamental, legal and management principle underlying the Blue Plan is the public trust doctrine, through which the waters and submerged lands of Long Island Sound are owned by the states of Connecticut and New York in trust for the public. The Sound belongs to the people--not just in terms of our environmental and cultural heritage, but in a specific legal sense as well. Under the common law public trust doctrine, a body of law dating back to Roman times, coastal states as sovereigns hold the submerged lands and waters waterward of the mean high-water line, in trust for the public. In Connecticut, a line of state Supreme Court cases dating back to the earliest days of the republic confirms that private ownership ends at the mean high water line, and that the state holds title to the lands waterward of mean high water, subject to the private rights of littoral or riparian access and incorporating public rights of use. For further background on the public trust doctrine, please consult the one-volume study Putting the Public Trust Doctrine to Work, a June 1997 report of the National Public Trust Study conducted by the Coastal States Organization, with contributions by CT DEEP staff (Coastal States Organization, 1997).

The public trust area comprises submerged lands and waters, waterward of the mean high-water line in tidal, coastal, or navigable waters of the state of Connecticut, out to the water boundaries

with New York and Rhode Island. As such, it generally coincides with the area "of planning, management and coordination authority under the Long Island Sound Blue Plan" as delineated by CGS § 25-257t (b)(2)(D). The landward boundary, the mean high water line (often referred to as "high water mark" in court decisions),[9] is technically defined as the average of high tides over a 19-year tidal epoch, and can often be ascertained on the shore by prominent wrack line, debris line, or water mark (Tidal Datums, 2018). The public trust area is also sometimes referred to as tidelands, and is defined as "public beach" by the Connecticut Coastal Management Act, C.G.S. § 22a-93(6).

In addition to state ownership, an essential element of the public trust doctrine is that the state's submerged lands and waters are in trust for use by the general public. Subject to applicable regulations and permits, the general public may freely use these lands and waters, whether they are beach, rocky shore, or open water, for traditional public trust uses such as fishing, shellfishing, boating, sunbathing, or simply walking along the beach.[10] The Blue Plan statute references these common law rights of the public, setting a goal to "promote maximum public accessibility to Long Island Sound's waters for traditional public trust uses, such as recreational and commercial boating and fishing," in CGS § 25-257t(b)(2)(D).

The status of Long Island Sound as state public trust waters has important implications for marine spatial planning, in that Connecticut and New York may exercise sovereign and proprietary authority as owners, as well as regulatory authority as governments, over activities within the Sound. In other words, states can manage their own property more freely and with fewer legal constraints than they can regulate private property on land. The public trust doctrine offers an additional basis for the management and stewardship of Long Island Sound, one that cannot readily be thwarted by private rights or overruled or pre-empted by federal agencies. The Blue Plan can therefore be seen as an implementation of Connecticut's sovereign and public trust responsibilities, as well as a statutorily-created mechanism to plan for and manage the Sound in the broader public interest. With the creation of the Blue Plan to revitalize the underlying public trust doctrine, Connecticut now enjoys a legal basis for comprehensive, adaptive, and proactive management of the Sound, and no longer needs to simply react in a piecemeal fashion to individual issues and project proposals.

[9] The public owns up to "high water mark," *Simons v. French*, 25 Conn. 346 (1856). Title of riparian proprietor terminates at ordinary high water mark, *Mather v. Chapman*, 40 Conn. 382 (1873). Private ownership of submerged lands is possible, only when basins are dredged from upland, or from inland, non-navigable waters. *Michalczo v. Woodmont*, 175 Conn. 535 (1978).

[10] "Public rights include fishing, boating, hunting, bathing, taking shellfish, gathering seaweed, cutting sedge, and of passing and repassing. . ." *Orange v. Resnick*, 94 Conn. 573 (1920). "It is settled in Connecticut that the public has the right to boat, hunt, and fish on the navigable waters of the state." *State v. Brennan*, 3 Conn. Cir. 413 (1965). The public has the right to fish and shellfish over submerged private lands, *Peck v. Lockwood*, 5 Day 22 (1811). The public has the right to pass and repass in navigable rivers, *Adams v. Pease* 2 Conn. 481 (1818). The public may gather seaweed between ordinary high water and low water, *Chapman v. Kimball* 9 Day 38 (1831).

2.3 Connecticut Long Island Sound Advisory Entities

Over the years, the Connecticut General Assembly has occasionally made special provisions for ad hoc organizations to advise governmental decision makers regarding Long Island Sound issues. The authorities creating these entities are codified in Chapter 483 of the General Statutes, sections 25-138 through 25-153. Except for the Blue Plan Advisory Committee, none of these entities are currently active, but their activities and statutory foundation provide context for the Blue Plan and mark milestones along the progression of LIS management from ad hoc and reactive to planned and proactive.

a. *Bi-State LIS Committee, CGS § 25-138 through § 25-142*
This body was created in 1973 as the Bi-State LIS Marine Resources Committee, consisting of legislative appointees and state officials, tasked with making recommendations and standardizing laws related to Long Island Sound, upon enactment of similar legislation by the State of New York. The Committee's recommendations were to be submitted in an annual report to the governors and legislatures of both states. In reaction to the proposed Broadwater floating liquefied natural gas (LNG) facility, Public Act (PA) 05-137 dropped "Marine Resources" from the Committee's title and amended the Committee's charge to include "proposed industrialization and private use of public trust resources of Long Island Sound." Although, New York State adopted corresponding legislation in 2011, the Bi-State LIS Committee was not convened and has never met in this form. The Bi-State LIS Marine Resources Committee was known to have had periodic meetings at times, but any reports or records of its activities are not readily available. Nonetheless, CGS § 25-140 contains useful language about public trust resources that is consistent with and serves as a precursor to Blue Plan policies.

b. *LIS Advisory Councils, Assembly, and Foundation, CGS § 25-154 through § 25-156*
In 1989, legislation created three regional LIS Advisory Councils whose members were to be appointed by coastal municipalities and legislative leaders. Each Council then designated some of its members to comprise an umbrella Long Island Sound Assembly (LISA), which compiled and submitted annual reports to the legislature "concerning the use and preservation of Long Island Sound." The LISA reports were widely circulated and reported on for a time, but the last Assembly Report was submitted in 2012. The Reports are no longer available online but may be found in hard copy in some libraries. During its heyday the LIS Assembly enjoyed staff support supplied by the Long Island Sound Foundation, a state-chartered foundation established by CGS § 25-156. The Foundation did receive some appropriations and other revenue, which it employed staffing the Assembly, convening periodic LIS Research Symposia, assisting with initial version of DEEP's Connecticut Coastal Access Guide, conducting a Sound-themed calendar contest for children, and other outreach efforts. The Foundation is no longer active.

c. *LIS Utility Crossing Provisions*

In the early 2000's, public concern in Connecticut over potential adverse impacts from cross-Sound cable and pipeline projects prompted both executive and legislative action in response. In 2002 Governor John Rowland issued Executive Order 26 (Executive Office of Governor Rowland, 2002) creating a Task Force of state officials headed by the Institute of Sustainable Energy (Eastern Connecticut State University, 2018), while the legislature responded with CGS § 25-157a, creating a larger joint Task Force, adding stakeholder and state agency representatives to the members and duties established under the Executive Order, and calling for a "comprehensive environmental assessment and plan" regarding utility crossings of LIS. Although it dealt in part with energy supply and reliability issues, the Task Force report can be considered a precursor to the Blue Plan in that it was also mandated to compile an inventory and maps of LIS natural resources and to recommend methods to minimize the potential environmental impacts of cross-Sound electric cables and natural gas pipelines (Task Force on Long Island Sound, 2003). Indeed, the Blue Plan statute at CGS § 25-157t(b)(1)(F) required that the Inventory include and update the data in the Task Force report. Moreover, CGS § 25-157b also required that state permit applications for any electric power line, gas pipeline or telecommunications crossing of LIS be evaluated in light of the Task Force report and be consistent with its recommendations. As such, CGS § 25-157b can be considered to be incorporated within the broader Blue Plan mandate.

Finally, another part of the 2002 legislative response to cable and pipeline issues was the adoption of two moratoria on utility crossings of the Sound. Under CGS § 25-157, DEEP and the Siting Council were prohibited from acting on any applications for certain electric cables, gas pipelines, or telecommunications cables until June 5, 2005. CGS § 25-157c required the Siting Council to request that the Federal Energy Regulatory Commission (FERC) not approve any LIS crossings until after completion of the CGS § 25-157a Task Force Report, and that FERC consider the Report's recommendations in any subsequent decisions. The history of how these provisions came about is complex and multifaceted, but their relevance to the Blue Plan lies in their demonstration of legislative interest in applying Sound-wide data and policies to utility crossing proposals.[11]

d. Bi-State LIS Commission, CGS § 25-157n

In 2009, the legislature created a new bi-state body to "consider major environmental, ecological and energy issues involving Long Island Sound and the lower Hudson River

[11] A related study was undertaken in 2004 by the Connecticut Academy of Science and Engineering, on behalf of the CT Energy Advisory Board (the functions of which have been incorporated into DEEP). Titled *Long Island Sound Symposium: A Study of Benthic Habitats*, the report was commissioned largely to investigate impacts of cable and pipeline crossings, and its findings have contributed to the Blue Plan Inventory (Connecticut Academy of Science and Engineering, 2004). See also the discussion in Chapter 26.3 of the Inventory.

Valley." The Bi-State Long Island Sound Commission was to include the Governors of both states and seven legislative appointees from each state and was understood to be a reaction to the proposed Broadwater LNG facility, as well as to a proposed cement plant along the Hudson that raised concern in western Connecticut. The Commission was to seek bi-state consensus on strategies and policies to address the environmental, ecological and energy issues, and to recommend administrative and legislative action accordingly. However, unlike the Long Island Sound Bi-State Committee of CGS § 25-138, the Bi-State Long Island Sound Commission was never adopted as New York legislation, and thus has never been established.

2.4 Connecticut State Plans

In developing and implementing the Blue Plan, DEEP and other state agencies will need to work within the context of existing Connecticut state plans that it and other agencies have been required by law to undertake. Several official planning efforts represent one-time initiatives, but others are ongoing and may directly affect and be affected by Blue Plan goals, data, and policies. The most relevant continuing state plans are listed below:

a. *Conservation and Development Policies: The Plan for Connecticut*
Commonly referred to as the State C&D Plan, the State Plan of Conservation and Development is perhaps the most high-profile Connecticut state plan, and in many respects represents a land-side model for the Blue Plan (Office of Policy and Management, 2005-2010). In accordance with CGS §16a-27 through 16a-30, the Office of Policy and Management (OPM) oversees the C&D Plan and prepares revisions on a recurring 5-year cycle, which are in turn submitted to the legislature for approval and adoption. Once adopted, the State C&D Plan is then implemented by state agencies whenever they undertake certain actions specified by CGS §16a-31, such as the acquisition or development of property, or the issuance of grants more than $200,000, which must be consistent with the Plan's policies. In addition, state agency funding for "growth-related projects" are encouraged to be directed to Priority Funding Areas, which are designated on a Locational Guide Map depicting categories of conservation and development areas. Like the Blue Plan, the State C&D Plan must be updated by the responsible state agency (OPM) and approved by the legislature every five years.

Further, under CGS §16a-31(e) OPM must render an advisory opinion on whether any state agency plan required by state or federal law is consistent with the C&D Plan, and will do so for the Blue Plan, which is itself required by CGS § 25-157t(b)(Q) to be consistent with the State C&D Plan. Since OPM is a statutory member of the Blue Plan Advisory Committee, coordination between the two plans will be facilitated. Finally, recent statutory amendments require future revisions to the C&D Plan to consider risks associated with coastal flooding and erosion and sea level rise, as well as greenhouse gas

reduction goals, which may affect state investments regarding renewable energy and coastal development.

b. Statewide Comprehensive Outdoor Recreation Plan (SCORP)

The Statewide Comprehensive Outdoor Recreation Plan (SCORP) is a planning document that identifies outdoor recreation issues of statewide significance and evaluates the supply of and the demand for outdoor recreation resources and facilities in Connecticut (CT DEEP, 2017-2022). The SCORP provides unified guidance to state and municipal officials as they develop and expand outdoor recreation opportunities for their respective constituents.

In addition to its value as a planning document, the completion of a SCORP also satisfies a requirement of the federally administered Land and Water Conservation Fund (LWCF), which then makes Connecticut eligible to receive its annual apportionment from the LWCF State and Municipal Assistance Program. Apportionments from the LWCF can be used by the state and its municipalities to acquire new land for outdoor recreation and conservation, and to construct new outdoor recreational facilities. As with previous editions, the 2017-2022 SCORP identified needs for improved coastal access and coastal recreational facilities.

c. Wildlife Action Plan

In 2015, DEEP revised and updated Connecticut's Wildlife Action Plan (formerly Comprehensive Wildlife Conservation Strategy), creating a blueprint for the conservation of the state's wildlife as part of a national framework for proactively conserving fish and wildlife, including their habitats, for the next 10 years (CT DEEP, 2015).

As part of this effort, Connecticut's List of Species of Greatest Conservation Need also was revised. This effort involved adding new information on climate change and its impacts to wildlife conservation, updating resource mapping, refining conservation threats, and incorporating information gained through the implementation of the first Wildlife Action Plan. The revision also includes the identification of new or revised conservation actions to help advance wildlife conservation over the next decade. As a result, information from the Wildlife Action Plan was included within the Inventory and will inform and guide future updates of the Blue Plan.

d. Energy Plans

As an energy as well as an environmental agency, DEEP is responsible for several plans and policies dealing with energy and climate change issues. The foremost of these is probably the State's Comprehensive Energy Strategy, required by CGS §16a-3d(a), and modified by Public Act 18-82 to become a Comprehensive Climate and Energy Strategy by 2020. First adopted in 2012, the Comprehensive Energy Strategy provides an assessment and strategy for all residential, commercial, and industrial energy issues, including energy efficiency, industry, electricity, natural gas, and transportation. It was

most recently updated in 2017 to advance the State's goal to create a cheaper, cleaner, more reliable energy future for Connecticut's residents and businesses. In addition, CGS § 16a-3a requires that DEEP prepare an Integrated Resource Plan every two years (CT DEEP, 2014). This Plan includes both an assessment of the state's future electric needs and a plan to meet those needs and is "integrated" in that it looks at both demand side resources (conservation, energy efficiency, etc.), as well as the more traditional supply side resources (generation/power plants, transmission lines, etc.) in making its recommendations on how best to meet future electric energy needs. As the scope of these plans evolves and expands, they may relate to Blue Plan policies on energy facility siting and other issues. In particular, demands for more renewable energy sources are likely to result in a need for connections to, if not in-Sound location of, offshore wind facilities.

2.5 State Regulatory Programs and Authorities

The heart of the Blue Plan's management framework resides within the state regulatory programs (and one local program), which are charged with implementing the plan pursuant to CGS § 25-157t(h). These regulatory programs are described in the following table:

Table 2-1 Overview of the Connecticut State and Local Regulatory Programs implementing the Blue Plan

Regulatory Programs Implementing the Blue Plan			
Statutory Title	Statutory Citation	Overview of Regulatory Program	Implementing Agency
Certificate for Environmental Compatibility and Need	CGS § 16-50k	The Connecticut Siting Council is a state agency that regulates the siting of a number of infrastructure facilities, including electric power facilities and transmission lines, hazardous waste facilities, and telecommunications towers and other technology (Connecticut Siting Council, 2019). The Siting Council membership is made of up 9 members for energy and telecommunications decisions and 13 members for hazardous waste decision (Connecticut Siting Council, 2019). The Council's regulatory approval is termed a Certificate of Environmental Compatibility and Need under CGS § 16-50k, and the Council in exercising its regulatory responsibilities is charged with: 1) balancing the need for adequate and reliable public utility services at the lowest reasonable cost to consumers with the need to protect the environment and ecology of the state and to minimize damage to scenic, historic, and recreational values; 2) providing environmental standards for the location, design, construction, and operation of public utility facilities that are at least as stringent as federal environmental standards and that are sufficient to assure the welfare and protection of the people of Connecticut;	Connecticut Siting Council

		3) encouraging research to develop new and improved methods of generating, storing, and transmitting electricity and fuel and of transmitting and receiving television and telecommunications signals with minimal damage to the environment; 4) promoting the sharing of telecommunications towers in order to avoid their unnecessary proliferation; and 5) requiring annual forecasts of the demand for electricity together with the planning for facilities needed to supply the predicted demand.	
Permit for Aquaculture Operations	CGS § 22-11h	The Connecticut Department of Agriculture, Bureau of Aquaculture (DA/BA) is the lead state agency for aquaculture development in Connecticut, pursuant to several statutes listed in this table. The responsibilities of the DA/BA include leasing submerged State lands to shellfish producers, classifying shellfishing waters, monitoring water quality, identifying sources of pollution and seeking corrective actions, and the licensing of all commercial shellfish operations and research or educational activities. With respect to aquaculture, the DA/BA Director acts as a liaison among local, State and federal permitting officials, and is the official State Aquaculture Coordinator. The Bureau has exclusive State authority for granting or denying aquaculture permits pursuant to CGS § 22-11h, except for matters concerning discharges from marine aquaculture operations, water diversions, and placement of floating or submerged aquaculture structures in coastal waters that require other coastal permits. Aquaculture-related water discharges and in-water structures are regulated cooperatively at the State and federal levels with the Connecticut DEEP and the U.S. Army Corps of Engineers (USACE) New England District. For further information, please consult: A Guide to Marine Aquaculture Permitting in Connecticut or DEEP Fact sheet on aquaculture permitting process	Department of Agriculture, Bureau of Aquaculture
Licensing of Aquaculture Producers	CGS § 22-11j	This section includes specific provisions for licensing of seaweed producers. A license for seaweed production may be issued for any area within the state's coastal waters for a renewable five-year term and an annual license fee of $25/acre, which may be waived if the seaweed farm is located in a leased shellfish bed. In order to prevent non-aquaculture interests from licensing areas for other purposes, a seaweed licensee must make a good-faith effort to cultivate and harvest seaweed from the license area, and the grant of a license may not interfere with an established right of fishing or shellfishing. Note that any in-water structures used in seaweed production, including longlines, buoys, and work platforms, also require appropriate authorization under the DEEP coastal permitting program at CGS § 22a-359 to 22a-363f, inclusive.	Department of Agriculture, Bureau of Aquaculture

Emergency authorization for regulated activity. Temporary authorization for regulated activity	CGS § 22a-6k	The Commissioner of DEEP may issue an emergency or temporary authorization for an activity regulated under one of several specified DEEP programs. Emergency authorizations may be issued when (1) such authorization is necessary to prevent, abate or mitigate an imminent threat to human health or the environment; and (2) such authorization is not inconsistent with the federal Water Pollution Control Act (WPCA), the federal Rivers and Harbors Act, the federal Clean Air Act or the federal Resource Conservation and Recovery Act (RCRA). However, the only Long Island Sound-related program subject to emergency authorization under this section would be CGS § 22a-430, regarding discharges to the waters of the state. However, pursuant to CGS § 22a-6k(b), the commissioner may issue a temporary authorization for any activity for which the commissioner has authority to issue a general permit, including coastal general permits under CGS § 22a-361, provided the commissioner finds that (1) such activity will not continue for more than ninety days; (2) such activity does not pose a significant threat to human health or the environment; (3) such authorization is necessary to protect human health or the environment or is otherwise necessary to protect the public interest; and (4) such authorization is not inconsistent with the federal WPCA, Rivers and Harbors Act, Clean Air Act or RCRA and is not renewed more than once.	Department of Energy and Environmental Protection
Regulation of dredging, erection of structures, and placement of fill in tidal, coastal, or navigable waters. Sunken or grounded vessels.	CGS § 22a-359	Blue Plan policies are likely to be most frequently applied through DEEP's coastal permitting program, which regulates virtually all activities within the tidal, coastal or navigable waters of Connecticut under the Structures, Dredging and Fill Statutes (CGS §§ 22a-359 to 22a-363f, inclusive) and in tidal wetlands under the Tidal Wetlands Act (CGS §§ 22a-28 to 22a-35, inclusive). The major objectives of the coastal permit program are to avoid or minimize navigational conflicts, encroachments into the state's public trust area, and adverse impacts on coastal resources and uses, consistent with the policies of Connecticut Coastal Management Act (CGS §§ 22a-90 to 22a-112, inclusive), pursuant to CGS § 22a-98. Overview of Coastal Permit Program This section outlines DEEP's responsibility for the regulation of dredging, structures, and the placement of fill in the tidal, coastal, or navigable waters waterward of the coastal jurisdiction line, and lists some of the factors for consideration in making regulatory decisions, including: • the preservation of natural habitats and living marine resources • shoreline erosion and coastal flooding • water quality and pollution control • the use and development of all adjoining lands • coastal and inland navigation • use of the state's public trust land and water • the rights and interests of all persons concerned with the proposed activity The area of the shore subject to Connecticut's permit authority includes everything waterward of the Coastal Jurisdiction Line (CJL) (or within the bounds of tidal wetlands) out to the state boundary. The CJL is an elevation in the North American Vertical Datum of 1988 (NAVD88) and is based on a specific predicted tide. The mean high-water line (MHW) is the line on the shore indicating the average shoreward extent of all high tides. The MHW line also denotes the	Department of Energy and Environmental Protection

		seaward limit of private property ownership in Connecticut. Navigable waters include tidal rivers upstream to the limit of the first dam or obstruction.	
Permit for dredging, structures, placement of fill, obstruction or encroachment, or mooring area or facility. Regulations. General permits. Removal of sand, gravel or other material. Fees. Prohibited docks or structures	CGS § 22a-361	This section sets forth the permitting requirements and procedures for regulated activities, such as dredging, the placement of structures, fill, encroachments, or mooring areas or facilities, within DEEP's coastal permitting jurisdiction. Three types of authorizations are issued for activities conducted within tidal, coastal and navigable waters, depending on the nature of the work proposed. Each involves a different review process, and the following two are contained in this section, as explained below. **Individual Permits** Certain activities require an "individual" permit specific to the proposed work. These activities typically include new construction and other work for which a detailed review of potential environmental impacts is needed. The review process for an individual permit provides an opportunity for public comment and potentially a hearing. **General Permits** General permits are issued to authorize certain minor activities. Because the environmental impacts of those activities are understood, detailed permit reviews are generally not required. General permit approvals, often referred to as a "registration', are typically issued within 90 days if a complete application is received. The following structures and activities may be eligible for authorization through a general permit: • Small residential docks having no navigational or environmental impacts • Boat moorings • Osprey nesting platforms and perch poles • Residential flood hazard mitigation • Buoys and markers for navigation and certain recreational activities • Swim floats • Pump-out facilities at marinas • Coastal remedial activities	Department of Energy and Environmental Protection
Activities eligible for certificate of permission. Exemptions. Issuance of certificate. Failure of commissioner to respond.	CGS § 22a-363d	This section provides for emergency authorization for activities subject to DEEP's Coastal Regulatory Program. Under the statutory provisions, an emergency situation is one which may result in immediate, unforeseen and unacceptable hazards to life, health or welfare or significant loss of property. In order for a regulated activity to be eligible, the damage and the proposed corrective action must be reported within fifteen days of the causative event. Corrective actions may include the repair or reconstruction of structures, fill, obstructions or encroachments damaged or destroyed by an act of nature or casualty loss necessary to avoid economic damage to ongoing commercial activities. Emergency authorizations can be issued quickly and will contain conditions appropriate for the activity but must be followed-up with a full CGS § 22a-361 permit application.	Department of Energy and Environmental Protection

Permit for new discharge. Regulations. Renewal. Special category permits or approvals. Limited delegation. General permits.	CGS § 22a-430	This section comprises part of DEEP's Wastewater Discharge Permit Program, which regulates discharges to waters of the state, including all surface waters, ground waters and Publicly Owned Treatment Works (POTW) (i.e., sewage treatment plants) pursuant to CGS §§ 22a-416 through 22a-438 and Sections 22a-430-1 through 22a-430-7 of the Regulations of Connecticut State Agencies. DEEP uses both individual and general permits to regulate discharge activities. Individual permits may be required for discharges of Industrial Wastewater and Municipal Wastewater, for instance, and there are a number of specific categories of general permits which can be found on the General Permits Factsheet. DEEP issues discharge permits in three major categories. While the process for each is similar, specific application requirements may vary. • **The Surface Water Discharge Permit Program**, also known as the National Pollutant Discharge Elimination System (NPDES) under the federal Clean Water Act, is authorized by this section, and regulates discharges into both coastal and inland surface waters (either directly or through municipal storm sewer drainage systems, or through other drainage systems such as wetlands or swales). • **The Ground Water Discharge Permit Program** regulates discharges to ground water from any source, including but not limited to large septic systems, agricultural waste management systems, and all waste landfills. • **The Pre-treatment Permit Program** regulates discharges to a sewage treatment plant through municipal sanitary sewer drainage systems, or through combined storm and sanitary sewer systems. All wastewaters (excluding domestic sewage) that are hauled directly to a POTW will require either a pre-treatment permit or will be regulated under the sewage treatment plant's permit. Domestic sewage hauled directly to a POTW is regulated by the CT Department of Public Health. In making a decision on a permit application, DEEP must determine that the proposed discharges will not cause pollution to the waters of the state. In doing this, staff review the potential for: 1) any adverse effects on existing and designated uses of the waters of the state as defined in Connecticut's Water Quality Standards and Criteria; 2) any interference with or adverse effects upon the operation of a POTW; and 3) any systems and methodologies proposed to counteract such adverse effects and to minimize the discharge of pollutants.	Department of Energy and Environmental Protection
Crossings of Long Island Sound. Evaluation of application's consistency with comprehensive environmental assessment plan.	CGS § 25-157b	As discussed in 2.3c above, this statutory provision was enacted in 2002 to follow up on the Task Force report on utility crossings of Long Island Sound. It requires that any state agency (including but not limited to DEEP and the Siting Council) that considers an application for an electric power line, gas pipeline, or telecommunications crossing of the Sound to evaluate such application for potential to impair the public trust in the Sound and for consistency with the environmental and other recommendations of the Task Force report.	Department of Energy and Environmental Protection, Connecticut Siting Council, other agencies

Leasing of shellfish grounds. Fee. Utility lines and public use structures. Shellfish removal or relocation costs. Annual host payments for Long Island Sound crossings. Designation of shellfish areas to regional agricultural science and technology education centers.	CGS § 26-194	This section contains the authority for the Department of Agriculture's Shellfish Leasing Program and establishes procedures and regulations for leasing. This program permits shellfish farmers to obtain underwater lands in Long Island Sound for the purpose of planting, cultivating, and harvesting shellfish crops. All applications to lease grounds must be approved by the Commissioner of Agriculture. The Department of Agriculture, Bureau of Aquaculture leases shellfish grounds through competitive bids, with a statutory minimum bid of $4.00/acre (CT DOA, 2019). A lease is granted for a 3-10 year term with renewal option, provided the lessee has paid rental fees. Leases will be granted by DA/BA to the highest responsible bidder. There is a 50-acre minimum and 200-acre maximum per bid, and it is the policy of the Department of Agriculture that lease be square or rectangular in shape. Also contained in this section are particular provisions that address conflicting uses within shellfish beds. For instance, provisions in CGS § 26-194(a) require lessees to actually cultivate shellfish and prohibit lessees from entering agreements not to cultivate and harvest shellfish; i.e., cable and pipeline companies cannot buy up leases to preclude any claims for damage to shellfish by any "utility line or public use structure" per CGS subsection 26-194(d). Instead, subsection (d) provides that owners of "a utility line or public use structure" that impacts a leased area must pay for removal or relocation of any shellfish, and are liable for any damages caused by the installation, construction or presence of such line or structure. Similar provisions apply to local shellfisheries in general and Branford shellfisheries in particular under CGS §§ 26-240 and 26-266, respectively. In addition, the provisions of CGS § 26-194(c), which establishes a limited form of submerged lands leasing as a "host payment fee" for cables and pipelines. Any "facility" needing approval from the Siting Council under CGS §16-50k or from FERC and that crosses "any grounds of Long Island Sound within the jurisdiction of the state," including leased or granted shellfish areas, must pay the Department of Agriculture an annual host payment fee of $0.40 per linear foot.	Department of Agriculture, Bureau of Aquaculture
Local shellfish commissions.	CGS § 26-257a	Connecticut's municipal Shellfish Commissions are responsible for managing shellfish resources, shellfisheries and aquaculture in town waters which lie landward of the State Jurisdiction Line (N.B: This line establishes state vs. local aquaculture leasing jurisdiction and is not the same as the Coastal Jurisdiction Line under CGS § 22a-359(c)). Each commission is required to develop a comprehensive management plan that includes a process for leasing commercial shellfish grounds and providing local review of applications for placement of aquaculture structures in town waters. Although these local decision makers do not have legal authority to directly permit aquaculture structures, the Commissions play a role in the review process for potential social and use conflicts, as well as potential effects on protected habitats and/or species caused by aquaculture activity. If projects are located in municipal waters, the local Shellfish Commission is consulted.	Municipal Shellfish Commissions

Section 401 Water Pollution Control Act	Section 401 of the Federal Clean Water Act (33 U.S.C. 1314)	Under Section 401 of the federal Clean Water Act, any federally-regulated discharge into the waters of the state must be consistent with the Connecticut Water Quality Standards and Classifications (WQS). The WQS set an overall policy for management of Connecticut's surface and ground waters in accordance with the directives provided by CGS § 22a-426 and Section 303 of the Federal Clean Water Act. The WQS provide guidance and policy about water quality in the state and DEEP's goals for maintaining or improving that quality, based on a system of classification for the state's waters (coastal and Marine waters are classified SA or SB). The WQS also establish designated uses of surface and ground water; indicate the general types of discharges allowed; ensure the segregation of drinking water supplies from waters used for waste assimilation; provide the standards to protect aquatic life and human use; provide a framework for the establishment of priorities for pollution abatement, dispensation of State funding, remediation goals; and provide guidance for location decisions for business and industry as well as other economic developments. At the state level, the WQS are implemented through the DEEP coastal permits under CGS § 22a-361 and water discharge permits under CGS §22a-430, which incorporate the 401 Water Quality Certificate. For federal permits such as those from the U.S. Army Corps of Engineers for discharge of dredged material or for the placement of fill material in tidal waters, DEEP issues a separate state 401 Water Quality Certificate. Future versions of the State Water Quality Standards may wish to incorporate or cross-reference Blue Plan policies.	Department of Energy and Environmental Protection

Other state regulatory programs that have authority in Long Island Sound, but are not required to use the Blue Plan include CT DEEP's Boating Division. The DEEP Boating Division exercises a number of regulatory authorities within the waters of the state, including Long Island Sound as well as inland lakes and rivers. These authorities include permits required for placements of buoys and markers, navigational aids, and waterski courses. While Coast Guard marine event permits are generally necessary for aquatic exhibitions on Long Island Sound, a DEEP Boating permit is required for all marine parades, regattas, races, tournaments, exhibitions, or other activities held on non-tidal state waters requiring exclusive use of a specified portion of a waterbody, including access through state boat launches (CT DEEP, 2019). DEEP officials are also responsible for registration of boats and for dealing with abandoned vessels (CT DEEP, 2019). Further information on boating regulation, and Connecticut boating information in general, can be found in the annual DEEP in Boaters Guide (CT DEEP, 2019).

2.6 Local Government Regulatory Programs

Coastal local governments are often on the front lines of appreciating and responding to in-water issues, which has been amply reflected in previous controversies over the Broadwater LNG facility, cables and pipelines, and dredging projects. For this reason, the Blue Plan Advisory Committee included two representatives from Connecticut coastal towns. In addition to comprising communities of residents concerned with the Sound and its shores, shoreline municipalities are given certain authority over coastal upland and inshore activities. As with all

Connecticut municipalities, there are a number of local equivalents corresponding to state plans, such as the municipal plan of conservation and development and municipal harbor management plans, as well as land use regulatory authority through planning and zoning, up to the limit of their regulatory jurisdiction at the mean high-water line. In addition, as discussed above, coastal municipal land use authorities are already required by statute to follow and implement the substantive policies of the Connecticut Coastal Management Act. Further, municipal harbor management commissions, authorized under the harbor management statutes of CGS §§ 22a-113k through 22a-113t, play an active role in managing and monitoring local developments that affect navigation and maritime uses, although they do not have direct regulatory authority. In municipalities with approved harbor management plans, the State-appointed harbor masters supervise the allocation of moorings, respond to abandoned vessels, and carry out their other duties in accordance with the plan (CT DEEP, 2019).

In the years since the Coastal Management Act and Harbor Management Act were enacted, localities bordering Long Island Sound have developed substantial institutional capacity, as well as legal authority, to manage inshore coastal issues such as waterfront development. As a result, the Blue Plan policy area, beginning at the -10' depth contour, was designed in part to focus spatial planning attention on the offshore spaces of the Sound, so as not to interfere with or duplicate existing municipal plans, programs and authorities. As a result, while local coastal and harbor management will inform and be informed by the Blue Plan, the only municipal authority directly affected by the Blue Plan are those associated with shellfish management, as described in Table 2-1.

2.7 Federal Authorities in Long Island Sound

Long Island Sound is unusual, if not unique among water bodies subject to marine spatial planning, in that it is comprised entirely of state public trust waters. The Territorial Sea baseline, from which the three-mile limit is measured, runs outside the entrance to the Sound, meaning that there are no federal waters within the Blue Plan planning or policy areas. Of course, state waters are subject to federal regulatory authority, so that in-water activities subject to state regulation may also require federal agency permits, most commonly from the U.S. Army Corps of Engineers. Federal agencies also frequently undertake their own projects within the Sound, such as the Corps of Engineers' navigational dredging and flood control structures or the Coast Guard's designation of safety and security zones. As states, New York and Connecticut cannot regulate or affect the actions of federal agencies in Long Island Sound, except through two provisions of federal law: the 401 water quality certifications, described in Table 2-1, and the Federal Consistency process of the federal Coastal Zone Management Act (NOAA, 2019).

a. Overview of Federal Consistency

Section 307 of the "Coastal Zone Management Act of 1972" (CZMA), called the "federal consistency" provision, gives states a strong voice in federal agency decision making, which they otherwise would not have, for activities that may affect a state's coastal uses or resources. Generally, federal consistency requires that federal actions, within and outside the coastal zone, which have reasonably foreseeable effects on any coastal use (land or water) or natural resource of the coastal zone be consistent with the enforceable policies of a state's federally approved coastal management program. Federal actions include federal agency activities, federal license or permit activities, and federal financial assistance activities. Federal agency activities must be consistent to the maximum extent practicable with the enforceable policies of a state coastal management program, and license and permit and financial assistance activities must be fully consistent.

Both New York and Connecticut have federally approved coastal management programs, and the entire Blue Plan policy and planning areas are within the states' coastal zones (CT DEEP, 2019). In Connecticut, the coastal zone also includes coastal lands up to a defined coastal boundary. In addition, there are interstate consistency provisions that allow the states to review certain federal activities across the Sound, not just in their own state waters. Connecticut, through a National Ocean and Atmospheric Administration (NOAA) - approved Geographic Location Description (GLD) that specifies certain offshore New York waters of Long Island Sound, can review certain federal agency activities and permits listed within the GLD for consistency with state enforceable coastal management policies. New York State has corresponding authority to review certain federal agency activities and permits in Connecticut waters. Also, while Connecticut can review federal actions in New York waters, Connecticut cannot require that an applicant applying for federal authorization in the New York coastal zone obtain Connecticut permits, licenses, leasing, or pay fees that may be required by Connecticut law for Connecticut waters, nor can New York impose its own requirements on applicants in Connecticut waters.

To understand which federal agency actions and permits would be subject to its coastal management policies, Connecticut has developed a list of federal activities that are subject to consistency review (CT DEEP, 2010). The list was initially established as part of the state's Coastal Management Plan in 1980. The list was updated in 2006 and 2010, and presently includes activities that might be undertaken in state waters as well as activities that might occur outside of state waters that would have a reasonably foreseeable effect on state coastal resources and uses.

For federal consistency purposes, within the Blue Plan policy area, Connecticut's enforceable policies with which proposed federal actions must be consistent are essentially those of the Connecticut Coastal Management Act (CMA) at CGS § 22a-92, and are listed in the Reference Guide to Coastal Policies and Definitions and the Coastal

Management Manual (CT DEEP, 1999) (CT DEEP, 2000).[12] The Manual includes individual downloadable and printable fact sheets with descriptive information for all coastal resources and uses identified in the CMA. It is important to note that for federally-regulated activities that also require a DEEP permit, the federal consistency review is not a separate process but is integrated into the DEEP process.

Once the Blue Plan is adopted by the Connecticut legislature, the Blue Plan statute at CGS § 25-157t(h)(2) requires DEEP to seek "incorporation" of its policies into the state's coastal management program. DEEP will submit the enforceable policies listed in Appendix 1 to the process specified in NOAA's most current regulations. Upon approval by NOAA, those policies may be applied through the federal consistency process.

2.8 Interstate, Regional, and Federal Partnerships

Aside from state and federal agencies themselves, there are a number of bi-state, federal-state, and regional partnership organizations that can interact with and support implementation of the Blue Plan.

a. Connecticut-New York Bi-State Marine Spatial Planning Working Group

The origins of the Blue Plan can be traced in part to an informal, unofficial working group that began meeting regularly August of 2012 with the goal of creating the enabling conditions for marine spatial planning in Long Island Sound. Initially referred to as the Sound Spatial Planning Work Group, it is referenced in the Blue Plan statute as the "Connecticut-New York Bi-State Marine Spatial Planning Working Group," reflecting the importance of stakeholders from both states in this effort. The Working Group was formed following workshops and discussions about marine spatial planning for Long Island Sound along with recognition of the 2010 National Ocean Policy and associated planning efforts unfolding for the Northeast and Mid-Atlantic regions. There was informal consensus that, as an intensely utilized, ecologically important water body, Long Island Sound needed and deserved its own marine spatial plan. This perspective was reinforced by the understanding that Long Island Sound, although a multi-state waterbody, is a sub-region without direct and specific attention from the regional planning efforts since it is geographically sub-divided between the Northeast and Mid-Atlantic Ocean planning regions.

[12] Additional enforceable policies from Connecticut's coastal regulatory programs may also apply.

Perhaps the most significant result of the Working Group's efforts is the distillation of a broad consensus on the purpose and potential guiding principles that may be appropriate for a marine spatial plan (MSP) in LIS, the types of data and information that may be important, and the options that may make the most sense in structuring and implementing a LIS MSP process. This consensus is reflected in a report titled *Options for Developing Marine Spatial Planning in Long Island Sound: Sound Marine Planning Interim Framework*, which provided much of the background for the development of the Blue Plan legislation and the work of the Blue Plan Advisory Committee and subcommittees. The Framework and a number of additional background documents produced by the Working Group can be found at Blue Plan related links (CT DEEP, 2019).

b. Joint Programs

i. Long Island Sound Study

A significant partner for the Blue Plan will be the Long Island Sound Study (LISS), a cooperative program led by the US Environmental Protection Agency (EPA) that contributes significant regional efforts in water quality monitoring, coastal habitat restoration, and public education (LISS, 2019). In 1985, in response to growing concerns over the ecological health of this heavily-used bi-state estuary, EPA, New York, and Connecticut formed the Long Island Sound Study (LISS) in 1985, a partnership consisting of federal and state agencies, user groups, concerned organizations, and individuals dedicated to restoring and protecting the Sound. The Long Island Sound Study Management Conference, a partnership of federal, state, interstate, and local agencies, universities, environmental groups, industry and the public, was convened in March 1988 following the Congressional designation of Long Island Sound as an Estuary of National Significance at the requests of Connecticut and New York. To guide its activities, the LISS developed its first Comprehensive Conservation and Management Plan (CCMP) in 1994 to protect and restore Long Island Sound. The LISS partners have since made significant strides in implementing the plan, giving priority to reducing nutrient (nitrogen) loads, habitat restoration, public involvement and education, and water quality monitoring. In the 20 years of implementing the CCMP, federal, state, and local partners have worked together to reduce by 40 million pounds the annual discharge of nitrogen, restore nearly 1,625 acres of habitat, reopen 317 miles of fish passage, and involve hundreds of thousands of people in education and volunteer projects to help bring Long Island Sound back to health and abundance. The most recent 2015 revision of the CCMP outlines objectives under the four themes of clean waters and healthy watersheds, thriving habitats and abundant wildlife, sustainable and resilient communities, and sound science and inclusive management. Significantly, the 2015 CCMP also calls for the development of marine spatial planning as part of the Sound Science theme, presaging the initiation of the Blue Plan.

The LISS also administers grant programs to further the goals of the CCMP and has provided important funding to assist in the development of the Blue Plan development. Since it provides a spatial planning component that has not been a part of the CCMP, the Blue Plan can be expected to provide guidance and coordinated implementation efforts along with the LISS Management Conference, not least because most of the agencies, stakeholders and partners that have worked on the Blue Plan have also been actively engaged with the LISS.

ii. Long Island Sound National Estuarine Research Reserve

NOAA's National Estuarine Research Reserve (NERR) System is a network of 29 coastal areas designated to protect and study estuarine systems authorized by the federal Coastal Zone Management Act as a formal partnership between NOAA and coastal states. NOAA provides funding, guidance, and technical assistance. Each reserve is managed by a lead state agency or university, with input from local partners. The reserves cover 1.3 million acres of estuaries and focus on Research, Stewardship, Training, and Education. At present, while NERRs exist in such close proximity as Narragansett Bay and the Hudson River, Connecticut is one of only two salt-water coastal states without one. However, DEEP has worked for a number of years to pursue the establishment of a Long Island Sound NERR and is currently going through the formal selection and nomination process. On December 21, 2018, Governor Dannel Malloy signed the nomination package that was sent to NOAA for formal review.

The process to nominate a CT NERR has identified a preferred site, which includes the following state-owned properties (CT DEEP, 2019) : Lord Cove Wildlife Management Area; Great Island Wildlife Management Area; Bluff Point State Park and Coastal Reserve and Natural Area Preserve; Haley Farm State Park; and the public trust portions of waterbodies defined by:

1. Long Island Sound ranging approximately west to east from the mouth of the Connecticut River to Mason's Island and north to south waterward of the mean high-water shoreline to just shy of the Connecticut state boundary in Long Island Sound;

2. the area waterward of the mean high shoreline of the lower Thames River from approximately the Gold Star Bridge south to the area described in 1. above;

3. the area waterward of the mean high shoreline of the lower Connecticut River from approximately Lord Cove south to the area described in 1. Above.

As proposed, therefore, the CT NERR would include open water areas within both the planning and policy areas of the Blue Plan. It is important to note that while potential NERR and Blue Plan areas may overlap, the presence of a NERR will not negatively impact or restrict existing uses or resources. If a NERR were established it would be extremely useful in providing research and educational opportunities to inform future updates to the Inventory, and to help guide the future adaptation and application of Blue Plan policies. In the future, a CT NERR is likely to be an important partner in updating the Blue Plan and Inventory and in addressing data gaps, research and education needs.

iii. Regional Ocean Planning and Partnerships

Prior to 2018, the federal government supported a number of ocean planning initiatives at the national and multi-state regional level. Established by an executive order in 2010, the National Ocean Policy designated nine Regional Planning Bodies (RPBs) to develop ocean management policies in accordance with a series of national goals, with RPB membership including federal, tribal, state, and Fishery Management Council representatives (Federal Register, 2010). Under the National Ocean Policy, Long Island Sound was bisected by the border between the Northeast and the Mid-Atlantic Regional Planning Bodies. Coordination with both RPBs played an important role in development of the Blue Plan, particularly in the case of the New England region's Northeast Regional Planning Body. However, since 2018 the status of ocean planning at the national and regional levels has become decidedly uncertain; the executive order establishing the National Ocean Policy was revoked by the subsequent federal administration, and the RPBs were abolished (Federal Register, 2018).

The composition of the Northeast RPB reflected the geography of the planning area, which includes state and federal marine waters of the New England states (e.g., from Long Island Sound, north around Cape Cod and including the United States and state waters of the Gulf of Maine). DEEP staff were Connecticut's representatives and were able to integrate knowledge and experience from the regional effort to development of the Blue Plan. The Northeast RPB, established in 2012, was guided by three overarching goals: 1) healthy ocean and coastal ecosystems, 2) effective decision-making, and 3) compatibility among past, current, and future ocean uses. Its Regional Ocean Plan was completed in 2016 and approved by the National Ocean Council (Northeast Ocean Planning, 2019).

Several Northeast RPB projects, such as the marine recreational use study, marine life characterization and baseline economic assessment, include LIS in the scope of data collection and resource characterization and have resulted in valuable products that have contributed to the Inventory. These projects and other data

have been compiled in the Northeast Ocean Data Portal, which is a very useful compilation of resource, habitat, and human use data for the entire Northeast region, including Long Island Sound, and is frequently referenced in the Inventory. Going forward, the Data Portal and Northeast Regional Ocean Plan will be maintained by the Northeast Regional Ocean Council (particularly their ocean planning committee), which is a partnership made up of federal, state, and regional organizations addressing coastal and ocean issues that benefit from regional coordination (NROC, 2019).

Similar to the Northeast, regional ocean planning in the Mid-Atlantic is led by the Mid- Atlantic Regional Planning Body (MARCO, 2019). Established in 2013, the Mid-Atlantic RPB focused on offshore waters, leaving bays and estuaries for later. Its Regional Ocean Action Plan, also approved in 2016, is shaped by two goals: 1) Promote ocean ecosystem health, functionality, and integrity through conservation, protection, enhancement, and restoration; and 2) Plan and provide for existing and emerging ocean uses in a sustainable manner that minimizes conflicts, improves effectiveness and regulatory predictability, and supports economic growth (MARCO, 2016). As in the Northeast, the Mid-Atlantic Regional Council on the Oceans (MARCO), a regional ocean partnership, is a key partner in Mid-Atlantic regional ocean planning, and is maintaining the regional data portal.

While regional ocean planning has by necessity worked at too broad a scale to address many of the management considerations relevant to the Sound, the Blue Plan has greatly benefited from the available data, information, and stakeholder engagement at the regional scale. The two regional ocean partnerships remain, and Blue Plan implementation and updates will continue to refer to the regional data portals.

iv. Long Island Sound Dredged Material Management Plan

The dredging of navigational channels and appropriate disposal of dredged sediments have been prominent and contentious issues in Long Island Sound for many years. The management of dredging operations and in-water disposal sites can affect other resources and uses and will need to be considered in implementing the Blue Plan. A number of federal and state agencies take part in managing dredging issues in the Sound, including CT DEEP, the Connecticut Port Authority, NY Department of State (DOS) and Department of Environmental Conservation (DEC), US EPA, NOAA and the US Army Corps of Engineers.

To help address these challenges, the federal and state agencies, led by the Corps, developed a Long Island Sound Dredged Material Management Plan (LIS DMMP) A DMMP is a comprehensive planning process and decision-making tool

to address the management of dredged material for a specific harbor or navigation project, group of related projects, or geographic area, and the LIS DMMP was completed on January 11, 2016. The USACE Long Island Sound Dredge Material Management Plan identifies a wide range of alternatives to open-water disposal and recommends standards and procedures for determining which alternatives to pursue for different dredging projects (USACE, 2016). The DMMP is implemented in part through a standing, interagency Steering Committee and a Regional Dredging Team for Long Island Sound. These groups are comprised of federal and state agency representatives who will work together to identify, develop, and promote the use of practicable alternatives to open-water disposal of dredged material, such as using sand for beach nourishment. They also review individual dredging projects and offer recommendations to the Corps regarding how the dredged material from such projects should be handled. To ensure progress towards reducing or eliminating open-water disposal in Long Island Sound, an interagency Long Island Sound Regional Dredging Team (LIS RDT) was established in 2006. The LIS RDT reviews proposed dredging projects to ensure that a thorough effort has been conducted to identify practicable alternatives to open-water disposal. The LIS RDT encourages the use of alternatives to open-water disposal, such as beneficial use and upland alternatives. Further information on dredged material management in Long Island Sound, including designation of disposal sites, can be found on the Dredged Material Management of Long Island Sound page of the EPA website (EPA, 2019).

v. NEIWPCC

The New England Interstate Water Pollution Control Commission (NEIWPCC) was established by Congress in 1947 to assist its seven-member states (the New England states plus New York) to preserve, protect, and advance the quality of their water resources. NEIWPCC focuses on water quality research and monitoring, outreach and education, and training and support (NEIWPCC, 2019). One NEIWPCC research project of particular interest to the Blue Plan is the Nutrient Bioextraction Initiative, in collaboration with DEC and the Long Island Regional Planning Council with funding from the Long Island Sound Study (LISS, 2019).

The Nutrient Bioextraction Initiative seeks to improve water quality in NY and CT marine waters by removing excess nitrogen through the cultivation and harvest of seaweed and shellfish. The Initiative will provide information to help facilitate public and private seaweed and shellfish farming and harvest operations in coastal waters, including Long Island Sound. One product of this project will be a GIS-based tool to identify potential seaweed and shellfish aquaculture sites for bioextraction, an effort which can readily draw upon Blue Plan geospatial data and policies.

vi. Interstate Environmental Commission

The Interstate Environmental Commission, comprised of representatives from New Jersey, New York and Connecticut, is a tristate agency that conducts water quality sampling, monitoring and coordination, among other programs. Its jurisdiction includes the western part of Long Island Sound up to a line between New Haven, CT and Port Jefferson, NY (Interstate Environmental Commission, 2019).

c. The Blue Plan and New York

The Blue Plan statute calls for the Plan to be "coordinated, developed and implemented, to the maximum extent feasible, with the state of New York." Apart from public outreach and stakeholder events, coordination with New York State in practical terms depends upon close cooperation with the two New York State agencies with primary responsibility for managing the New York waters of the Sound—the NY DOS and DEC. Both agencies have been fully advised of Blue Plan development and have designated representatives to the Blue Plan Advisory Committee.

The Department of State, through the Office of Planning and Development, administers New York's federally approved coastal management program (NY DOS, 2019). While the New York coastal management program implements a set of statewide enforceable coastal policies, there is also a specific regional LIS Coastal Management Program with 13 enforceable coastal policies. As discussed in section 2.7a, DOS also applies interstate consistency authority through the CZMA to review federal agencies activities in Connecticut state waters. In addition, DOS operates the New York Geographic Information Gateway data portal, whose Long Island Sound pages contain useful data that has contributed to the Inventory (NY DOS, 2019).

New York's Department of Environmental Conservation, in conjunction with DOS's CZMA federal consistency review authority, plays a more regulatory role in Long Island Sound by issuing permits in accordance with state laws for protection of natural resources and water quality in New York's coastal area (NY DEC, 2019). DOS works cooperatively with DEC on a range of issues, especially concerning water quality, fisheries and wildlife issues, coastal erosion, and adaptation and resilience to climate change. Additionally, New York's local governments have home rule powers of zoning, comprehensive planning, and adopting local waterfront revitalization plans (including harbor management plans for adjacent coastal waters).

A significant example of New York interagency cooperation in the area of marine spatial planning is reflected in New York State's *New York Ocean Action Plan: 2015-2025* (NY DOS, 2017-2027). The Ocean Action Plan, developed by DOS and DEC, discusses the

need for integrated planning and management of New York's offshore marine resources, focusing on the State's ocean waters stretching from New York City to the end of Long Island, including ecological connections to offshore waters out to the edge of the continental shelf. The Blue Plan could prove useful to the New York agencies when they are able to address spatial planning in the state's Long Island Sound waters.

Finally, in addition to DOS and DEC, New York's Office of General Services administers leases for the use of the state's public trust submerged lands, including the lands underlying the New York Waters of Long Island Sound (NY Office of General Services, 2019). Structures, including fill, pipelines or cables located in, on, or above state-owned lands under water are regulated under the Public Lands Law and may require authorization from the state in the form of a license or easement, in addition to any permits that may be required from DOS. 9 CRR-NY-G II Parts 270-271. Issuance of submerged lands authorization must be consistent with coastal management policies as well as require payment of fees in accordance with the regulations.

Chapter 3 The Blue Plan in Long Island Sound

3.1 Introduction

Long Island Sound (LIS), the "Urban Sea," supports diverse natural features and human activities. Covering over 1,300 square miles, the estuary exists at the cusp where northern and southern marine species overlap and provides key habitat for the life stages of many migratory fish, birds, mammals, and invertebrates (Long Island Sound Study, 2019). The world record clearnose skate and striped bass were both caught in Long Island Sound since 2010 (CT DEEP, 2018), and recently humpback whales have made incidental appearances in the Western Sound (Shay, 2015). The US Coast Guard issues more Marine Event permits annually for LIS than any other waterbody in the country (Radelat, 2014), and the annual ecosystem services[13] provided by the Sound have been valued between $17 billion to over $36 billion, and up to $1.3 trillion over 100 years (Earth Economics, 2015).

The following sections of this chapter illustrate the unique conditions that exist in Long Island Sound, and how the Blue Plan addresses, characterizes, and protects each. This is not only conservation of ecological resources: there are myriad unique human activities that depend on access to an intact Long Island Sound. Some of the most recognized shellfish in the country is farmed in LIS, and the "Marine Highway" running lengthwise through the Sound allows for the transport of millions of dollars of product in an efficient and ecological means (US Department of Transportation Maritime Administration, 2011). Working waterfronts support commercial fishing, commerce, tourism, and national security with regional and global ties. Marinas and yacht clubs connect nearly 100,000 recreational boaters to the Sound in Connecticut alone (Nickerson, 2016), and over 300,000 recreational anglers register with the State to fish the Sound (NOAA Office of Science and Technology, 2019). This chapter examines how ecological and human use characterizations were developed, how and why criteria and thresholds were incorporated, and how these integrate with Blue Plan policies. Since it is intended that the whole of the Blue Plan will be useful to not just Connecticut planning authorities but also to project proponents, Sound user groups, educators, the interested public, and planning bodies in New York State, the descriptions here are overview, with more complete methodologies available in the appendices.

[13] Ecosystem services as further defined by the International Union for the Conservation of Nature (IUCN) as the, "benefits people derive from ecosystems." These benefits can include but are not limited to pollination of crops, water purification, and prevention of soil erosion (IUCN, 2019).

3.2 Long Island Sound Areas Subject to the Blue Plan

The Blue Plan planning and policy areas were established as part of Connecticut Public Act 15-66 Section 1 subsection (c) which states:

"For the purposes of this section, the submerged lands and waters subject to the commissioner's planning, management and coordination authority under the Long Island Sound Blue Plan shall include Long Island Sound and its bays and inlets from the mean high-water line, as defined by the most recent data of the National Oceanic and Atmospheric Administration, to the state's waterward boundaries with the states of New York and Rhode Island. Any siting policies, identification of locations, or performance standards for activities, uses and facilities under the Long Island Sound Blue Plan shall apply in a spatial planning area located seaward of the bathymetric contour of minus ten feet North American Vertical Datum to the state's waterward boundaries with the states of New York and Rhode Island provided such planning area shall not extend into any river that flows into the sound beyond the first motor vehicle bridge or railroad bridge that crosses such river or area along such river that is authorized by the Commissioner of Economic and Community Development, pursuant to section 32-70 of the general statutes, to be an enterprise zone that shall be known as a defense plant zone. Such spatial planning area shall be designated on a map to be prepared by the advisory committee established pursuant to subsection (a) of this section."

❖ Planning Area

To delineate the Blue Plan Planning Area, CTDEEP geospatial mapping data representing the boundaries of Connecticut, New York, and Rhode Island land and waters[14] were used as a proxy for the mean high water (MHW) line, as no such consistent and reliable data exists for all states. The approximate boundary limit for crossing all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) as depicted in aerial photography and manually added to the MHW shoreline. All shorelines upstream of these obstructions were removed. The statutory definition, however, places no explicit boundaries specifying the extreme Eastern and Western extents of the Planning Area, and there is no formal definition for the boundaries of Long Island Sound.

In reviewing this and the best available mapping data, the Plan Development Team defined the westernmost limit by using the bridge at Throg's Neck, which connects the mainland to Long Island in New York (Figure 3-1). Using this is consistent with the use of obstructions to identify boundary limits as specified in statute, and represents, in the best professional judgment of the Team, a defensible boundary between Long Island Sound and the East River.

[14] Political Boundaries - From the Northeastern United States State Boundary layer, published by CT DEEP. Source map scale is 1:24,000

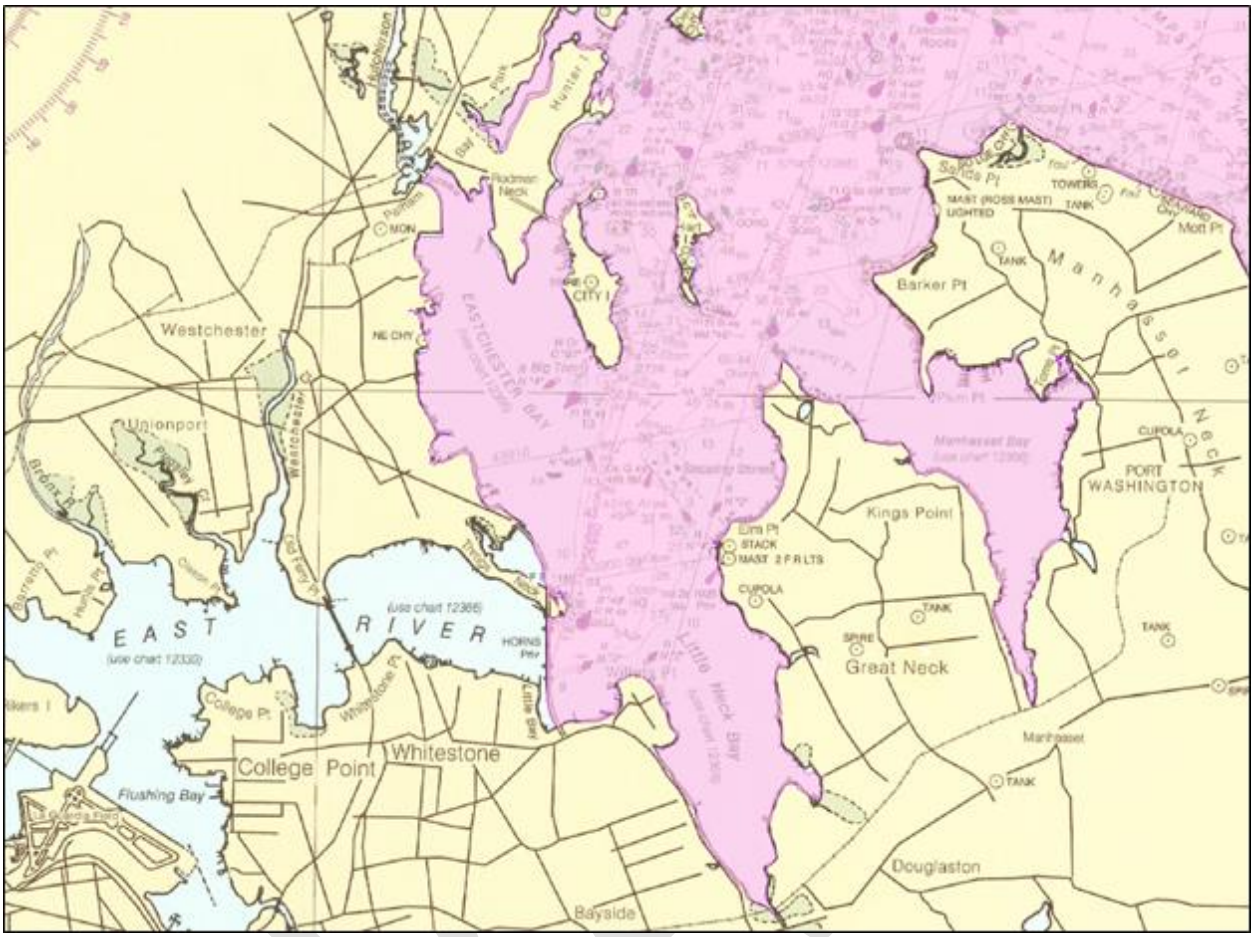


Figure 3-1 The western planning area (shown in purple) uses the Throg's Neck bridge in New York to separate Long Island Sound from the East River. NOAA Nautical chart data represents the basemap.

On the opposite side of the Sound, the Connecticut state line south of the Rt. 1 bridge across the Pawcatuck River serves as the easternmost boundary between Connecticut and Rhode Island in the Pawcatuck River, through Little Narragansett Bay, and around Sandy Point, NY (Figure 3-2).

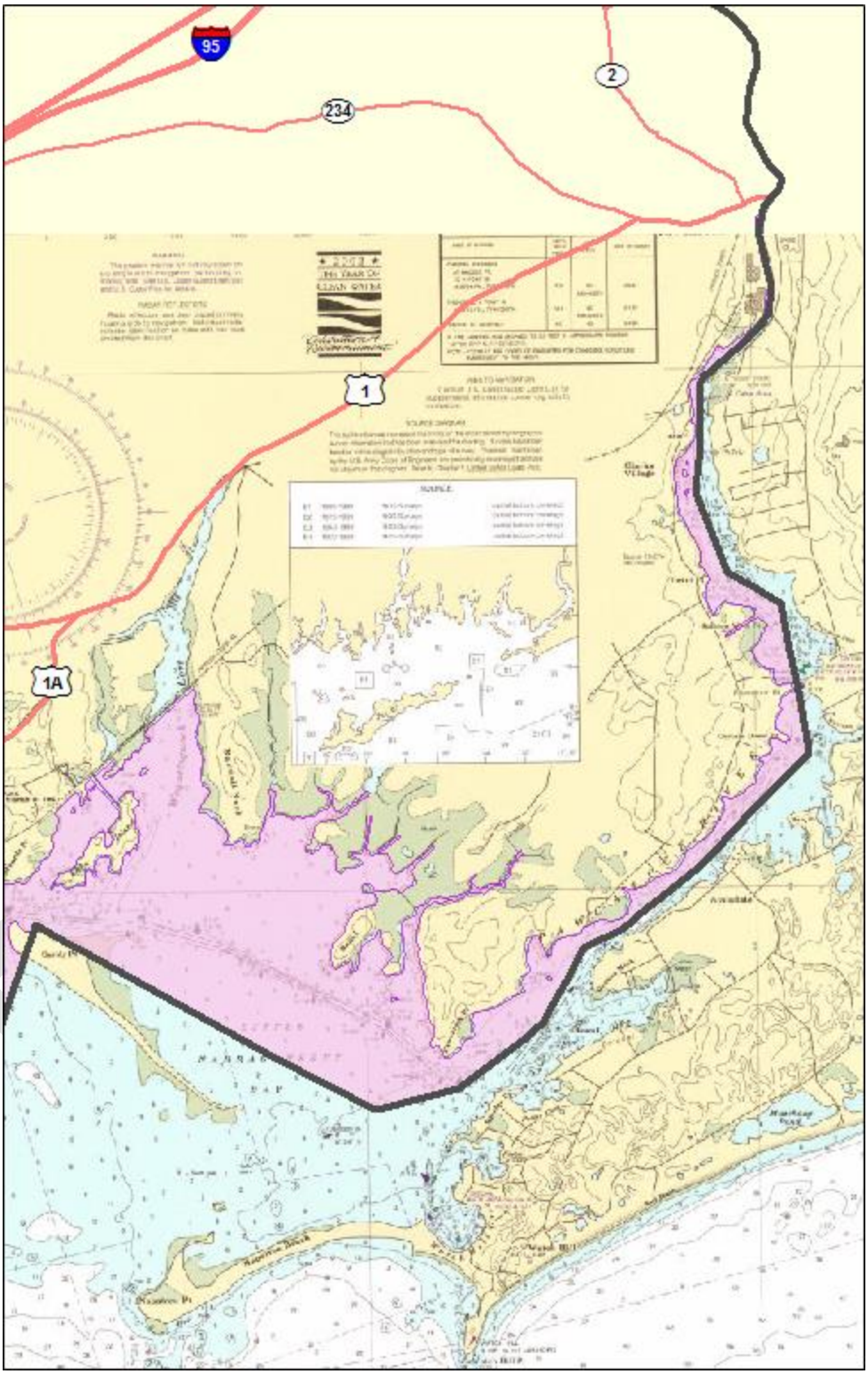


Figure 3-2 The easternmost border, showing the Connecticut state line through the Pawcatuck River, Little Narragansett Bay, and Sandy Point.

To complete the eastern boundary area and collect relevant New York waters, the Planning Team used the EPA Long Island Sound Study National Estuary Program Ecoregion Boundary (Figure 3-3). As a federally recognized entity working in a bi-state capacity with Connecticut and New York, it was felt this provided a reasonable and defensible approach. The Ecoregion Boundary, which extends from Orient Point NY to include Plum, Great Gull, Little Gull, and Fisher's Islands, was joined to the CT State line data at a point roughly halfway between Fisher's Island New York and Napatree Point, Rhode Island.

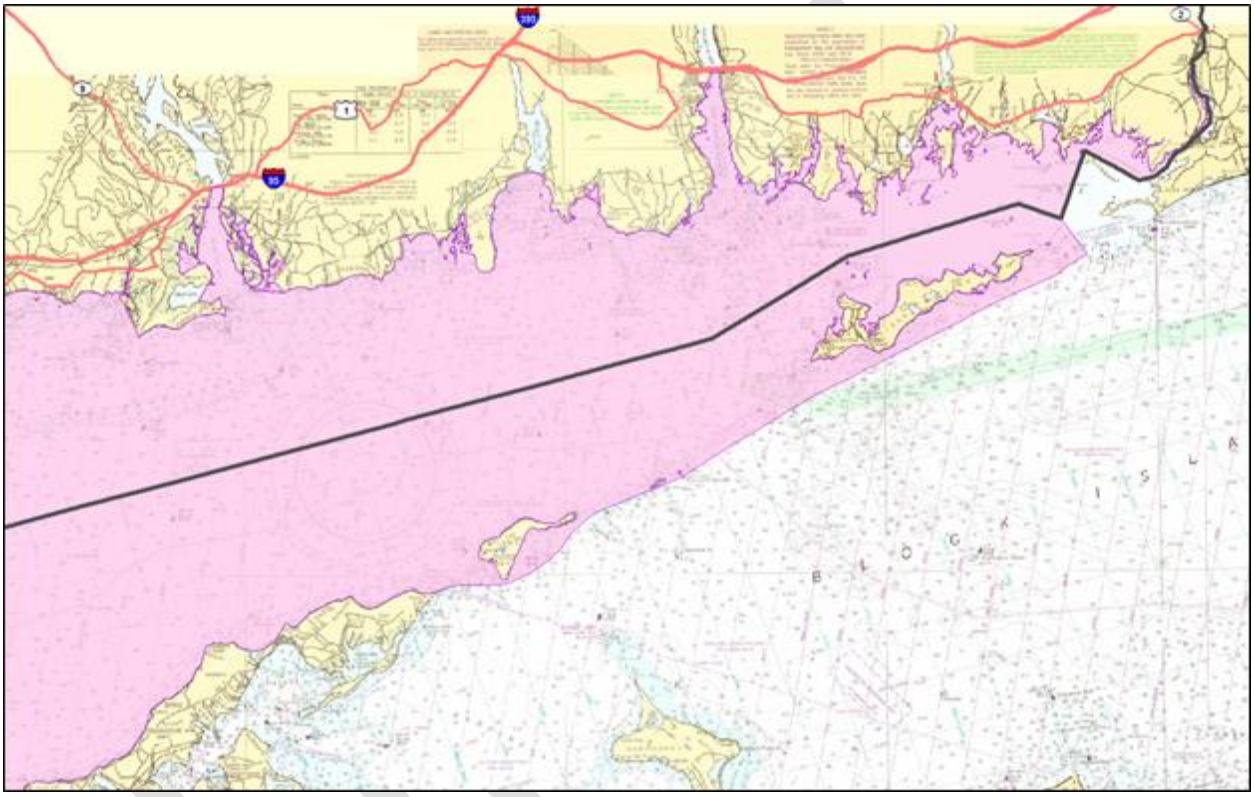


Figure 3-3 The complete eastern planning area boundary using both the EPA Long Island Sound Study Ecoregion area as well as the state lines between Connecticut, New York and Rhode Island.

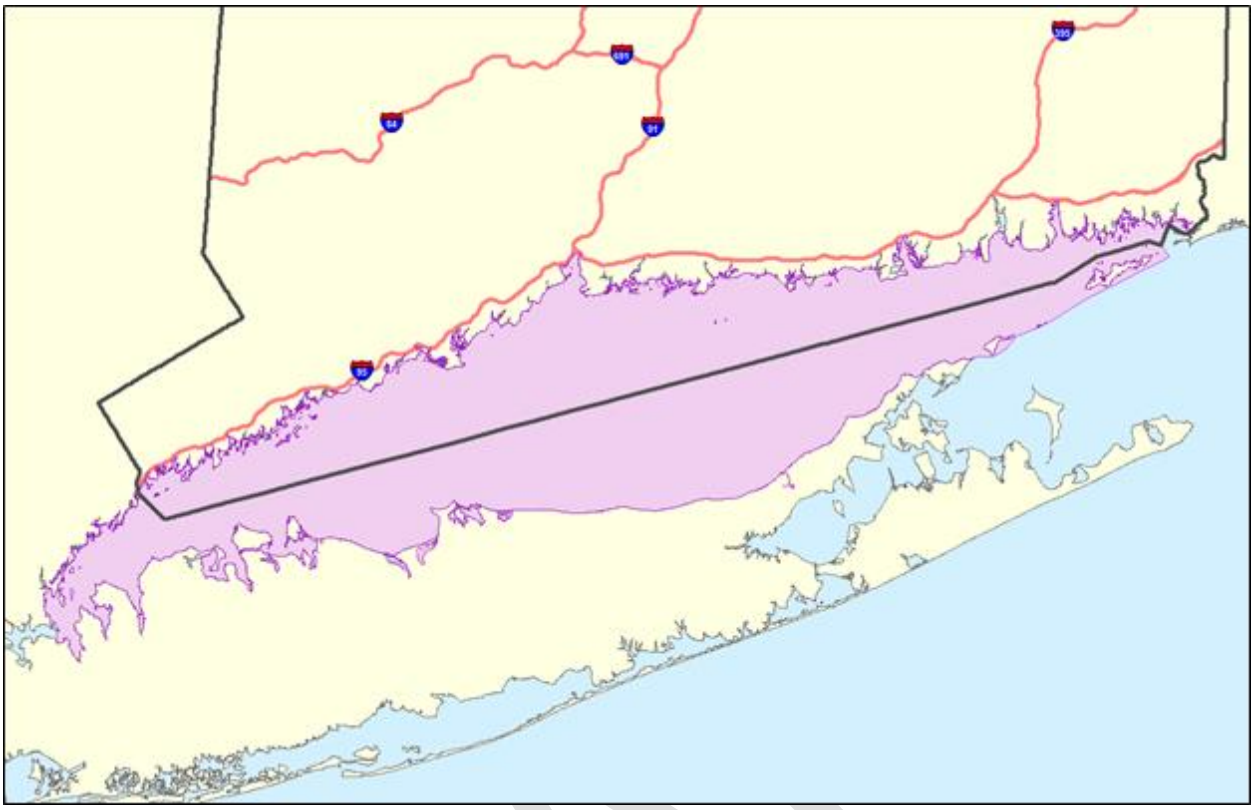


Figure 3-4 The complete extent of the LIS Blue Plan Planning area.

These state-level data sources were either based directly on Digital Line Graph (DLG) files produced by the U.S. Geological Survey (USGS) or created by State governmental agencies that digitized and attributed town boundaries typically published on 1:24,000-scale USGS topographic quadrangle maps. Therefore, it must be noted that these boundaries, while suitable for planning purposes, do not depict official state delineations established by the respective state and municipal governments, and may contain boundary line errors (Figure 3-4).

❖ Policy Area

The Policy Area is a subset of the planning area and uses a statutorily defined bathymetric depth contour as the delimiter. Unfortunately, the most definitive and well-maintained source of bathymetric data, NOAA Nautical charts, do not provide values that correspond to -10ft North American Vertical Datum of 1988 (NAVD88) as set in statute. Charting depths use a different datum (effectively the "floor" or "0" value) – typically Mean Lower Low Water (MLLW), and not a geodetic datum such as NAVD88. The result is a value of 10ft NAVD88 will correlate to some other value in MLLW. There is, however, an online tool called VDatum provided by the NOAA National Ocean Service that can convert depth values between datums (NOAA, 2018). Thus, it is possible to convert the 10ft NAVD88 value to a MLLW value found on Nautical charting data that is the same or close to it to use as a proxy. Using the VDatum tools

and looking at key points (Thames River, CT River, Bridgeport) to account for the spatial variability of the tidal range across the Sound, an average value of -12.6ft MLLW provided a best estimate for -10ft NAVD88 (Table 3-1).

Table 3-1 Calculating an average value of MLLW as a best estimate for -10ft NAVD88.

Best Estimate of -10ft NAVD88			
	NAVD88 (ft)	MLLW (ft)	MLLW (ft) equivalent to -10 ft NAVD88
Bridgeport	0	Approx. -3.7	-13.7
CT River	0	Approx. -2.2	-12.2
Thames River	0	Approx. -1.8	-11.8
		Average:	-12.6

This value (converted to -3.8 meters) was cross-referenced with geospatial bathymetry data extracted from Harbor-scale Electronic Nautical Charts (ENCs). The ENC data do not provide an exact numeric match, but the -3.6 meter depth contour was the best approximation, as compared to -1.8 meters and -5.4 meters, the next closest options. It should be noted that while this provides the best possible bathymetric depth data available for the policy area boundary, it slightly overestimates it the further west one goes; in other words, the -3.6 MLLW depth contour is actually closer to -8 ft NAVD88, approximately 2 feet shallower in Bridgeport than it is at the mouth of the Thames River. Once the best possible bathymetric contour from the digital charts was identified, depth areas waterward of this were selected. These were further refined by using CTDEEP data on Channels, Basins, and Anchorages to fill gaps in nearshore areas where the depths would exceed the -10ft minimum. Manual cartographic editing was employed to fill slivers and holes resulting from merging different data sets, and the entire area was manually reviewed using nautical chart images to correlate areas. As needed, manual cartographic editing was employed to parse out small islands or shallow areas around them and to approximate depths in the Oyster Bay area of New York where NOAA bathymetric contours were not available. Finally, the extents were clipped using the planning area boundaries defined previously (Figure 3-5, 3-6).

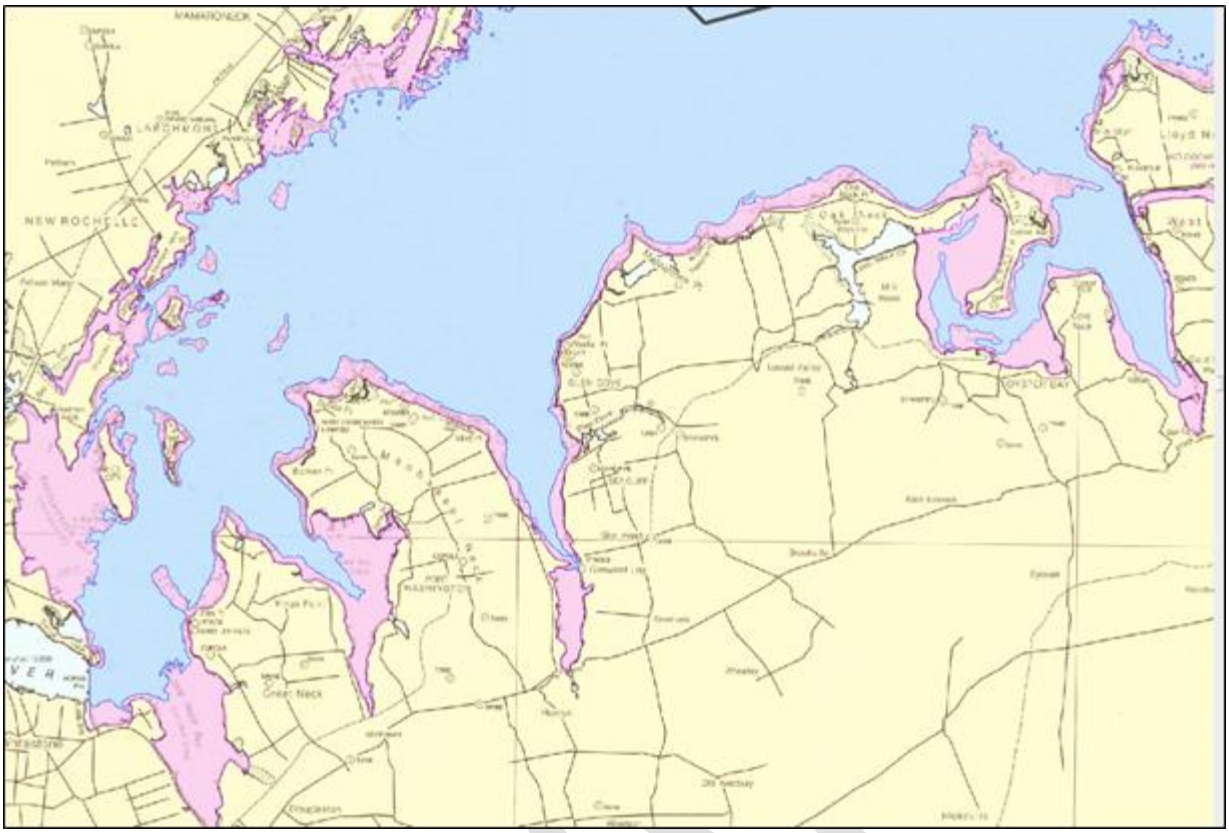


Figure 3-5 The Blue Plan Policy area (in blue) shown on top of the Planning area (in purple). The areas surrounding the small islands were refined during a manual review of the data, and areas within Oyster Bay, NY in the upper right were manually added.

Figure 3-6 An example in the Bridgeport, CT vicinity showing where navigation channel data was used to augment NOAA bathymetric data. Policy areas appear in blue, planning areas in purple.

3.3 Overview of Inventory Process

Long Island Sound hosts diverse uses including recreation, aquaculture, commercial and recreational fishing and boating, marine trades, energy and transportation, and habitats for fish, shellfish, birds, marine mammals, and plants. Human use sectors generally depend on and are closely related with natural resources. For example, one can assume that people generally fish where there are fish, and loss of fish would impact fishing activities. Protecting offshore and coastal resources, traditional uses, and community character while simultaneously considering changing environmental conditions and proposals for new offshore activities presents a complex set of challenges. Comprehensive, coordinated, and proactive planning is needed to improve the Sound's ability to support thriving habitats, abundant wildlife, and sustainable and resilient communities.

Sound and informed decision making requires a strong base of objective, science-based and verifiable information on where different natural resources and human activities take place. This

was accomplished through the development of the Long Island Sound Resource and Use Inventory, under the guidance of the Inventory and Science subcommittee, as dictated by Public Act 15-66, the Blue Plan legislation. The legislation required that "such resource and use inventory shall be comprised of the best available information and data regarding the natural resources within Long Island Sound and the uses of Long Island Sound", an exercise that had to be performed "within existing resources," i.e., without new state financial support

The Inventory and Science subcommittee organized and grouped sectors identified in the Blue Plan legislation, and mobilized sector-relevant members of the Blue Plan Advisory Committee and staff members to gather and review relevant information. Following an initial review of those datasets for technical quality, sector-specific experts and stakeholders were engaged in a review of associated map products for accuracy, representativeness, and relevance. Experts also helped identify significant data gaps, along with the existence of datasets not yet identified by the Blue Plan team that would help address such data gaps. In some cases, stakeholders and experts were directly engaged to summarize and integrate information and knowledge not previously available, or to complement existing information. The result of this effort is a series of objective and extensively stakeholder/expert reviewed/endorsed geospatial information summarized to the extent possible through a series of maps, along with an associated narrative, to "tell a story" about a given sector. The Inventory is based on the best available information, but it is certainly not perfect, and data gaps are identified in each chapter. Further details, information, and data can be found in the Inventory.

3.4 Designation of Ecologically Significant Areas and Significant Human Use Areas

Human activities and natural resources occur throughout the Sound. The Blue Plan recognizes that Long Island Sound is unique as a whole; no single resource or use is more valuable than all others, and that maintaining a productive estuary is best for the species and people that depend on it. Certain places in the Sound, however, do stand out as having attributes that set them apart from similar areas, and should receive special recognition and protections. Without an effort to recognize those "special places," there would be no way for a planning process to make recognize areas of intense, unique, and special use or with characteristics of particular importance for natural resources. In other words, if every location is deemed equally "important," there would be no way to recognize real "priority" areas that deserve special attention.

The Inventory is focused on objective geospatial information on which to base a forward looking marine spatial Blue Plan. However, judgement and interpretation of the data from the Inventory was necessary to facilitate the identification of the most important areas for categories of natural resources and human uses, to help prioritize areas in the Blue Plan. This was accomplished through the designation of "Ecologically Significant Areas" (ESAs) and "Significant Human Use Areas" (SHUAs), on which many Blue Plan policies are based.

Protecting the integrity of ecological features and human uses in Long Island Sound is a primary goal of the Blue Plan. The identification of these critical elements and their spatial locations is a necessary step for enabling the Blue Plan and its policies to meet the protection goal. Using state-of-the-art approaches to understand what constitutes ESAs and SHUAs and where they are located allows the Blue Plan policies to better inform all parties when considering new uses of the Sound.

Most SHUAs are unique concentrations of a particular type of activity or activities, locations that support a large number of participants in that use. These areas support the livelihoods and/or recreation of many individuals, but most currently have no special protections prohibiting other new uses from degrading their unique qualities. Many of these areas were not well understood before the Blue Plan process, and through the development of SHUAs some use communities received recognition for the first time. A few SHUAs are noted for National Security reasons; in all cases SHUAs have been identified with the dual goals of protecting access for those that use and value the area now and to reduce conflict with new activities in the future.

Similarly, ESAs are locations of unique environmental conditions or species concentrations. The process for describing and delineating these was significantly different from the SHUA process (both discussed below), but the resulting criteria are functionally the same: areas that are important, more than anywhere else in the Sound, to particular species or communities and need to be recognized as such. As with the SHUAs, pioneering, specific work went into identifying what should be included as an ESA, yet the intent of the process was not to prove that all of LIS is important for one reason or another. In fact, the effort was quite the opposite: to determine, of all of the vibrancy in the Sound, what places are truly unique and truly worth establishing specific siting and performance standards for. Protecting these unique areas does not conflict with their wise use, but rather supports a diversity of human uses. Without eelgrass there would be many fewer sportfish and without complex seafloor there would be no lobster. A good understanding of the most important places to pay attention to helps preserve the Sound and its resources, while enabling sustainable economic growth.

Below are some important overall facets to bear in mind regarding ESAs and SHUAs:

- ***Note on "Significant:"*** In general, significant is relative to the larger goal of sustaining the features and functions of the Long Island Sound ecosystem and sphere of existing human uses over time. Nevertheless, the ESAs and SHUAs do not attempt to measure, calculate or specify what level of damage or adverse alteration would represent an unacceptable diminishment or undermining whether from a single impact or cumulatively over time. The ESAs and SHUAs do point, however, to the elements that are considered important or *significant* for sustaining the LIS ecosystem and key human uses. These areas, by generally representing the highest levels, qualities or other traits of LIS marine life and key use components, point to places where adverse alteration is arguably more likely to result in tangible, identifiable or measurable impacts, even if the full ramifications to the overall systems are not immediately known.

- ***ESAs and SHUAs are spatial*:** These areas are spatial in nature, they represent the locations where we use the Sound, and the locations of ecological significance. This means the ESAs and SHUAs are represented on maps – distinguishing one geographic area from another. Depicting *locations* is different than general descriptions, illustrations, or other representations of marine life and ecological features.

- ***ESAs and SHUAs are depicted on maps but are defined by Criteria*:** Rather than relying solely on locations to reflect what should constitute an ESA or SHUA, written criteria were developed to define them as objectively as possible. These criteria were based on assessing other similar criteria established for marine spatial plans in the Northeast (e.g. Northeast Regional Ocean Plan, Massachusetts Ocean Plan, Rhode Island Ocean Special Area Management Plan) along with considering the characteristics of LIS. They provide an ongoing basis and definition of what is meant by an ESA or SHUA. This means that there is a stable reference point so that differences in the extent and feasibility of data and/or changes in data over time, can be accounted for. The criteria prevail over a given ESA or SHUA map recognizing both the potential shortcomings of data and associated maps and the dynamic nature of the Sound.

- ***The ESAs and SHUAs are connected to Blue Plan Policy*:** In addition to providing substantial ecological and human use information and insights about LIS "in one place," these areas are directly connected to Blue Plan Policy (See Chapter 4 for more specifics). In some cases, there are not any siting or performance standards beyond the general policies of the Blue Plan; in other cases, there are siting and performance standards associated with the specific ESAs and SHUA layers/criteria in additional to the general policy.

- ***The ESAs and SHUAs are relevant to both the Planning area and Policy area:*** The planning area includes up to and where appropriate, upland of the mean high-water line of LIS. The Policy area is the 10-foot depth contour and deeper. Although Blue Plan policies will only apply within the Policy areas, important places in the coastal zone were also included in the ESAs and SHUA. The decision to represent these places involved a desire to present a more holistic view of the Sound. For example, these places can provide connection to biological and ecological processes in the offshore environment. Coastal wetlands and submerged aquatic vegetation are prime examples. Similarly, activities in the Policy area may affect human uses outside of it; in-water structures may present a visual impediment to scenic resources as viewed from access points along the shore.

- ***ESAs are required by Statute and unprecedented for Long Island Sound*:** Although the identification of ESAs is of practical importance to the functioning of the Blue Plan, they have also been called for in the enabling Blue Plan statute, PA 15-66 - their identification fulfills a statutory requirement. It is also noteworthy that a comprehensive and spatial depiction of ecologically significant areas in Long Island Sound is unprecedented. It is also unprecedented for such ESAs to serve in helping carry out official policy for the management of new uses in Long Island Sound – that has not been previously accomplished.

While there was no similar specific provision for SHUA's in Public Act 15-66, the PDT felt strongly that the human uses in Long Island Sound required a similar level of attention. As a result, the SHUA treatment was implemented as a value-added process.

- ***ESAs and SHUAs represent priorities, not a general description of the LIS ecosystem and sphere of human uses:*** An in-depth assessment was made of the LIS ecosystem and the assorted sets of human uses to find the ESAs and SHUAs. These areas, by definition, represent priorities or places that are disproportionately notable and/or important. As such, it is important to note that ESAs and SHUAs do not by themselves represent a full description of the LIS ecosystem or human uses. Such a goal would entail much greater description and coverage of the full extent of LIS marine life ecological factors, both biotic and abiotic, and the way in which the Sound is used; which for this effort was not practical.

- ***Overall LIS ecosystem and sphere of uses remains important:*** It is very important to be clear that as the ESAs and SHUAs call attention to priority areas, the overall LIS ecological integrity and the ways in which people use the Sound remains important. By recognizing an areas as an ESA or SHUA does NOT mean non-ESA or non-SHUA areas are unimportant. It is the full collection of interacting elements, features, and uses of LIS that allow it to be as ecologically and economically vital as it is. It is also this "full collection" that allow the many specific characteristics of the Sound to be recognized and appreciated. Blue Plan policy decisions will not only take into account the ESAs and SHUAs but will continue to address the need to protect LIS overall.

- ***The ESAs and SHUAs represent what we know but there is much more to learn:*** Fortunately, the Blue Plan process has discovered, assembled, utilized, and integrated a remarkable extent of data and information about marine life, their ecosystem, and the myriad of ways we use and rely on LIS. Many of the maps stem from current and complete information. Other maps depict high quality information but only where observations have been taken. Additionally, the Sound is a dynamic system and climate change is accelerating the rate of change. Data that we have at this time will not necessarily represent change that is inevitable.

ESAs and SHUAs represent an ambitious and thorough scientific effort to characterize the significant ecological and human use areas of the Sound and the results are credible on the basis of the information that we have now. However, there remains much we do not know and there is little doubt that other areas exist that we have not identified because we do not yet have the data and/or methods to reveal them. A significant example is the over 30 years of fish trawl data collected by the CT DEEP which provides profound insights into LIS fish and invertebrates. The sampling locations, while present throughout most of the Sound, do not cover all key areas, especially in the far eastern and western parts, because of bottom structure that is incompatible with the trawl techniques. What we have from the trawl survey is robust but not complete for the Sound and this needs to be recognized. As such, the ESAs and SHUAs identified through this current Blue Plan effort represent, in essence, the "minimum" areas. This consideration is another factor in remembering that "all of LIS remains important" when decisions are made

regarding proposed new uses and the local, site specific information that may remain key for specific, individual projects.

Solidly anchored in the objective geospatial information of the Inventory, and through well-defined and transparent processes, ESAs and SHUAs were carefully defined by criteria used to generate a series of maps with extensive input from topical experts and stakeholders. This new series of integrative and interpretive maps were further publicly reviewed and are made available through a user friendly website for use by managers, users, and project proponents in a "point and click" manner that allows the integration of ESAs and SHUAs across sectors for use in identifying overall intensity of "use" for a given area, along with the identity of natural resources or human uses in different locations. The identification and easy visualization of the ESAs and SHUAs, and link to associated policies, represent the backbone of a forward looking plan that will help protect natural resources and human uses, while facilitating the siting of future uses in a manner that will minimize conflicts and maximize compatibility, to meet the goals of the Blue Plan.

3.4a. Designation of Ecologically Significant Areas

a. Introduction

This section includes a summary of the approach, rationale and methodology used for identifying the ESA along with a representative sampling of the ESA results. The full set of results are contained in Appendix 2: ESA Supplemental Information and Maps which includes a discussion of each of the 14 ESA Criteria with a full set of corresponding maps. These 14 ESA Criteria fall under two overarching pillars: (1): Areas with rare, sensitive, or vulnerable species, communities or habitats and (2): Areas of high natural productivity, biological persistence, diversity and abundance, including areas important for supporting or exhibiting such features. Each of the criteria represent a layer of ESA. The two sample results represent an ESA from each of Criteria Pillars.

Appendix 2 is important for providing the full story of what the ESA are and how they were developed. Appendix 2 also has key tables and other material that track the process and results, e.g. ESA Layer Construction tables that provide the technical details needed to reproduce the results. Finally, the "Ecological Characterization Summary" is an additional stand-alone document providing the broader picture of what the ESA were drawn from. It can be used with ESA to gain a more complete ecological picture of places in the Sound.

b. Approach, Rationale, and Methodology

i. Approach and Rationale

The underlying thesis in identifying the ESA is that the ESA are more than notable areas in and of themselves. They also serve to represent places important for sustaining the ecological integrity of the Sound as a whole. In short, the ESA are intended to be places that represent both what is best in the Sound biologically and what is important for its function ecologically. The approach taken charts a course that takes both into account, uses the latest data and current state of knowledge and produces practical results within a small budget. Within this frame it remains important to qualify the results. Because the extent of data is limited as is the ability to represent the multiple complexities of an ecosystem, the ESA are only a proxy for the LIS ecosystem. It is also important to reiterate that the ESA pertain to geographic or spatial considerations of the LIS ecosystem. As such, the ESA are not intended to address other important ecological factors such as water quality.

There can be many interpretations or opinions on what constitutes something that is "ecologically significant." The answer for the LIS Blue Plan starts with the LIS ESA Criteria, which, as noted above, serve as the basis for defining and finding all of the ESA. Within each of these criteria, the ESA typically represent the areas where these features exist (e.g. areas of coastal wetland) or the top 20% of the range and distribution of the feature (e.g. top 20% of seafloor complexity). A summary of the 14 ESA Criteria follows:

Criteria Pillar 1: Areas with rare, sensitive, or vulnerable species, communities or habitats including:

1. Hard bottom and complex sea floor
2. Areas of submerged aquatic vegetation
3. Endangered, threatened, species of concern or candidate species listed under state or federal ESA, and their habitats
4. Areas of cold water corals
5. Coastal wetlands

Criteria Pillar 2: **Areas of high natural productivity, biological persistence, diversity and abundance, including areas important for supporting or exhibiting such features relative to …**

6. Cetaceans (marine mammals)
7. Pinnipeds (seals)
8. Sea turtles and other reptiles
9. Birds
10. Fish
11. Mobile invertebrates (e.g., American lobster)
12. Sessile-mollusk-dominated communities (e.g., blue mussels)
13. Managed shellfish beds

14. Soft-bottom benthic communities

In addition to being based on criteria used for other marine plans in the Northeast, these criteria, taken together, are meant to capture two major ecological considerations both of which are deemed essential for sustaining the features and function of the LIS ecosystem. The two ecological considerations are:

One, *representation* of the major and multiple marine life expressions in LIS, particularly its species, natural communities and habitats – and to capture the best of this broad spectrum. The idea is to be representative across the range of taxa and habitats. The approach includes attention to those species, communities and habitats that are sensitive, vulnerable and/or rare.

Two, capturing the habitats, communities or places that embody or provide key *ecological processes and roles* that serve or support the healthy functioning of the LIS ecosystem.

There are additional ecological considerations built into these criteria: capturing multiple ecological factors in single measures such as persistence and abundance and using biological measures to account for non-biological (abiotic) processes and/or chemical measures:

Multiple Ecological Factors:
By identifying areas of high natural productivity, biological persistence, diversity and abundance, each of which are single measures, we are identifying the places where marine life is, in layman's terms, "doing the best." Sometimes ecological factors can be identified in association with why these areas emerge with the highest numbers (e.g. high-water quality, strong food sources, suitable habitat structure). In many cases, it is not clear what the factors are. What is clear is that there is some combination of ecological factors at work, whether known or not. The idea is, by identifying the best or highest of these measures we are also capturing areas where other ecological factors are at play that matter to the ecosystem as a whole.

Abiotic Processes:
A full examination and understanding of the LIS ecosystem includes the large role of abiotic processes such as hydrological circulation, tides, storms and chemical measures such as temperature, salinity, water quality and more. The approach taken in identifying the ESA was to emphasize the known elements of the living system with a general assumption that the abiotic elements are integrated into the expression of the living system. Future efforts to better delineate significant ecological areas may find benefit in focusing more on the geospatial implications of abiotic processes and chemical measures.

Approach for addressing limited data and information:
This is an important subject of the ESA and addressed in more detail in Appendix 2. In general, two points are noted here. One, the use of criteria definitions points clearly to what is being sought and intended by a given ESA layer whether the data is sufficient for fully representing the criteria or not. Additionally, the ESA results are clear and upfront about noting where data is lacking and how the ESA results are correspondingly incomplete.

ii. Methodology: Procedural Process

The following describes the ESA process procedurally. It is a short summary of who did what to produce the ESA. Please see Appendix 2 for a more complete history.

Blue Plan Ecological Characterization Work Team (ECWT):
The ECWT was formed at the beginning of the Blue Plan process to give direction and provide work support for the ecological aspects of the Blue Plan formation process. This bi-state group was the core team for overseeing the ecological elements of the Inventory.

Formation and Engagement of Ecological "Interested Parties":
Early on a robust effort was made to identify scientists and experts in marine ecology to provide and review data and help assure a scientifically rigorous ESA process. Over 100 "Ecological Interested Parties" were approached, multiple webinars held and at least 60 participants engaged to complete this phase. Please see Chapter 1 of the Inventory for more detail.

Blue Plan Resource & Use Inventory:
The major work product on the way to identification of the ESA was completion of the Inventory which contains the wealth of ecological data sets, information and guidance that would provide the foundation for the ESA work.

Ecological Characterization:
The Ecological Characterization (EC) process was used in preparation for and as an active part of the effort to identify the ESA. In short it represents the scientific and data development work that transpired after completion of the Inventory. The EC process made the data usable for analysis which often meant making new maps. It also produced data synthesis and data products so ecological significance could be discerned. Key results of the EC process are contained in the "Ecological Characterization Summary (ECS)" noted in the Introduction. A short description of the ECS is included in Appendix 2.

Ecological Consultants:
Two ecological consultants were hired to support the Inventory, the EC and ESA processes. They played very significant roles in providing technical expertise and large work output throughout the process. The first contract was with EPI Consulting, LLC (Nick Napoli principal) and the second contract was with E & C Enviroscape, LLC (Emily Shumchenia, principal).

Formation of the Ecological Experts Group (EEG):
A major step for identifying the ESA was forming the "Ecological Experts Group (EEG)" from the larger "Ecological Interested Parties." This body of marine ecologists, researchers and other experts provided the scientific horsepower, credibility and raw work hours alongside the consultant and Blue Plan leadership to carry out the process. The following is the EEG roster:

Chris Elphick	University of Connecticut
Christian Conroy	University of Connecticut
Emily Shumchenia	E&C Enviroscape, LLC, Lead Consultant
Giancarlo Cicchetti	U.S. Environmental Protection Agency
Kevin O'Brien	Connecticut Department of Energy and Environmental Protection
Maxine Montello	Riverhead Foundation for Marine Research and Preservation
Melissa Albino-Hegeman	New York State Department of Environmental Conservation
Nathan Frohling	The Nature Conservancy, Blue Plan Advisory Committee, Project Lead
Nick Napoli	EPI Consulting, LLC, Consultant
Penny Howell	Connecticut Department of Energy and Environmental Protection, retired
Peter Auster	Mystic Aquarium/University of Connecticut
Tessa L. Getchis	Connecticut Sea Grant/University of Connecticut

The ESA Process:
In summary, the EEG, Consultant and ECWT 1) developed the methods for identifying the ESA, 2) secured additional data and information, 3) developed and finalized the ESA Criteria, 4) generated outputs of maps, data products, data synthesis and recognized ecological models and 5) final draft ESA maps.

Review by Scientists and the Public:
During the ESA process there were multiple communications with scientists and experts outside the EEG that assisted in moving the ESA process forward. At the end, a series of formal presentations of the draft ESA were made to the larger

body of Ecological "Interested Parties" and the public. Additional ESA refinements were made as a result leading to the final draft ESA.

iii. Methodology: Technical Process

The following is short overview of the technical process used to develop the ESA. Presentation and explanation of each of the ESA layers and how they were prepared including associated data is provided in Appendix 2. The section below shows final result samples.

Start with the Statute:
The Blue Plan legislation (PA 15-66) calls for the Inventory to be comprised of information and data regarding "all plants, animals, habitats, and ecologically significant areas." These very basic categories were translated into multiple sub-categories which formed the basis for how the Inventory was prepared and organized.

ESA Criteria:
The next major step was forming the ESA Criteria discussed above. These would be connected to and generally encompass the natural resource categories of the Inventory but not be a literal translation of them – in keeping with the scientific rationale and basis for the ESA Criteria as discussed above. There would also be additional factors and characteristics brought into the ESA Criteria not captured by the natural resource categories (e.g. areas of highest abundance). Appendix 2 includes a section showing the connection between the natural resource categories and the ESA Criteria.

Framework for Translating Data and Criteria into ESA:
With draft ESA Criteria in hand, the EEG, ECWT and E & C Enviroscape identified a framework for how ESAs would be synthesized and presented, even before all datasets were assembled. Three principal elements emerged:

1. Definitive areas: Developing presence/absence layers for each ESA criterion where the criterion lends itself to this binary approach. For example, if the ESA is something that wherever it shows up, it is considered ESA, the general task is to map where it is present.

2. Continuous Variables/Thresholds: In many cases the ESA criterion involved working with a range from low to high or small to large such as species abundance. After significant deliberations and review of multiple ESA criteria where this applied, it was decided by the EEG that in general, the top 20% would be considered "ecologically significant."

3. Expert Input/Participatory Mapping: (PM; aka Participatory GIS): Expert input from scientists and experts was used as a tool for identifying specific areas of ESA through PM when data was limited but direct knowledge of relevant geospatial areas was sufficiently robust. Although there was relatively little PM contributing to the ESA because the existing data was sufficient in representing the existing extent of knowledge (even if limited), there were valuable PM additions relative to birds, pinnipeds, cetaceans and sessile-mollusk-dominated communities. These were made as part of receiving input from experts as part of the broader scientist and public review process held in December 2018.

Places with Multiple ESA:
The approach acknowledges that a place can be ecologically significant for more than one reason; sometimes those reasons are directly driven by the local ecology or where there may be a link or connection between the ESA layers (e.g., hard bottom and complex seafloor with cold water corals). Other times the reasons are indirect or where there is no link or the link is less clear (cold water corals with cetaceans). There are many places with more than 1 ESA. With this in mind it is important to recognize that the ESA occur in different locations vertically in addition to horizontally. There is also consideration for variability in time or season. Bird ESA are formed considering spring and fall seasons and represent the air and water surface stratum. Water-column based fish are the middle stratum and consider season. There are several sea-floor or benthic-based ESA such as hard bottom. The approach recognizes that there may be different planning and management considerations for different components of ecological significance; for example, siting and performance standards for hard bottom and complex seafloor may be very different than for birds.

Technical Steps:
There are 12 technical steps that have been outlined to generally describe how the ESA were identified and depicted on maps. This information is contained in Appendix 2. Additional ESA Layer Construction Tables are also provided in Appendix 2 that provide highly technical and specific information sufficient to enable the ESA to be reproduced.

c. Sample Results

Introduction
A representative sampling of overall ESA results is shown below to provide an understanding of the full picture of ESA while keeping the volume of information within reason. Please see the Appendix 2 for the full set of ESA layers and associated results including all the ESA-related maps and ESA Layer Construction Tables. The stand-alone

"Ecological Characterization Summary" is also an important part of the full documentation of ESA.

The results presented below include a table of all the ESA Criteria with associated descriptions and supporting data sources (Table 3-2). The sample ESA results are for 2 ESA criterion. "Hard bottom and complex seafloor" is the first and "Fish" the second. Each criterion is prefaced with a summary of the overarching Criteria Pillar it falls under. For each ESA criterion, a short narrative of its ecological significance is presented. This is followed by descriptions of the principal, underlying data and associated maps used to form the ESA layer[15]. These maps are the building blocks that are combined to 1) show how the underlying layers overlap and 2) create a presence/absence layer that depicts the final map for the given ESA criterion. Next, a synthesis of all the 14 ESA criteria is presented that shows the overlay and density of all the ESA together. Finally, one example is presented of the ESA Layer Construction Tables to illustrate the full set of tables prepared for each and every criterion.

Table 3-2 ESA criteria, supporting datasets, and descriptions. Mapped data layers can be found in Appendix 2 and in a LIS Blue Plan mapping portal. Some ESA sub-criteria do not have associated datasets, but descriptions have been included so that these areas may be recognized in policy and designated if spatial information is provided in the future.

ESA Criteria, Supporting Data, and Descriptions		
ESA Criteria	**Supporting Datasets**	**Description**
Areas with rare, sensitive, or vulnerable, species, communities, or habitats		
Hard bottom and complex sea floor	• Long Island Sound Ecological Assessment (LISEA) hard bottom (pts) • USGS Surficial sediment map, gravel areas (polys) • Long Island Sound Mapping and Research Collaborative (LISMaRC) Phase II SEABOSS hard bottom observations (pts) • Terrain Ruggedness Index (top quintile) • Wrecks and obstructions (pts)	Areas of hard bottom are characterized by exposed bedrock or concentrations of boulder, cobble, pebble, gravel, or other similar hard substrate distinguished from surrounding sediments and provide a substrate for sensitive sessile suspension-feeding communities and associated biodiversity. Complex seafloor is a morphologically rugged seafloor characterized by high variability in neighboring bathymetry around a central point. Biogenic reefs and man-made structures, such as

[15] "ESA layers" refers to the maps of ESA that are used to depict the ESA criteria. ESA criteria are the written descriptions of the ESA and because they point to the "ideal" ESA, they are often more comprehensive and/or specific than the maps (and underlying data) are able to provide.

		artificial reefs, wrecks, or other functionally equivalent structures, may provide additional suitable substrate for the development of hard bottom biological communities. Areas of hard bottom and complex seafloor are areas characterized singly or by any combination of hard seafloor, complex seafloor, artificial reefs, biogenic reefs, or wrecks and obstructions.
Areas of submerged aquatic vegetation	Seagrass surveys from 2002, 2006, 2009, 2012, 2017 (polys)	Areas where submerged aquatic vegetation, e.g., eelgrass (Zostera marina), etc., are present or have been found to be present in the past.
Endangered, threatened, species of concern, or candidate species listed under state or federal ESA, and their habitats	• Atlantic sturgeon gear restriction areas (polys) • Atlantic sturgeon and shortnose sturgeon high and medium use areas (polys) • Atlantic sturgeon migratory corridor (polys) • Predicted summer occurrence of roseate tern (raster) • Connecticut Natural Diversity Database approximate locations of endangered, threatened, species of concern (polys) • Connecticut Critical Habitats (estuarine, polys) • New York rare plants and rare animals (polys) • New York Significant Natural Communities (polys) • New York Significant Coastal Fish and Wildlife Habitats (polys) • US Endangered Species Act Critical Habitat for Atlantic sturgeon (polys)	The species listed by federal or state statutes (e.g., the US Endangered Species Act, the CT Endangered Species Act, the NY Endangered Species Act) as endangered, threatened, species of concern, or candidates for listing, and their associated habitats, recognizing that detailed spatial data depicting the distribution and abundance for these marine species in Long Island Sound are potentially unavailable.
Areas of cold water corals	LISMaRC Phase I and Phase II cold water coral observations near Stratford Shoals and eastern LIS (polys)	Areas where cold-water corals have been observed or where habitat suitability or other scientific models predict they occur.

Coastal wetlands[16]	National Wetlands Inventory, clipped to Long Island Sound Study boundary (polys)	According to Connecticut General Statute (CGS) 22a-29: "Those areas which border on or lie beneath tidal waters, such as, but not limited to banks, bogs, salt marshes, swamps, meadows, flats, or other low lands subject to tidal action, including those areas now or formerly connected to tidal waters, and whose surface is at or below an elevation of one foot above local extreme high water; and upon which may grow or be capable of growing some, but not necessarily all, of [a list of specific plant species found in CGS section 22a-29(2)].
ESA Criteria	**Supporting Datasets**	**Description**
Areas of high natural productivity (HNP), biological persistence, diversity, and abundance, including areas important for supporting or exhibiting such features, relative to the following characteristics or species.[17]		
Cetaceans (marine mammals)	• Cetacean density models for the US Atlantic Coast, Duke University Marine Geospatial Ecology Lab, for species with predictions in LIS (raster) • Expert participatory mapping (polys; P. Comins, Connecticut Audubon Society, 1/4/19)	Areas where cetaceans occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support cetaceans (e.g. particular feeding areas, nursery grounds).

[16] Long Island Sound Blue Plan policies do not apply to areas landward of the 10-foot contour, and therefore, while considered Ecologically Significant Areas, Coastal Wetlands and any associated existing statutes or policies relevant to Coastal Wetlands are not within the scope of the Long Island Sound Blue Plan.

[17] Areas where natural productivity, biological persistence, diversity, and abundance are high, as well as migratory sanctuaries, stopovers and corridors, nesting areas, feeding areas, and nursery grounds for cetaceans, pinnipeds, sea turtles, marine birds, fish, mobile invertebrates, sessile-mollusk-dominated communities, managed shellfish beds, and soft-bottom benthic communities.

Pinnipeds (seals)	• NOAA Environmental Sensitivity Index seal concentration areas (polys) • Expert participatory mapping included in the Blue Plan Inventory (polys)	Areas where pinnipeds occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support pinnipeds (e.g. particular haul-out locations, feeding areas).
Sea turtles and other reptiles	• Northern diamondback terrapin probability of occurrence (polys) • Locations of 2018 coastal CT sea turtle strikes (pts) • Live sea turtle stranding's, rescues, and in-water observations, Riverhead Foundation for Marine Research and Preservation (pts) • Live sea turtle strandings and rescues, Mystic Aquarium (pts)	Areas where sea turtles and other reptiles occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support sea turtles and other reptiles (e.g. particular feeding areas, nesting grounds, hibernation areas).
Birds	• Seabird occurrence models, University of Connecticut (raster) • Expert participatory mapping (polys; P. Comins, Connecticut Audubon Society, 1/4/19)	Areas where birds are abundant or diverse including feeding areas; areas of high bird productivity including nesting areas.
Fish	• Persistently productive places for fish (polys; LISEA high weighted persistence) • Areas of high fish abundance and concentration (polys; CT DEEP Marine Fisheries Long Island Sound Trawl Survey, 1995-2004 and 2005-2014, spring and fall data for species caught in >5 tows)	Areas of high weighted fish persistence and high fish abundance and concentration.
Mobile invertebrates	• Areas of high mobile invertebrate biomass and concentration (polys; CT DEEP Marine Fisheries Long Island Sound Trawl Survey, 1995-2004 and 2005-2014, spring and fall data for crabs, lobster, squid, and horseshoe crab) • Horseshoe crab offshore hotspots (polys) • Horseshoe crab predicted high and medium use areas (polys) • Horseshoe crab predicted spawning beaches (polys) • American lobster projected thermal refuge (polys)	Areas of high mobile invertebrate (e.g., lobster, other crustaceans, squid) abundance and concentration.

Sessile-mollusk-dominated communities	LISMaRC Phase I and Phase II observations of Slipper shell (*Crepidula fornicata*) aggregations and blue mussel (*Mytilus edulis*) aggregations near Stratford Shoals and eastern LIS (polys)	Areas where wild, natural sessile-mollusk-dominated communities occur.
Managed shellfish beds	• Oyster seed beds (CT Natural Shellfish Beds) (polys) • CT Recreational Shellfish Beds (polys) • CT State-managed Shellfish Beds (polys) • CT Town-managed Shellfish Beds (polys)	Locations of commercial and recreational shellfishing harvest areas, including shellfish restoration activities and areas closed to shellfishing.
Soft-bottom benthic communities	*Adequate data not available*	Areas of soft-bottom seafloor communities where natural productivity, biological persistence, diversity, and/or abundance of marine flora and fauna are high, as well as areas of soft-bottom seafloor communities known to support important life history or important ecological functions of mobile species (e.g., migratory stopovers and corridors, feeding areas, and nursery grounds).
Zooplankton	*Adequate data not available*	Not an ESA criterion at this time, but noted for ecological relevance to productivity.

Criteria Pillar 1: Areas with rare, sensitive, or vulnerable species, communities, or habitats

Summary:

The first set of criteria considered by the EEG encompass the concepts of "special," "sensitive," and "unique" that were articulated in the statute definition. In naming this set of criteria the EEG attempted to avoid using words that could be considered to be value-laden. The criteria in this category correspond to similar components of ecological importance identified by other ocean planning and management efforts. For example, these criteria match the components "Areas of vulnerable marine resources" and "Areas of rare marine resources" that were described by the Northeast and Mid-Atlantic regional ocean plans. Some of the criteria in this category match directly to the twelve "Special,

Sensitive, or Unique (SSU) Resources" described in the Massachusetts Ocean Plan, such as the MA hard or complex seafloor and eelgrass SSUs.

The ecological components in this category play critical roles in the Long Island ecosystem but are rare or particularly vulnerable to disturbance and/or environmental change. Many already confer special protection via local, state, and federal regulations.

ESA Results: Example one: Hard bottom and complex seafloor (Criterion 1)
Definition: See "Description" in the Table above. This ESA falls under Criteria Pillar 1

Significance of Hard bottom and complex seafloor
Areas of hard bottom and complex seafloor are known to attract a variety of mobile organisms like fish and seabirds and serve as attachment sites for sessile creatures such as corals, anemones, sponges, and tube-building worms, which in-turn create additional structure and complexity that attracts and shelters marine organisms. Species diversity tends to be higher in areas of complex seafloor when compared to adjacent homogeneous seafloor, and this relationship also influences ecosystem functioning and increases ecosystem efficiency (Zeppilli, Pusceddu, Trincardi, & Danovaro, 2016). The hard bottom and complex seafloor criterion is a proxy for all of these characteristics and components. Multiple datasets were required to characterize hard and complex seafloor.

Hard bottom component
The EEG described "hard bottom" as any substrate coarser than "very coarse sand" on the Wentworth grain size scale, which is equivalent to particles greater than 2 mm in size, and includes granules, pebbles, and cobbles (collectively called "gravel"), as well as boulders. Outcrops of bedrock are also considered hard bottom. Any locations where hard bottom occurred were considered ecologically significant and contributed to the summary map of hard and complex seafloor ESA. The following data sources and associated maps each contributed to depicting the extent of known hard bottom in LIS. They were combined into one map (Figure 3-7) to create the hard bottom portion of the overall Hard bottom and complex seafloor ESA criterion.

The Nature Conservancy's Long Island Sound Ecological Assessment (LISEA) known occurrences of hard bottom
The LISEA known occurrences of hard bottom map integrates data several sources (below). The resulting layer is a point dataset depicting the locations of hard bottom. The maps and data can be accessed via The Nature Conservancy's Conservation Gateway (The Nature Conservancy, 2017).

- USGS usSEABED database - scientific measurements of seafloor type and grain size
- USGS East Coast Sediment Texture Database - scientific measurements of seafloor type and grain size
- NOAA Electronic Nautical Chart data - notations on charts of bottom type

USGS Long Island Sound Surficial Sediment map

This map represents sediment types in Long Island Sound by polygons, interpreted by USGS scientists from bottom samples, bottom photography, and side scan sonar data. The map and data were published in an academic journal (Poppe, Knebel, Mlodzinska, Hastings, & Seekins, 2000) and in a USGS open file report (US Geological Survey, 2000).

Long Island Sound Mapping and Research Collaborative (LISMaRC) Phase II SEABOSS hard bottom observations

LISMaRC, as part of the Long Island Sound Habitat Mapping Initiative, characterized seafloor type in eastern Long Island Sound in 2017 (LISS, 2017). Locations described as gravel and coarser seafloor types were included in the criterion map. These unpublished data were provided by Dr. Christian Conroy, University of Connecticut.

Figure 3-7 integrates the datasets for hard bottom and shows the extent of hard bottom that contributes to the Hard bottom and complex seafloor ESA Criterion. The points have a 160 meter buffer so they are visible.

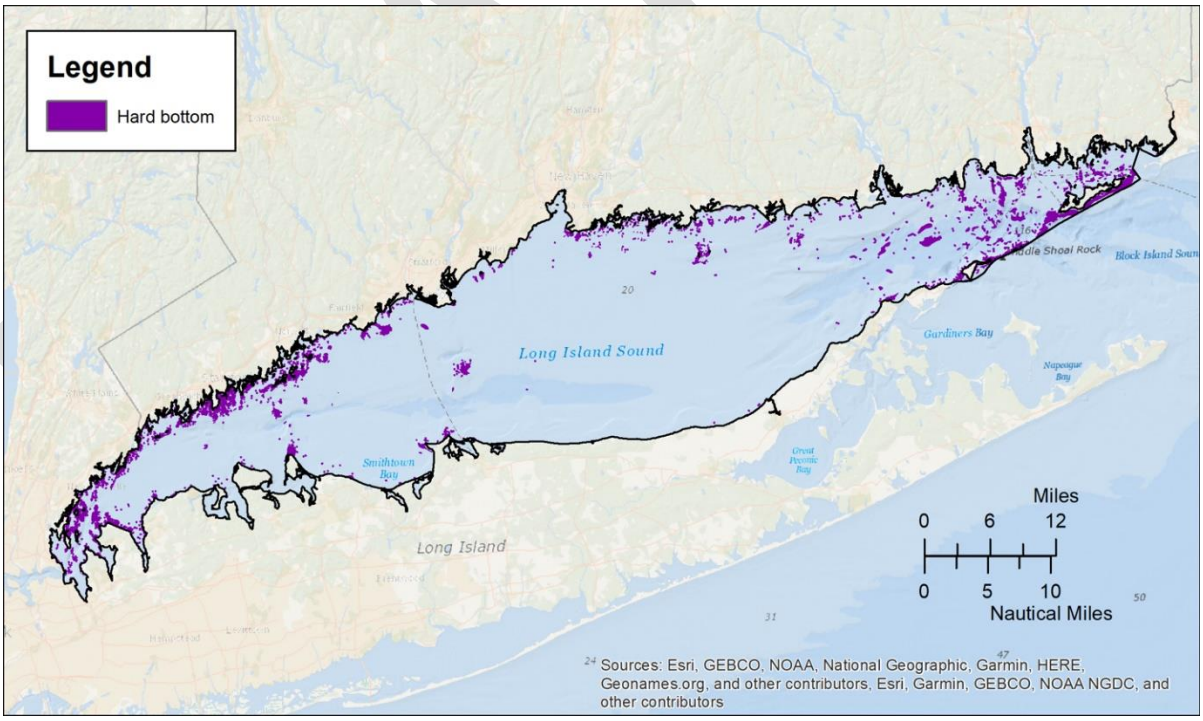


Figure 3-7 The extent of hard bottom in Long Island Sound. As mapped from the Long Island Sound Ecological Assessment (LISEA), USGS Long Island Sound surficial sediment map, and Long Island Sound Mapping and Research Collaborative SEABOSS surveys.

Complex seafloor component

The EEG identified areas of complex seafloor using the Terrain Ruggedness Index (TRI) (Riley, DeGloria, & Elliot, 1999). The TRI metric reflects the difference between the depth at each point on the seafloor and the depth of the points surrounding it. Complex seafloor has greater differences between focal points and their surroundings (which equals higher TRI), whereas featureless seafloor has smaller differences between focal points and their surroundings (which equals lower TRI). The data required to calculate TRI are full-coverage bathymetry, or depth, data. A composite bathymetry dataset with a horizontal resolution of 8 meters was created for Long Island Sound by mosaicking the most recent federal and local datasets from the NOAA National Ocean Service. Data sources including high-resolution multibeam survey data wherever available (ranging in resolution from 0.5m to 8m), and the NOAA Coastal Relief Model data (83m resolution) where high-resolution data were not available. The mosaic resolution of 8m was chosen to optimize the detail conveyed by the highest resolution datasets in the final bathymetry map. TRI was calculated at the scale of a single pixel (8m) and so the resulting TRI map has a resolution of 8m. In order to identify ESA for complex seafloor, the EEG classified the data into quintiles and extracted the top quintile (top 20%) as ecologically significant (Figure 3-8).

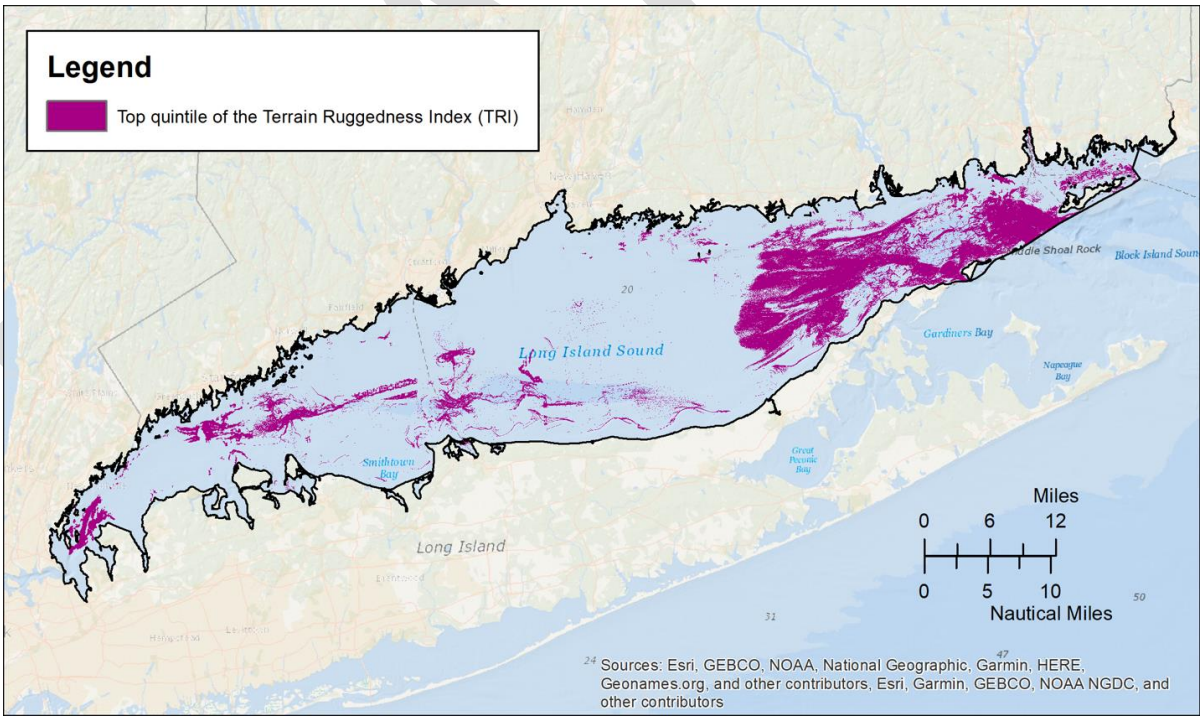


Figure 3-8 The top quintile of the Terrain Ruggedness Index (TRI) calculated at 8-meter resolution for Long Island Sound.

Wrecks and obstructions component

The EEG included wrecks and obstructions in the map of hard bottom and complex seafloor. Wrecks tend to serve as artificial reefs, and obstructions can include boulders or other hard bottom not delineated in geologic maps. The NOAA Automated Wreck and Obstruction Information System was clipped to the Blue Plan planning area for inclusion in this criterion map. Any locations where wrecks and obstructions occurred were considered ecologically significant (Figure 3-9). These also have a 160 meter buffer to be visible.

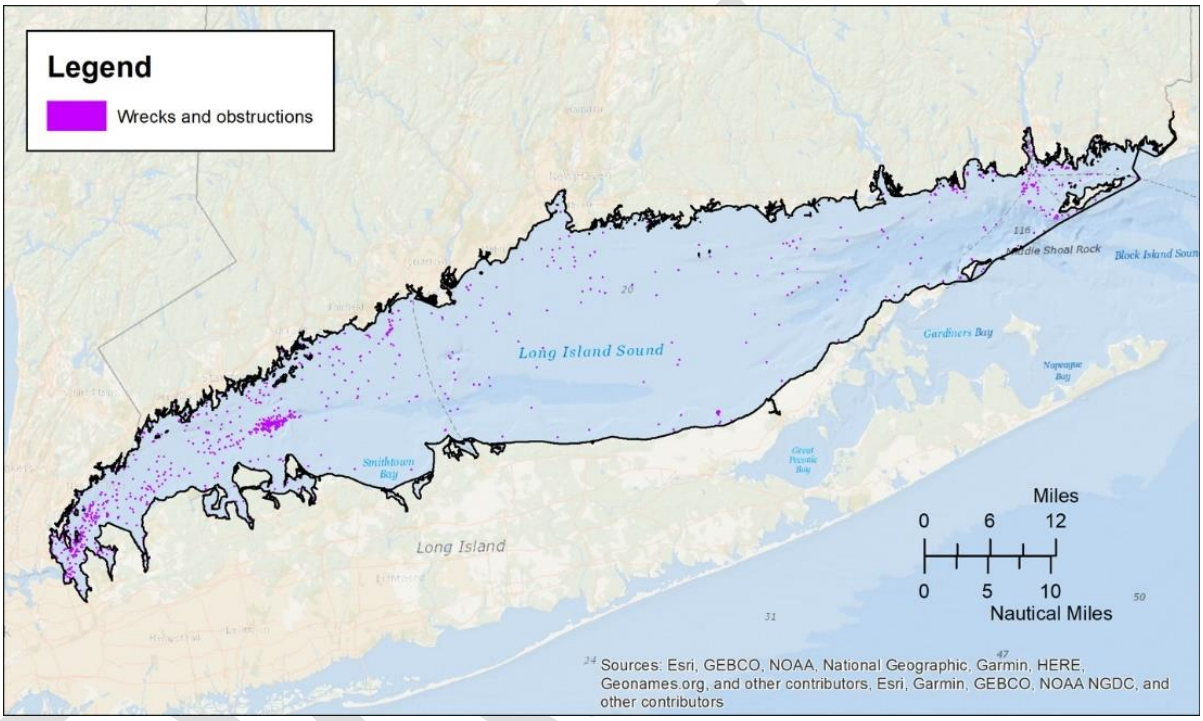


Figure 3-9 Locations of wreck and obstructions in Long Island Sound from the NOAA Automated Wreck and Obstruction Information System.

Integration of components

Each of the datasets described above (hard bottom, complex seafloor, wrecks and obstructions) were mapped together to represent the full extent of hard bottom and complex seafloor. Figure 3-10 shows the number of overlaps in those datasets. Figure 3-11 shows all of the datasets dissolved together to show a single presence/absence layer of Ecologically Significant Areas for hard and complex seafloor.

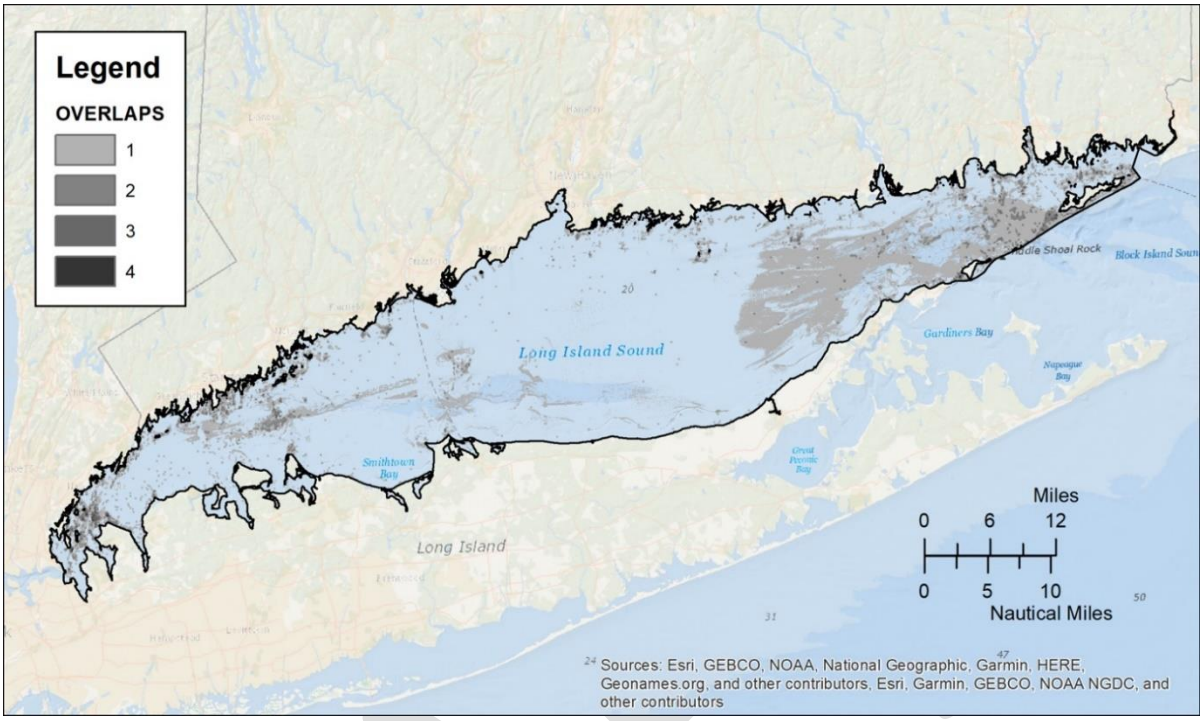


Figure 3-10 Overlaps among each of the input datasets representing the hard bottom and complex seafloor criterion.

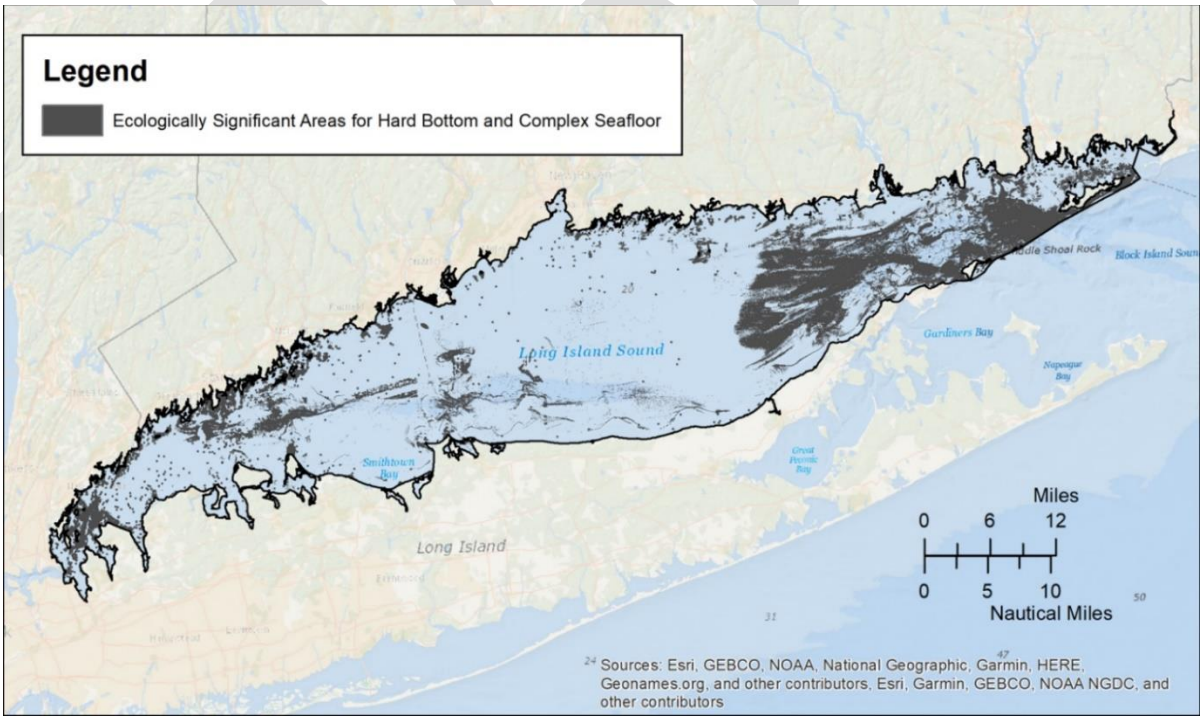


Figure 3-11 This is the final ESA map for the hard bottom and complex seafloor criterion.

Updates and potential future work
Additional seafloor observations from the Long Island Sound Seafloor Mapping Initiative and similar projects will improve the identification of both hard bottom and complex seafloor in this criterion. Additional high-resolution multibeam bathymetry surveys by these projects and/or federal agencies will also improve the identification of complex seafloor.

Criteria Pillar 2: Areas of high natural productivity, biological persistence, diversity, and abundance, including areas important for supporting or exhibiting such features, relative to the following characteristics or species (see footnote 12 above for complete title)

Summary:
The second set of criteria considered by the EEG expand on the concept of "productive" places articulated in the statute. From an ecological perspective, productivity refers to the processes of reproduction and growth. If organisms throughout the ecosystem grow and reproduce to their potential, the ecosystem is considered balanced and efficient. This balance is important for the provisioning of ecosystem services on which humans depend. Productivity as a set of processes is difficult to measure, so ecologists often use abundance, and other metrics like diversity and persistence, to understand productivity. Furthermore, the places where behaviors that allow organisms to be productive, such as feeding areas, nesting areas, nursery grounds, and migratory routes were considered important to include in this category. The EEG decided to take a taxa-based approach to gather data on these topics because the data were usually collected and presented by species group or at the taxa level. The criteria within this category are similar to the components of ecological importance identified by the Northeast and Mid-Atlantic regional ocean planning efforts "Areas of high productivity," "Areas of high diversity," and "Areas of high abundance." The Massachusetts Ocean Plan also took a taxa-based approach for several of its SSUs, including important fish resources and colonial waterbirds important nesting habitat, among others.

The broad taxonomic categories used to organize these data can potentially mask or obscure relevant spatial patterns in individual species or groups of species within a taxon. Species within a taxonomic group have diverse behaviors, life history traits, and habitat requirements, and so it could be necessary, once at the project-scale, to drill into underlying datasets to better understand how Ecologically Significant Areas for individual species could be captured by the taxonomic group's ESA, or not.

ESA Results: Example two: Fish (Criterion 10)
Definition: "Areas of high weighted fish persistence and high fish abundance and concentration"
This ESA criterion falls under Criteria Pillar 2.

Significance of Fish:
The fish criterion includes pelagic and demersal vertebrate fish species. Fish are key components of the Long Island Sound ecosystem and are critical to both human and animal food webs. In addition to fishing pressure, fish community composition in Long Island Sound is influenced by climate and environmental change. Since 1998, the fish community has transitioned to a single community adapted to higher temperatures, from a state where distinct winter-spring and summer-autumn communities existed prior to 1998 (Howell & Auster, 2012). There are likely other species-specific and functional-group-specific trends that are also relevant to management and decision-making that should be considered on a case-by-case basis. In an effort to characterize Ecologically Significant Areas for fish in a simplified, but not oversimplified way, the EEG considered metrics of persistence and abundance for species using water column habitats (i.e., diadromous and pelagic species), and seafloor habitats (i.e., demersal species). Both types of metrics use data derived from the CT DEEP Marine Fisheries Long Island Sound Trawl Survey (LISTS), which occurs in spring and fall of each year since 1984 (CT DEEP, 2019). The LISTS divides the Sound into about three hundred 1x2 nautical-mile grid cells and uses a stratified-random survey design. The survey design relies on the stratum assigned to each 1x2 nautical mile area and weights the number of samples per stratum by the amount of stratum-specific area available for sampling. Strata are 12 combinations of three bottom types and four depth intervals. Although LISTS data are representative of the entire Sound, there are some areas that cannot be effectively sampled by the Survey (e.g., The Race, shoals, reefs and trenches). Biomass has been recorded since 1992. All the data for this criterion is reported using the 1x2 nautical mile grid.

Persistently productive places for fish
The Long Island Sound Ecological Assessment (LISEA) identified persistently productive areas for fish using 26 years of LISTS data (1984-2009). These places have the highest number of species that have persisted there for the longest period (i.e., throughout each period of the LISTS, or 3 periods totaling 26 years at the time of the assessment) and each of these species have been detected at a frequency higher than expected, from just under 1 standard deviation to over 2 standard deviations above the mean. These persistently productive places for each species were aggregated into persistently productive places for fish functional groups: diadromous, pelagic, and demersal species. The maps and data showing persistently productive places for each functional group can be accessed via The Nature Conservancy's Conservation Gateway (The Nature Conservancy, 2017). From these maps, the following criteria were applied to identify Ecologically Significant Areas:

Diadromous species

- Grid cells of Diadromous species in the highest weighted persistence category
- Grid cells where both Pelagic and Diadromous species are in the second highest weighted persistence category overlap

Pelagic species

- Grid cells of Pelagic species in the highest weighted persistence category
- Grid cells where both Pelagic and Diadromous species are in the second highest weighted persistence category overlap

Demersal species

- Grid cells in the highest LISEA weighted persistence category for each of the Demersal species functional groups (Elasmobranchs, Gadids, Pleuronectids, Structure-oriented, Other)
- Grid cells where 3 or more of the 5 Demersal species functional groups are in the second highest LISEA weighted persistence category overlap

Areas of high fish abundance and concentration

CT DEEP Marine Fisheries provided LISTS data to the EEG to identify areas of high fish abundance and concentration. The data included the natural log of the mean abundance per grid cell for each species for spring and fall in the following date ranges: 1995-2004 and 2005-2014. Only species caught in more than 5 tows in any of the seasons in each date range were included. Species were assigned to either water column (which included diadromous and pelagic) or demersal (which included demersal and epibenthic) functional groups and group total mean abundance was calculated for each season in each date range. The 2 decades of data were each used to find high fish abundance (instead of just one combined period) for several reasons. The EEG believed the most recent decade is particularly important to see, especially given the dynamics in fish distribution. Combining the two decades would have diluted that clarity and there were other statistical challenges as well. DEEP Marine Fisheries believed that 1995-2004 decade was important to use, in part so a larger portion of the broader abundance record could be captured. All parties agreed that using the first decade (before 1995) would be less relevant because of the significant shift in fish distribution that occurred in 1997. This resulted in 8 individual abundance layers. Layers were classified by quintiles and the top quintile of each layer was considered an ecologically significant area of high fish abundance and concentration.

Integration of Areas:

The datasets described above were mapped together to represent the extent of Ecologically Significant Areas for fish. Areas delineated from ten individual layers were overlaid for this ESA criterion (Table 3-3). Because of the particular detail available in the datasets for this criterion, and the importance of seasonality and long-term trends in

the fish communities of Long Island Sound, Ecologically Significant Areas for fish have been visualized using the 10 layers grouped by persistence, decade, functional group (water column or demersal) and season (Figures 3-12 to 3-17). Figure 3-18 shows the number of overlaps in each of the 10 fish components. Figure 3-19 shows all of the datasets dissolved together to show a single presence/absence layer of ESA for fish. Figure 3-19 represents the final Ecologically Significant Area for the Fish criterion.

Table 3-3 The ten individual data layers that contributed to the fish criterion.

Data Layer Description for Fish Criterion
Demersal fish species high weighted persistence (LISEA) 1984-2009
Water column fish species high weighted persistence (LISEA) 1984-2009
Top quintile of demersal species fall abundance, 1995-2004
Top quintile of demersal species spring abundance, 1995-2004
Top quintile of demersal species fall abundance, 2005-2014
Top quintile of demersal species spring abundance, 2005-2014
Top quintile of water column species fall abundance, 1995-2004
Top quintile of water column species spring abundance, 1995-2004
Top quintile of water column species fall abundance, 2005-2014
Top quintile of water column species spring abundance, 2005-2014

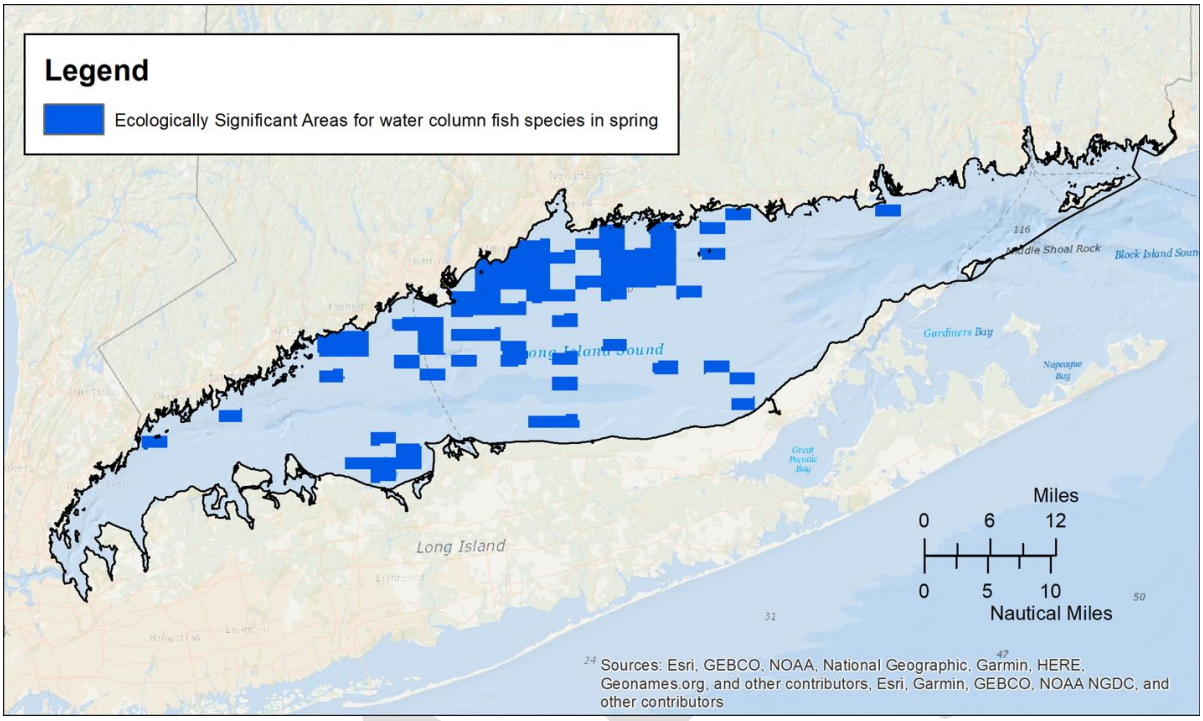


Figure 3-12 A map showing the combination of persistently productive areas for water column species, the top quintile of abundance in spring for water column species 1995-2004, and the top quintile of abundance in spring for water column species 2005 – 2014.

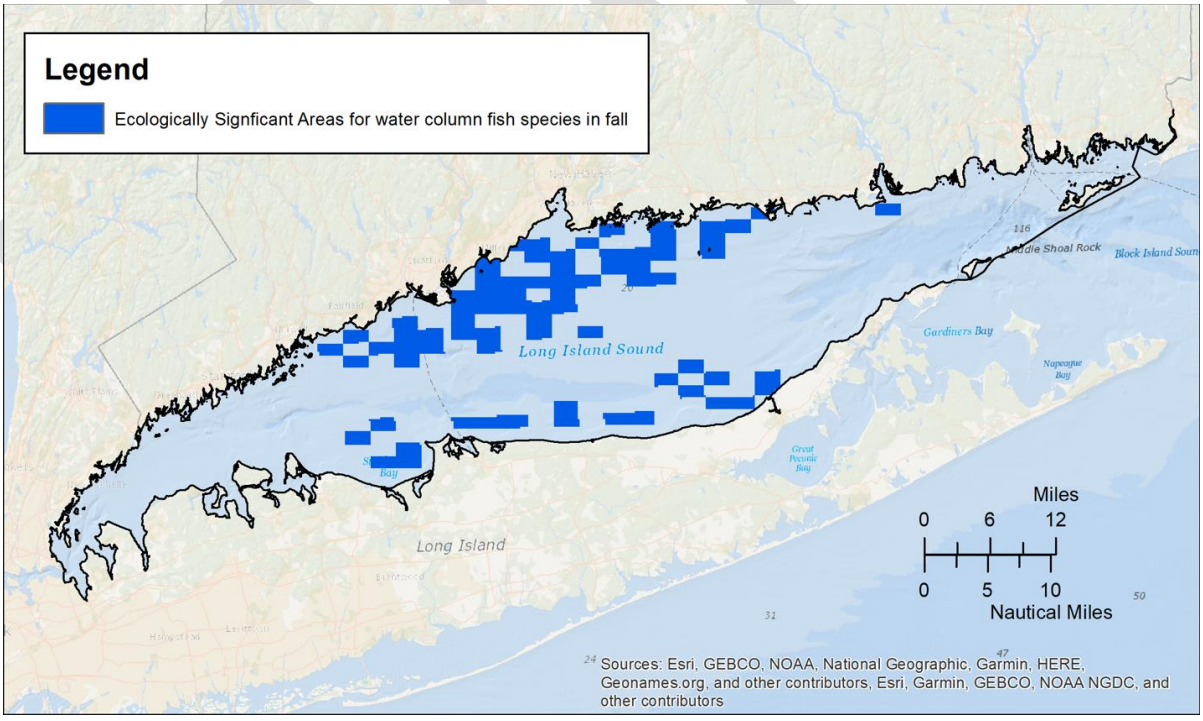


Figure 3-13 A map showing the combination of persistently productive areas for water column species, the top quintile of abundance in fall for water column species 1995-2004, and the top quintile of abundance in fall for water column species 2005-2014.

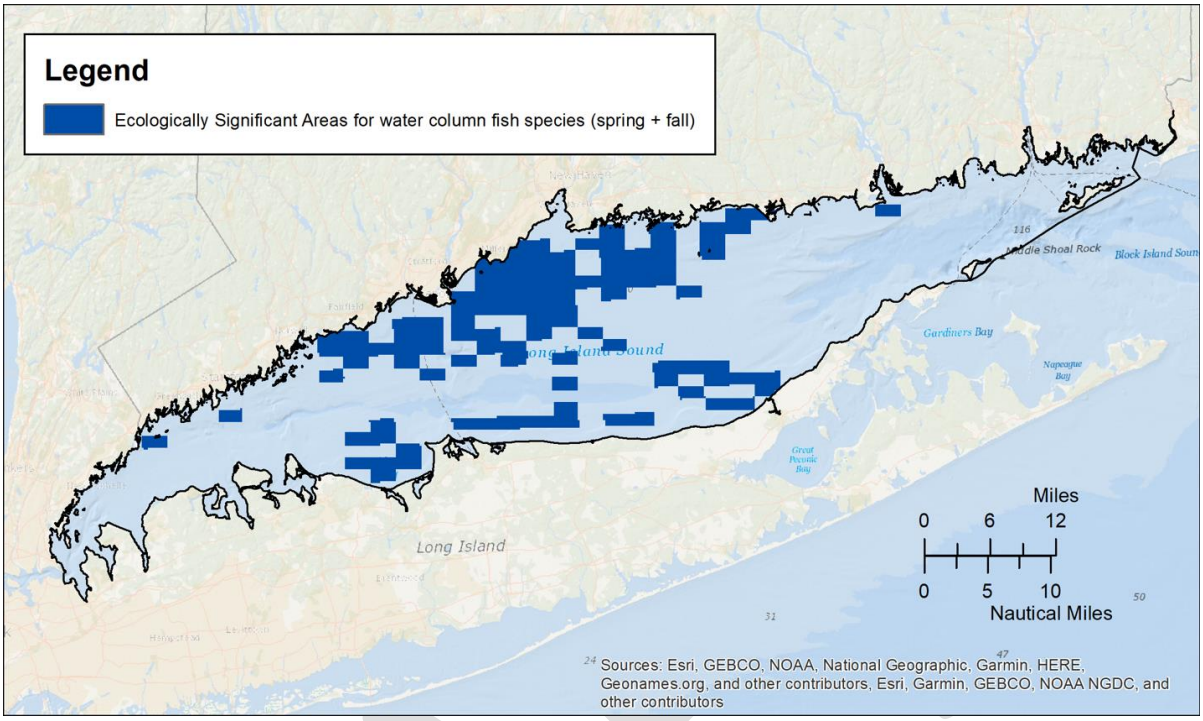


Figure 3-14 A map showing the combination of Figure 3-12 and 3-13, which comprise ESA for water column fish species in spring and fall.

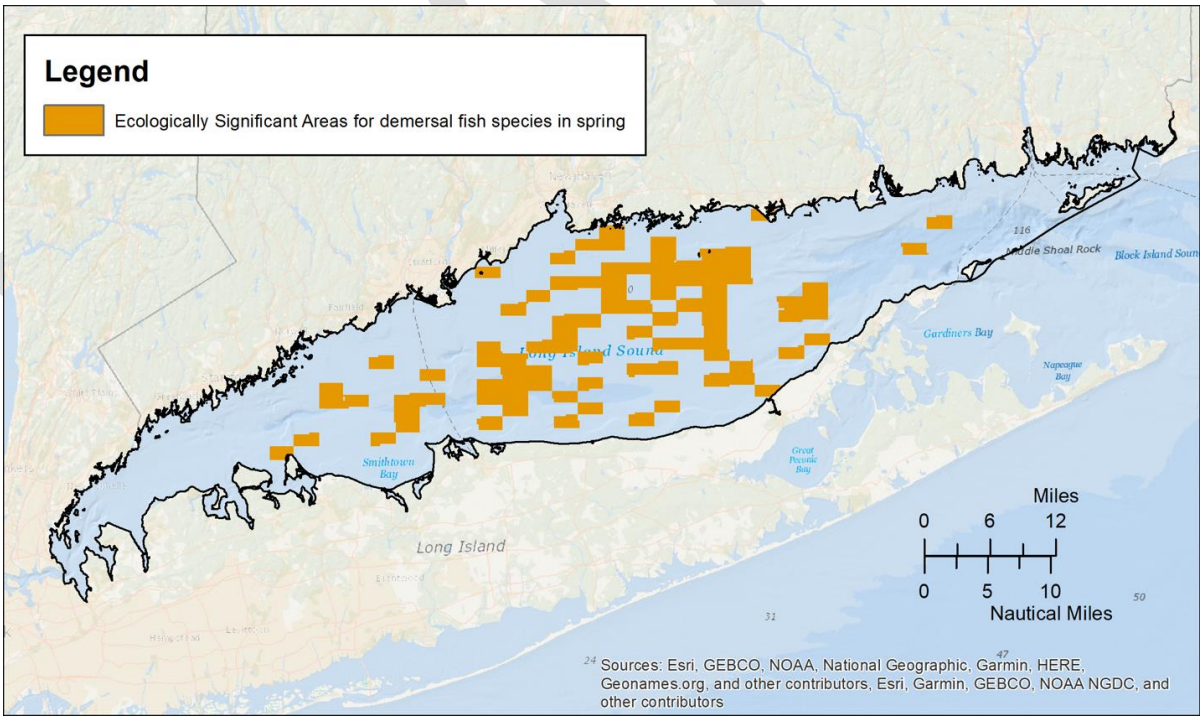


Figure 3-15 A map showing the combination of persistently productive areas for demersal species, the top quintile of abundance in spring for demersal species 1995-2004, and the top quintile of abundance in spring for demersal species 2005-2014.

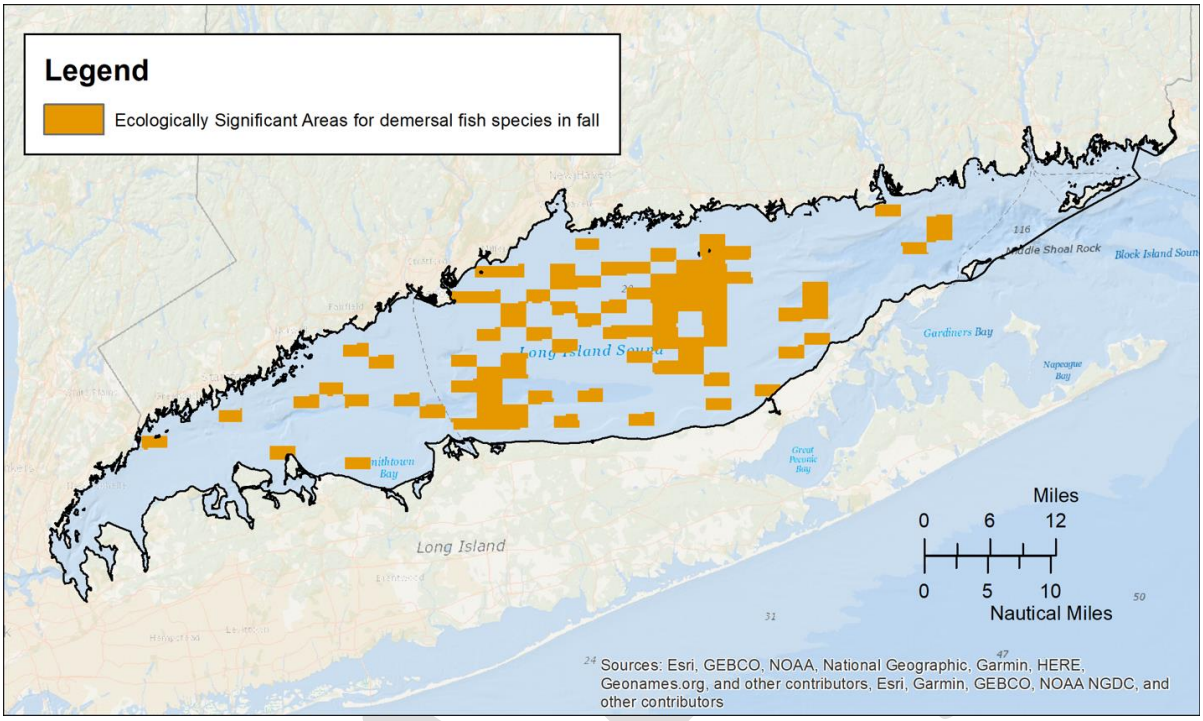


Figure 3-16 A map showing the combination of persistently productive areas for demersal species, the top quintile of abundance in fall for demersal species 1995-2004, and the top quintile of abundance in fall for demersal species 2005-2014.

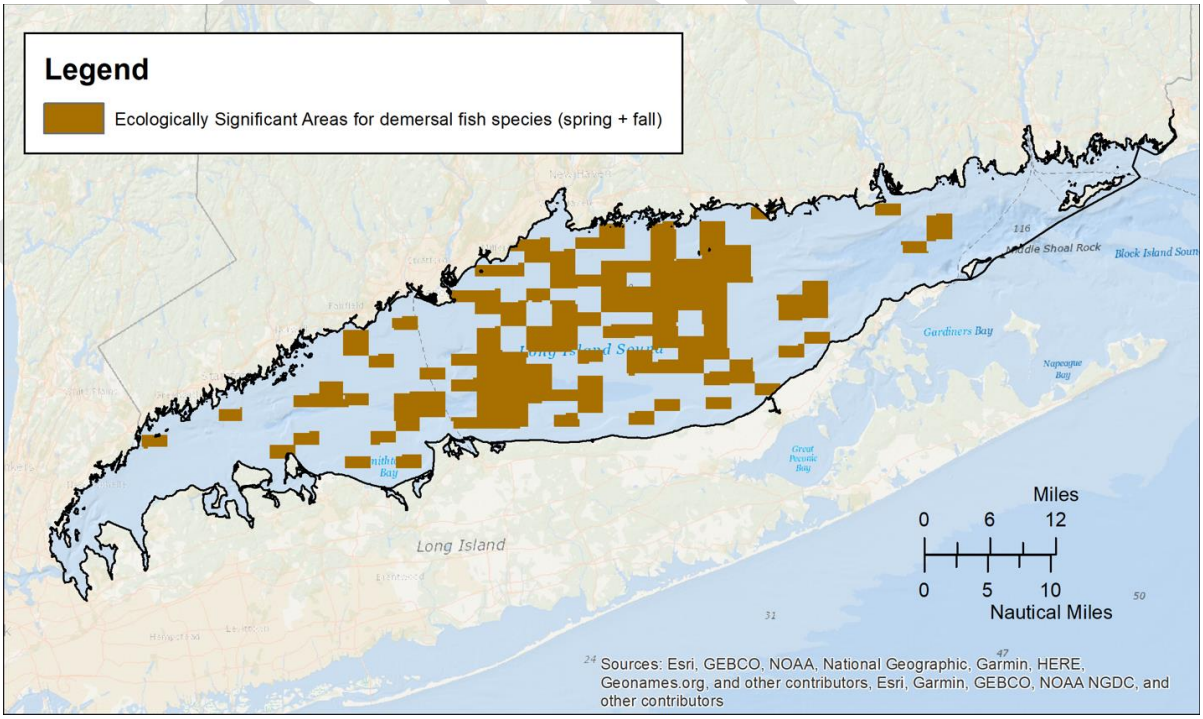


Figure 3-17 A map showing the combination of Figures 3-15 and 3-16, which comprise the ESA for demersal fish species in spring and fall.

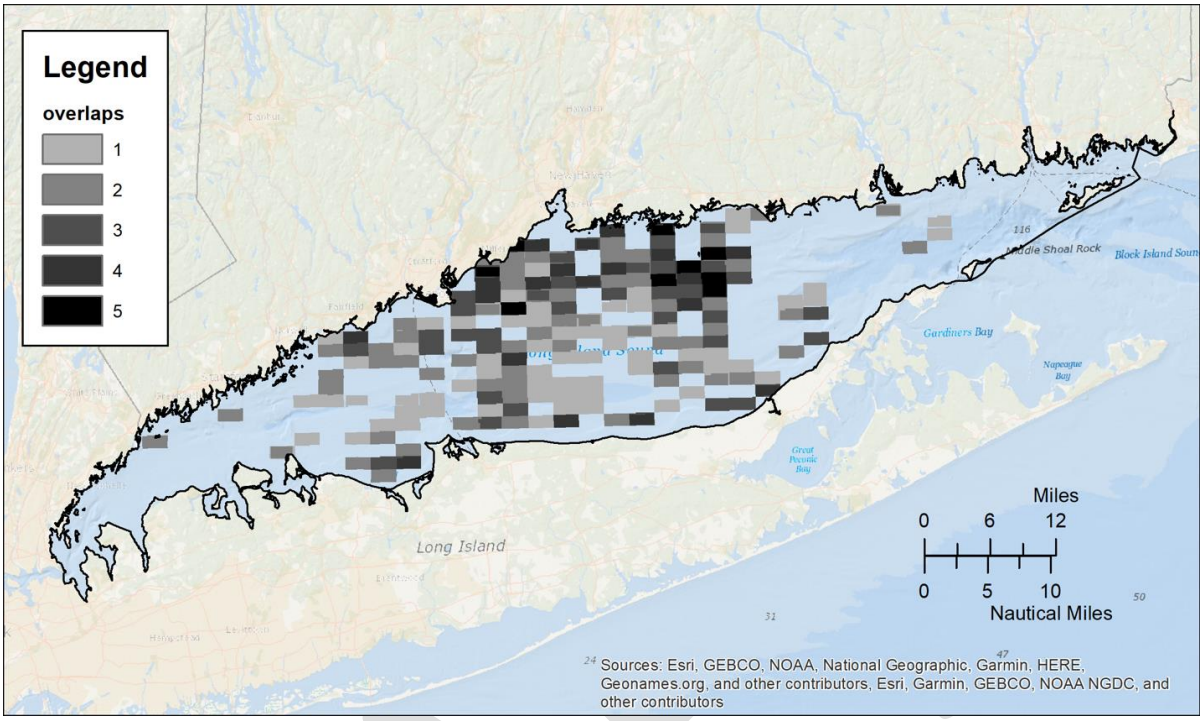


Figure 3-18 Overlaps among each of the 10 input datasets representing ESAs for fish species.

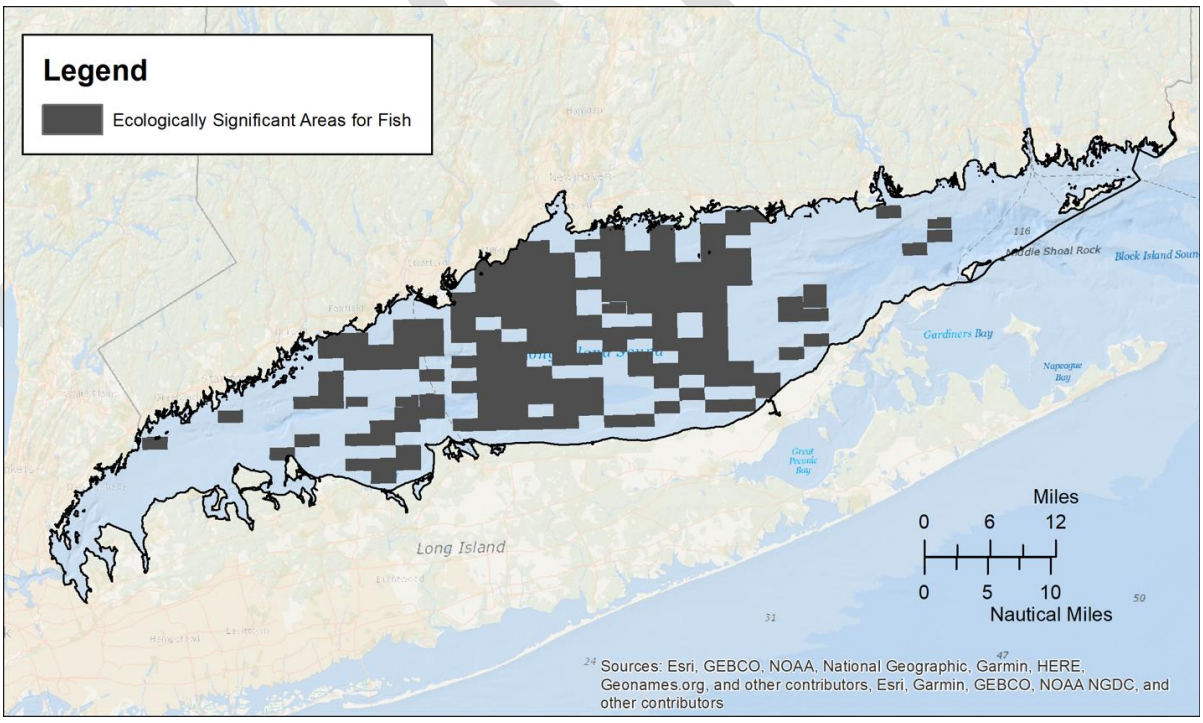


Figure 3-19 Final ESA map for the fish criterion.

Updates and potential future work

The CT DEEP Marine Fisheries LISTS dataset is a robust, long-term dataset that provides many different opportunities for summarization. Future work could take the form of developing updated persistence products with additional data collected since the LISEA report's analysis that included data up to 2009. Similarly, the abundance products could be updated to include the most recent survey years since 2014. In both types of analyses, additional steps could be taken to highlight the differences in fish communities before and after the observed regime shift of the mid-1990s.

Synthesis of Multiple ESA Criteria

The complete set of results (2 of which are presented above) describes 14 individual ESA criteria and corresponding ESA layers or maps. While each individual layer is useful on its own, it can also be informative to visualize the multiple criteria together, to better understand the distribution of ESA and where they might overlap, if at all. Again, it is important to remember that the current suite of maps represents the best available knowledge about the location of ESA, and just because a map doesn't show ESA for a particular criterion, it does not mean that ESA does not exist there. Therefore, composite maps for ESA should be viewed as "The minimum number of ESA."

The EEG did not apply a ranking or prioritization scheme to the individual layers. Therefore, the map legends are simple to interpret: a value of 5 corresponds to a minimum of 5 ESA present in a location and a minimum of 5 siting and performance standard to consider.

Three synthesis maps were developed: one for each Criteria Pillar and a third for all ESA criteria together (Figures 3-20, 3-21, 3-22).

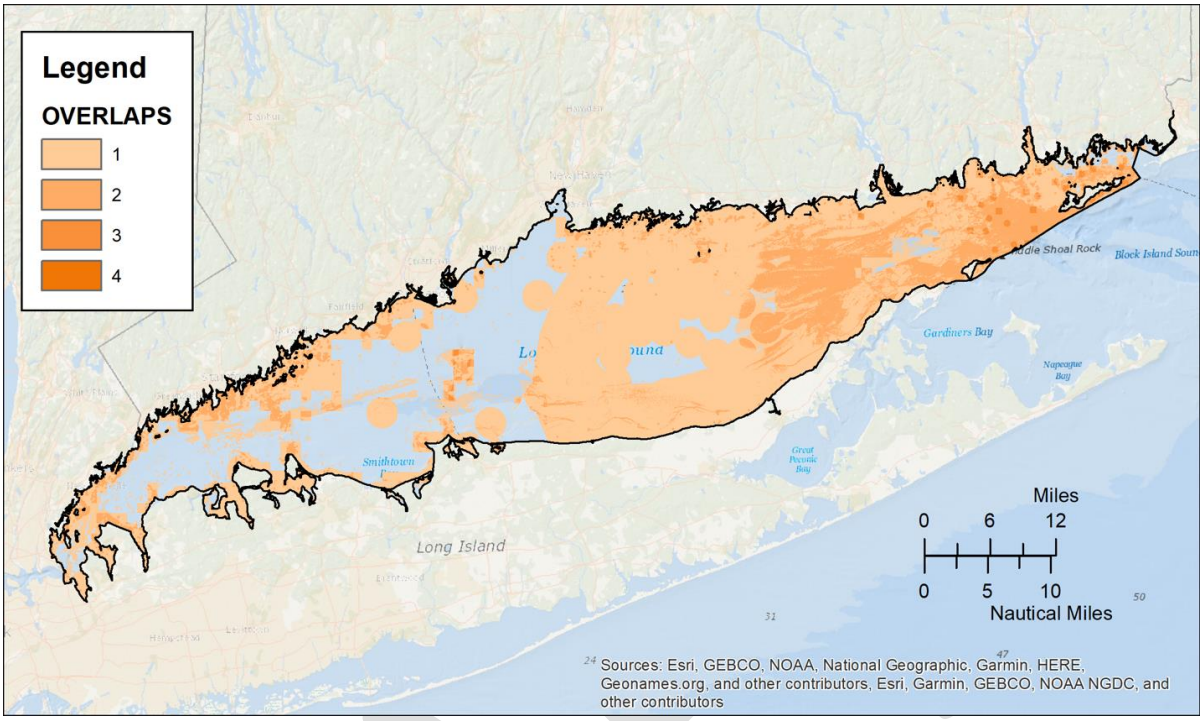


Figure 3-20 Overlaps among the fiver criteria that contribute to the ESAs with rare, sensitive, or vulnerable species, communities, or habitats (Pillar I)

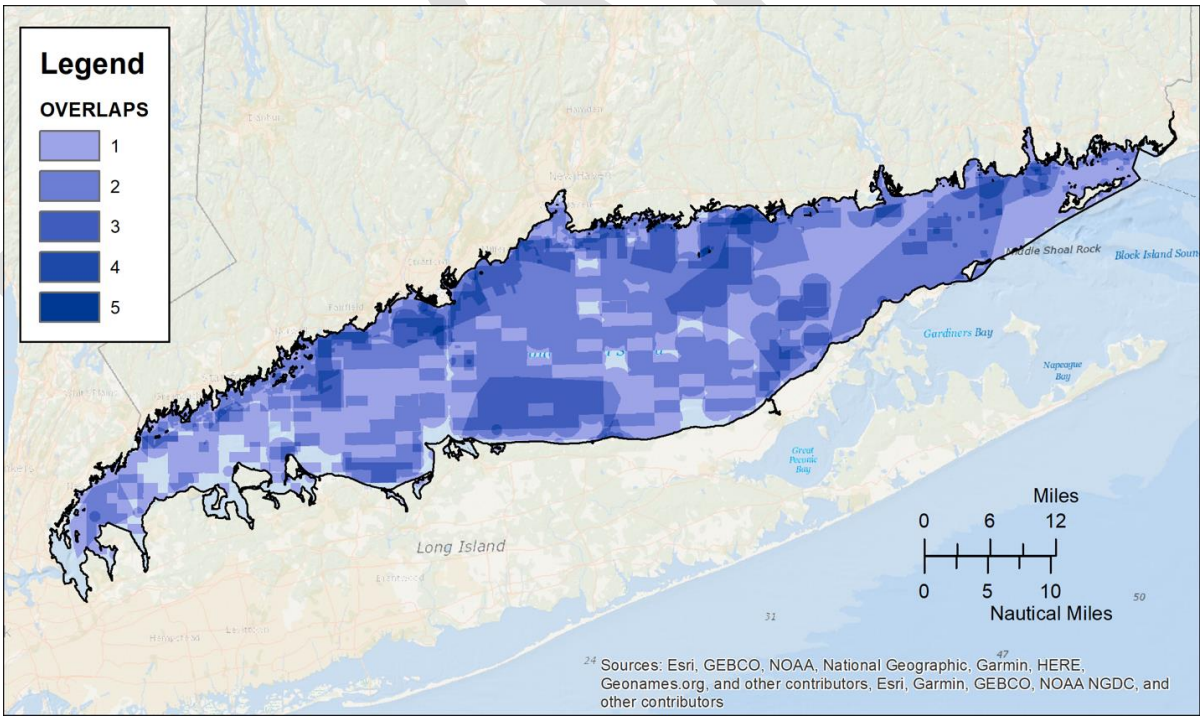


Figure 3-21 Overlaps among the 9 criteria that contribute to the ESAs of high natural productivity, biological persistence, diversity, and abundance (Pillar 2).

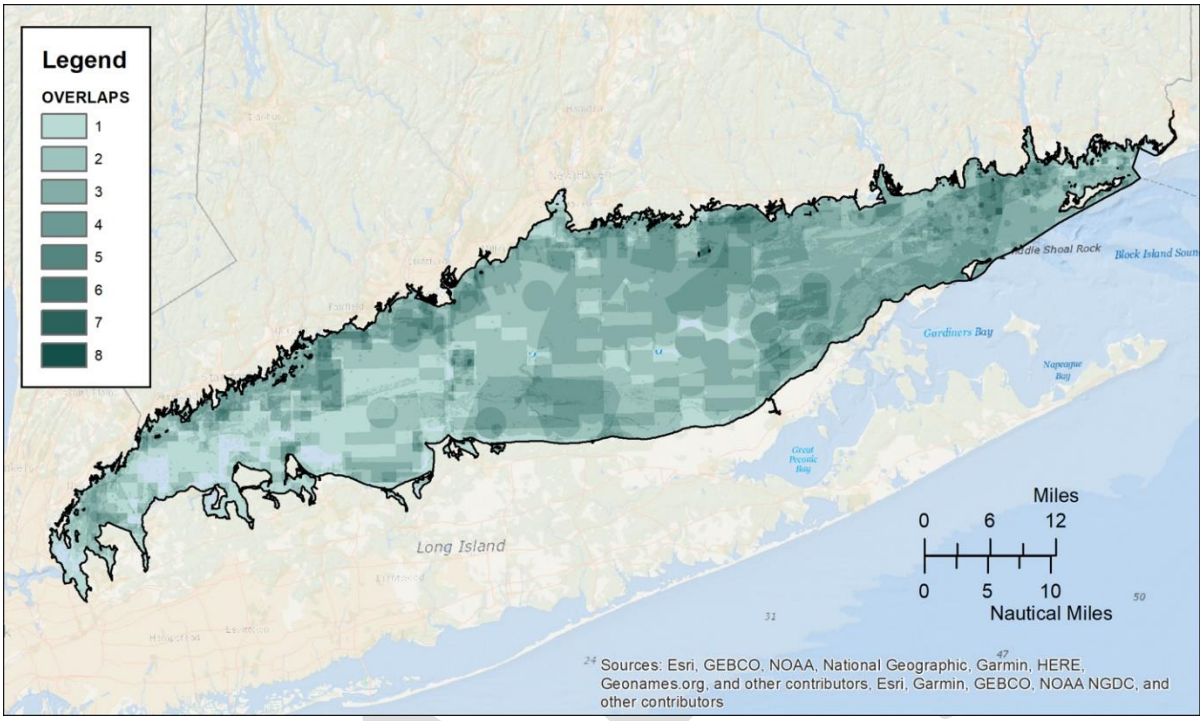


Figure 3-22 Overlaps among all 14 criteria that represent the full set of ESAs in Long Island Sound.

ESA Layer Construction Tables: Example

The following is one example of the 14 tables prepared for each of the ESA Criteria. These table record the technical information and methods used for producing the ESA layers (the full set of tables are in Appendix 2). The example selected below is for the hard bottom and complex seafloor criterion (Table 3-4).

Table 3-4 Sample data construction table of hard bottom and complex seafloor, similar data construction tables can be found in Appendix 2 and 3 for both ESA and SHUA datasets.

Sample Data Construction Table	
	Areas of Hard Bottom and Complex Seafloor
ESA criterion Description	Areas of hard bottom are characterized by exposed bedrock or concentrations of boulder, cobble, pebble, gravel, or other similar hard substrate distinguished from surrounding sediments and provide a substrate for sensitive sessile suspension-feeding communities and associated biodiversity. Complex seafloor is a morphologically rugged seafloor characterized by high variability in neighboring bathymetry around a central point. Biogenic reefs and man-made structures, such as artificial reefs, wrecks, or other functionally equivalent structures, may provide additional suitable substrate for the development of hard bottom biological communities. Areas of hard bottom and complex seafloor are areas characterized

	singly or by any combination of hard seafloor, complex seafloor, artificial reefs, biogenic reefs, or wrecks and obstructions.
Data Source	Hard bottom: The Nature Conservancy's Long Island Sound Ecological Assessment (LISEA; 2015) known occurrences of hard bottom from usSEABED, USGS East Coast Sediment Texture Database, and NOAA Nautical Chart ENC data. Points are described as "bedrock", "boulders", "rock" or "rocky"; the USGS Long Island Sound Surficial Sediment map; Long Island Sound Mapping and Research Collaborative Phase II SEABOSS hard bottom observations described as gravel and coarser (unpublished data courtesy of C. Conroy christian.conroy@uconn.edu) Complex seafloor: TopoBathy – LIS 8m composite Terrain Ruggedness Index (TRI). Wrecks and obstructions: NOAA's Automated Wreck and Obstruction Information System (AWOIS). AWOIS is a catalog of reported wrecks and obstructions that are considered navigational hazards in coastal U.S. waters. These data are not a comprehensive inventory of wrecks. Data were downloaded from the Northeast Ocean Data Portal.
Data Extent	The Long Island Sound Blue Plan planning area.
Data Adjustment and Pre-processing	Hard bottom: Data were clipped to the Long Island Sound Blue Plan planning area. Complex seafloor: Data were clipped to the Long Island Sound Blue Plan planning area. Wrecks and obstructions: Data were clipped to the Long Island Sound Blue Plan planning area.
Data Analysis	Hard bottom: LISEA hard bottom points were buffered with a 160-meter radius. The buffer distance was chosen so that individuals points were visible at the ~1:800,000 scale. Areas classified as "gravel, bedrock" were extracted from the USGS sediment map. The gravel/bedrock zones and buffered hardbottom points were merged and gridded to an 8-meter grid (same resolution as the TRI dataset). Complex seafloor: Complex seafloor was calculated using bathymetry data by applying the TRI algorithm developed by Riley (1999) to measure the variability in seafloor relief. The resulting unitless output ranges from 0 to 100 and has a resolution of 8-meters. Wrecks and obstructions: Wrecks and obstructions points were buffered with a 160-meter radius. The buffer distance was chosen so that individuals points were visible at the ~1:800,000 scale. The buffered wrecks/obstructions points were then gridded to an 8-meter grid (same resolution as the TRI dataset).

Data Classification	Hard bottom: LISEA hard bottom data were classified using the Wentworth (1922) grain-size scale that defines hard bottom ("bedrock or concentrations of boulder, cobble, or other similar hard bottom") as sediment with a grain size of 64 mm or larger. LISMaRC hard bottom data included any points classified as "gravel", or "cobble", or "rock". Areas classified as "gravel, bedrock" were extracted from the USGS sediment map. Complex seafloor: Complex seafloor was classified from descriptive statistics calculated on the TRI dataset. Seafloor complexity values were divided into fifths (quintiles), and areas in the top quintile were classified as complex. This threshold was chosen based on a comparison between the USGS classification of gravel and bedrock areas and the complex dataset, and a comparison between the observed locations of cold water corals and the complex dataset. Complexity values in the top quintile were coincident with some gravel and bedrock areas (although much of the complex seafloor in LIS is not gravel and bedrock). In addition, every positive cold water coral observation overlapped with complexity values in the top quintile. Wrecks and obstructions: N/A
Selection of ESA	All 8x8-meter grid cells classified as 1) hard bottom, or 2) complex seafloor, or 3) wrecks and obstructions were selected for inclusion as Ecologically Significant Areas.

3.4b. Designation of Significant Human Use Areas

a. Introduction

As a corollary to the Statutorily-mandated Ecologically Significant Areas (ESA) the Plan Development Team (PDT) decided to identify Significant Human Use Areas (SHUA) for policy considerations. The identification of such areas is generally a component of any Marine Spatial Plan, and in a waterbody as intensely trafficked as Long Island Sound, regulatory and planning consideration must be given to both traditional uses and ecological aspects. In the context of the current regulatory processes traditional users may only hear of a proposed project through word of mouth, the media, or Public Hearing notifications, at which time the project proponent has invested considerable time and resources into preparing an application, often unaware of other users in the area. This format can lead to inefficiencies and unnecessary conflicts. By proactively identifying significant use areas and corresponding policy standards that new project proponents will need to adhere to, the Blue Plan avoids this conflict by "laying all cards on the table" for applicants and existing users alike to see.

b. Approach, Rationale, and Methodology

The first step in identifying SHUAs was to determine what activities or locations needed to be recognized as such. While the majority of these are in-water activities such as fishing and boating, the PDT felt it was necessary to include some landside features such as working waterfront infrastructure, parks, and historic artifact discovery locations. New in-water projects may impact these upland sites either directly (for example, horizontal drilling and grid link associated with a cable) or by simple proximity (scenic view degradation) so developers should be aware of all uses they may impact. Through the Inventory data vetting process the PDT connected with use communities in the Sound and determined what types of activities and areas are of particular concern to each constituency. Initially the PDT identified over 50 specific use criteria (i.e., Connecticut State Managed aquaculture beds, boat launches, recreational fishing areas, etc.) across 12 broadly defined activity types (i.e., Aquaculture, Boating, Fishing, etc.), and conducted a rapid assessment of datasets to support these. The assessment process was designed to identify and organize the most appropriate representations of human use data, and to develop descriptions for them. It is these descriptive criteria that matter the most to the Blue Plan policy. Maps are the backbone of any spatial-planning exercise as they are incredibly useful visual tools for communicating place-based information. But they can only be based on existing data, which may become out of date or change. A written definition of each use can exist without any spatial data and can more easily shift to match future conditions. These descriptions were further improved as the Siting and Performance Standards were written for each area; forming specific policies to protect each area allowed the PDT to see what criteria descriptions would be useful to permitting agencies and other readers. The PDT determined it was desirable to create overarching criteria "pillars" to pull similar uses together. The four criteria pillars in Table 3-5 were defined to group SHUAs together in a way that integrates information between sectors so that they may be more easily interpreted and visualized, both digitally and in hardcopy. These categories are: Areas with features of historical, cultural, educational, or research significance; Areas of substantial recreational and/or "quality of life" value; Areas important for navigation, transportation, infrastructure, and economic activity; and Areas important to Fishing and Aquaculture.

The assessment process also identified several data gaps, and filling these became a major facet of Plan development in 2018. In some cases, the needed information does not exist, or exists in a format beyond the scope of this project to collect and process. For example, New York does not manage the shellfish industry in the same way as Connecticut. While the New York Department of Environmental Conservation (DEC) was able to provide information on the dollar value of shellfish harvest, spatial information for where effort is concentrated was not available. As a result, it appears that

Connecticut waters are dominated by aquaculture, while New York waters see only a few tiny operations: in reality, shellfish harvest is a prominent business in both states. Addressing this discrepancy will be a key point to address in the ongoing Plan update process.

Where possible and practical, datasets were created to fill gaps. This was accomplished through several methods including digitizing areas of interest from published sources, such as aerial photos or boating guides, and Participatory Mapping (PM). PM, or Participatory GIS, is a widely accepted means of collecting spatial information based on community knowledge, often used in Marine Spatial Planning (NOAA, 2014). During the Inventory review process the recreational fishing community, the recreational sail racing community, and the recreational diving community all noted that the existing information available did not contain many of the sites important to sustaining their sports. Because a few members from each of these communities had become closely involved in the planning process the PDT was able to work with them and create a PM program. This required three crucial elements: trust, on the behalf of the participants, that the resulting Blue Plan would include and protect the areas they were sharing; a dialog in which the PDT listened and learned what factors led each particular area to be special to the use community; and a managing of expectations that mapped areas need to be the locations that are crucial to sustaining each activity. This last point is a fine one and relies on the judgement of the expert participants creating the map; for example, recreational anglers hold that that Sound is "one big nursery" and each wreck and hole will yield fish. However, if each of these areas is noted as important eventually the map of the Sound fills to the point that "everywhere is important, so nowhere is important." Participants understood this concept and mapped only the areas that are heavily used by many community members rather than their particular "secret spots" they would want to see protected.

In some cases, thresholds were applied to datasets in order to refine the SHUA areas. For example, recreational boating occurs virtually everywhere in the Sound, and this was reflected in the supporting dataset. However, to create a meaningful SHUA a threshold was established to highlight the most prevalent areas of recreational boating. In this situation the PDT decided to use densities of boats per area that are higher than average density to represent the SHUA; see Figure 3-23 below. A similar approach was also applied to vessel Automated Information System (AIS) transponder data to determine corridors of substantial vessel traffic.

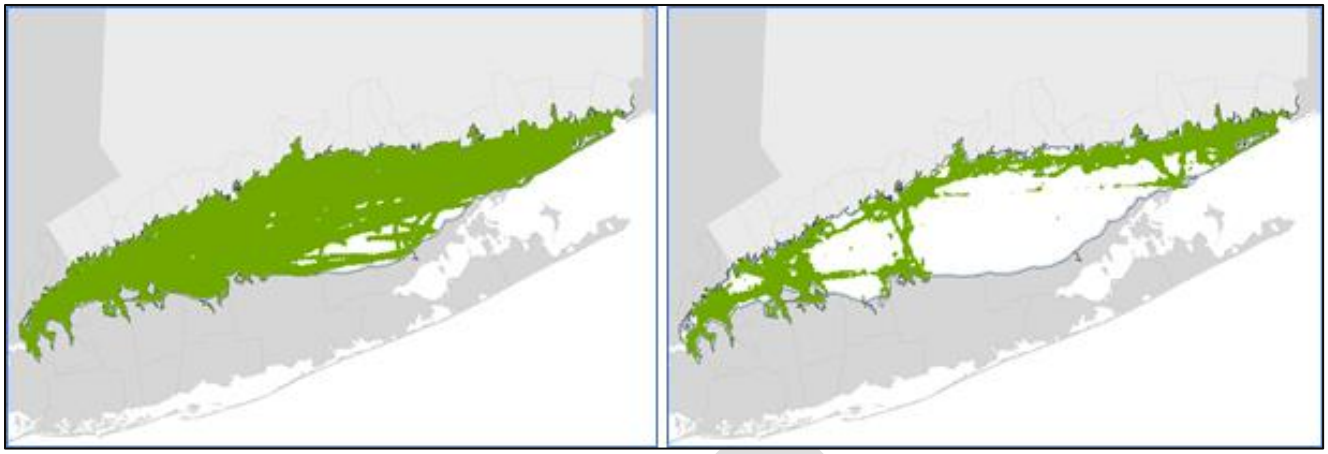


Figure 3-23 Methodology for delineating the Recreational Boating SHUA. The image of the left shows all areas of identified recreational boating density in the Blue Plan planning area as of a 2012 survey. The image on the right reflects a threshold based on retaining the areas where boating density is in the top two quintiles.

Some datasets that were part of the initial collections were eliminated; for example, a historic buildings dataset was excluded in favor of a historic district dataset that included over 90% of the buildings – using both was redundant and the districts provided a sufficient level of representation. In other cases, data representing similar topical areas from different sources were modified. Some were combined, as in the case of shipwrecks the location of shipwrecks originally spanned three sets of national and state-based information; these were refined and combined into one singular shipwreck SHUA. Others had records removed where they were better reflected by other sources and reduced over counting that would negatively affect subsequent analyses. For example, certain Coastal Access Sites were removed from that layer as they were already captured in other layers such as Boat Launches or Public Open Space. And many data layers contained records that exceeded the Blue Plan Planning areas, some which were omitted from our assessments. Thus, it is important to note that when considering the data reflected in the SHUAs, the intent was to provide a set of maps that should be considered in aggregate - they are specifically designed to work collectively and may not in some cases depict all the material contained within their original sources.

To potentially help better understand and represent the overall area of impact for each of these categories, the PDT applied a clustering analysis for each of the four use-groups, (plus a group of all human uses) based on the count (frequency) of human use data layers occurring in a given area. This would synthesize the numerous individual layers and present them as clusters – areas where concentrations of uses can be statistically defined by the levels frequency counts. This was done using a spatial statistics process (optimized Getis-Ord Gi* Hot-Spot Analysis) within Geographic Information System (GIS) software (Esri, 2018). This looks at the frequencies of activities in given areas and returns statistically determined clusters based on like-frequency counts. This results in maps that show:

a) Areas where many activities are strongly concentrated (hot spots; reds)
b) Areas where few activities are strongly concentrated (cool spots; blues)
c) Areas that are neutral (tan)

In addition to the original four groups of uses, the same clustering process was repeated by re-organizing the criteria into new groups that reflect existing uses that may be susceptible to impacts by future activities occurring either on the bottom substrate, in the water column, or at/above the surface of Long Island Sound. An example of the cluster map process can be seen in Figures 3-24 to 3-25, below, which depict how the map products for all Human Use criteria are concentrated.

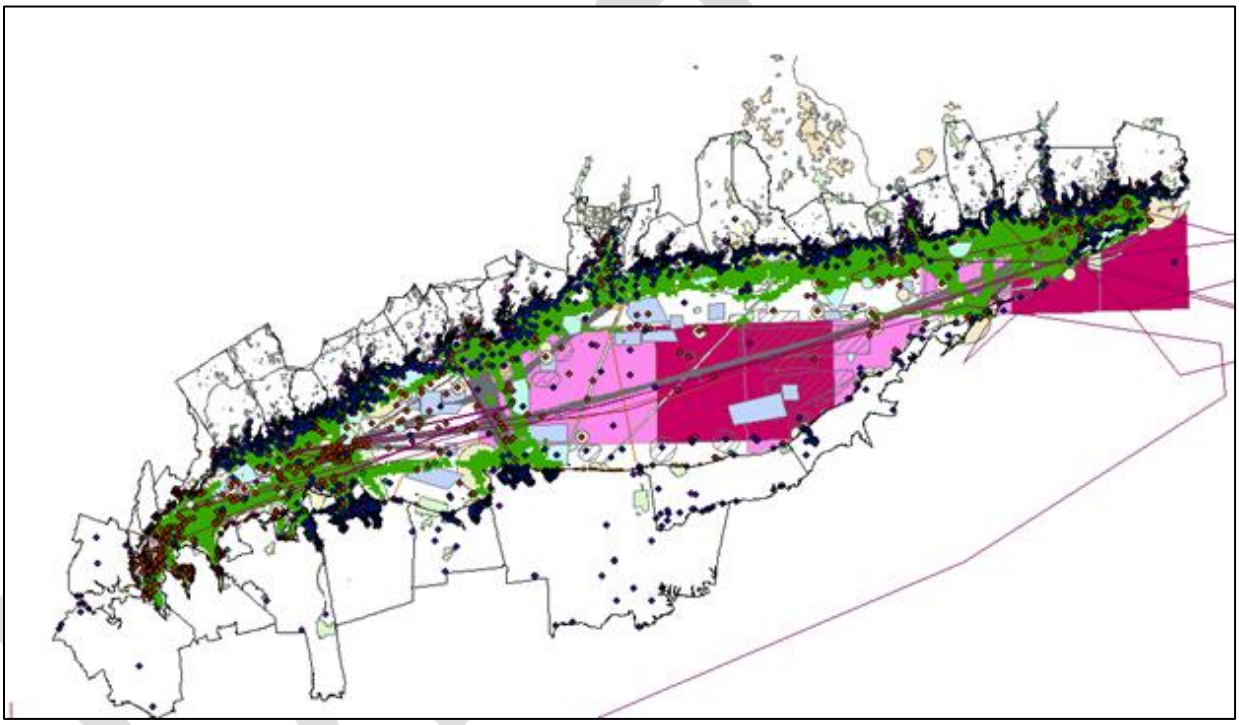


Figure 3-24 All human use data. Note the grid does not cover all possible uses but centers on the offshore and immediate coastal areas.

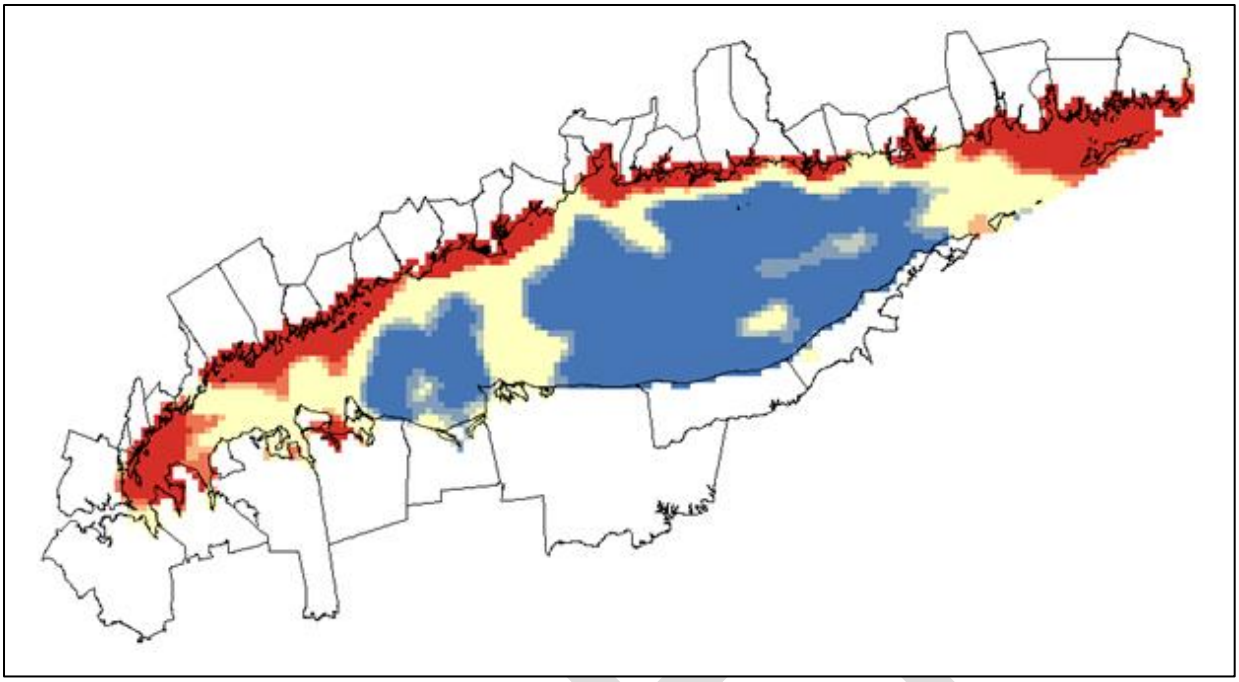


Figure 3-25 Results of clustering analysis for all human uses based on activity frequency. Reds represent areas of high-frequency clustering; Blue areas represent clusters of low frequencies. Yellow/tan areas reflect areas that display neither high nor low clustering.

Regarding the ESA methods of Section 3.4a, above, readers may note that differences exist between the SHUA and the ESA methodology for identifying both the individual map products as well as in clustering. This is due to several factors, including how relevant data were identified, the nature of the data themselves, the total number of data layers, and the goals of the clustering process. The ESA "rollup" maps are intended to show where the minimum number of siting and performance standards for those criteria may be found, while the SHUA cluster maps are intended to show areas of relatively higher and lower use. More complete methods may be found in Appendix 3: SHUA Supplemental Information and Maps.

c. Sample Results

Ultimately, each SHUA was formed from the best available data synthesized to be meaningful to planning efforts and useful to a broad array of readers. Table 3-5, below, shows a complete list of the final resulting SHUA, their representative data layers at this time, and the criteria that describe each for policy application. Note that while the supporting data may change with time as newer and more complete studies become available, the description of each criteria is intended to last and guide management of the Sound with respect to each SHUA.

Table 3-5 SHUA criteria, supporting datasets, and descriptions. Mapped data layers can be found in Appendix 3 and in a LIS Blue Plan mapping portal. Some SHUA sub-criteria do not have associated datasets, but descriptions have been included so that these areas may be recognized in policy and designated if spatial information is provided in the future.

SHUA Criteria, Supporting Data, and Description		
SHUA Criteria	Supporting Datasets	Description
Areas with features of historical, cultural, education, or research significance		
Areas associated with lighthouses and other historic areas	• CT & NY Historic Districts (poly) • LIS Lighthouses (pts)	Lighthouses, waterfront historic districts, or in-water structures of historical significance, excluding wrecks, and areas of Long Island Sound immediately adjacent to such resources.
Shipwrecks	• LIS Shipwrecks (pts)	Wrecks of historical or cultural significance.
Visual and Scenic Resources	• CT & NY Open Space and Parklands (poly)	Views of Long Island Sound's scenic resources from publicly accessible coastal land.
Submerged and Coastal Archaeological Areas	• CT SHPO & OSA Upland Sites (pts) • CT SHPO & OSA Underwater Sites (pts) • CT OSA Potential Holocene Underwater Sites (polys)	Submerged or coastal locations of archaeological sensitivity and/or significance.
Areas of Tribal Significance	*No available data*	Submerged or coastal locations recognized by Tribes as having historical or cultural significance.
Discrete Areas for Research, Education, and Monitoring	• LIS Water Quality Sampling Sites (pts) • LISICOS Sites (pts)	Areas actively and consistently used for research activities, including but not limited to long term monitoring sites, and Sound-dependent experiential educational programming.
SHUA Criteria	Supporting Datasets	Description
Areas of substantial recreational and/or "quality of life" value		

Sailing or Rowing Races	• LIS Sailing Areas (poly) • LIS Sailing Routes (lines)	Areas consistently used by organized clubs and associations. Including but not limited to racing and training areas, and long-distance sailing race routes.
Marine Events	*Data available in USCG weekly Notice to Mariners and 33 CFR 100.100 table.*[18]	Recurring marine events including those described in 33 CFR 100.100 Table.
High Activity Recreational Boating Areas	• LIS Boating Density (Top 2/5 Quantity Classes)	Approximate areas where the density of recreational boating is substantially higher than the overall mean for LIS.
Mooring Fields and Anchorage Areas	• LIS Observed Boat Clusters (poly) • NOAA ENC Anchorages (poly)	Formally designated or traditional mooring fields and anchorages, as designated or managed by NOAA, municipal Harbor Management, or other organizations.
Marinas, Yacht Clubs, and Boat Launches	• CT & NY Marinas and Yacht Clubs (pts) • LIS Boat Launches (pts)	Locations of marinas, yacht clubs, and boat launches that are within the Blue Plan planning area.
Waterfowl Hunting Areas	• CT Waterfowl Hunting (poly)	Areas in Long Island Sound important for waterfowl hunting, including sea duck habitat.
Dive Sites	• LIS Dive Sites (pts) • MARCOS LIS Dive Areas (poly) • NEODP Dive Areas (poly)	Locations in Long Island Sound important for SCUBA activities.
Coastal Public Use Areas	• CT Coastal Access Sites (pts) • NEODP Individual Ocean Uses (pts) • CT & NY Open Space Parkland (poly) • NEODP Water Trails (lines) • CT Waterfowl Concentration Areas (poly) • CT & NY NWI Beaches (lines)	Areas important for public access and use of Long Island Sound for recreational activities including but not limited to swimming, paddling, and wildlife watching.
SHUA Criteria	**Supporting Datasets**	**Description**
Areas important for navigation, transportation, infrastructure, and economic activity		

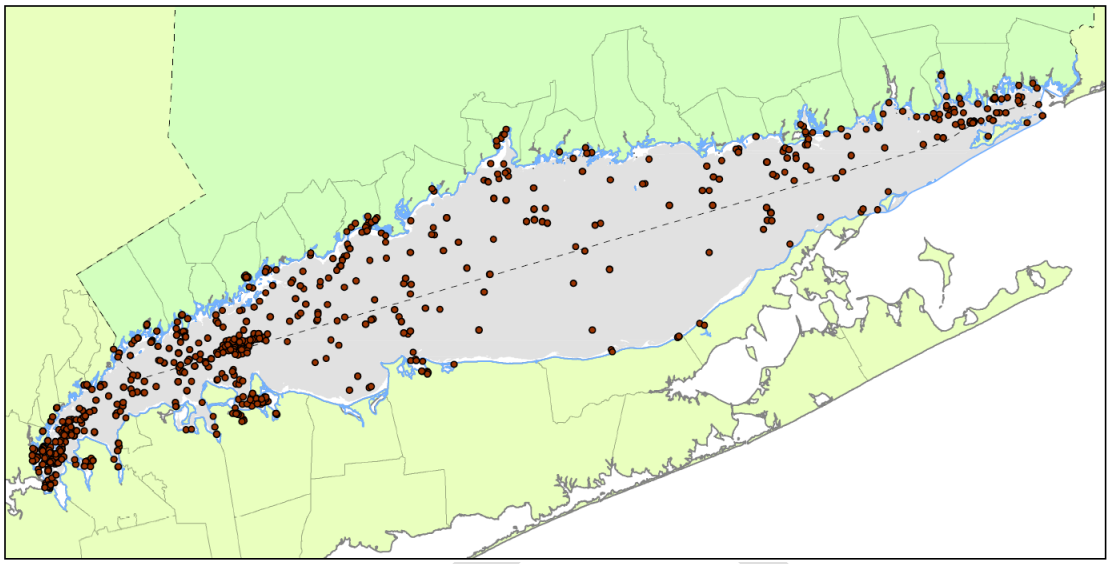
[18] (USCG, 2019)

Working Waterfronts, Ports, and Marine Commercial Areas	• LIS Working Waterfronts (pts) • Offshore Terminals (pts)	Commercial facilities that are water dependent, or service water dependent uses on Long Island Sound, including but not limited to onshore and offshore terminals and port facilities.
Designated Navigational Channels, Fairways, and Basins	• LIS ENC Fairways & Navigational Channels (poly) • Squid Dredge Footprint (poly)	Designated and maintained navigational channels as they appear on the NOAA-published charts and USACE management plans. Also includes authorized privately maintained navigational channels, fairways, and basins, excluding facilities for individual residential use.
Designated Anchorage Areas	• LIS ENC Anchorages (poly)	Anchorage areas as they appear on the NOAA charts, and are generally used by commercial vessels.
Security Zones and other Designated Areas	• LIS ENC Restricted Areas (poly)	Security zones and other operational zones, as designated by the Coast Guard or other appropriate authority.
Areas of Lightering Activity	• LIS ENC Lightering Zones (poly)	Areas designated by the Coast Guard for ship-to-ship transfer (lightering), and other areas regularly used for such transfers.
Vessel Traffic Areas	• 2016 AIS All Vessel Transit Counts	Areas of high traffic use by vessels with AIS transponders including but not limited to ferries and commercial ships. High traffic use is defined by areas that exceed the mean value of transit counts.
Dredged Material Disposal Areas (Active and Historic)	• LIS Disposal Sites (poly)	Material disposal sites as they appear on the NOAA charts, in the LIS DMMP, or designated by EPA. Includes areas currently and historically used. Also includes confined aquatic disposal (CAD) cells.
Cables, Pipelines, and Cable/Pipeline Areas	• LIS Submarine Cables (lines) • LIS Cable and Pipeline Areas (poly)	Submerged cable and pipeline infrastructure areas, including but not limited to those indicated on NOAA navigational charts.

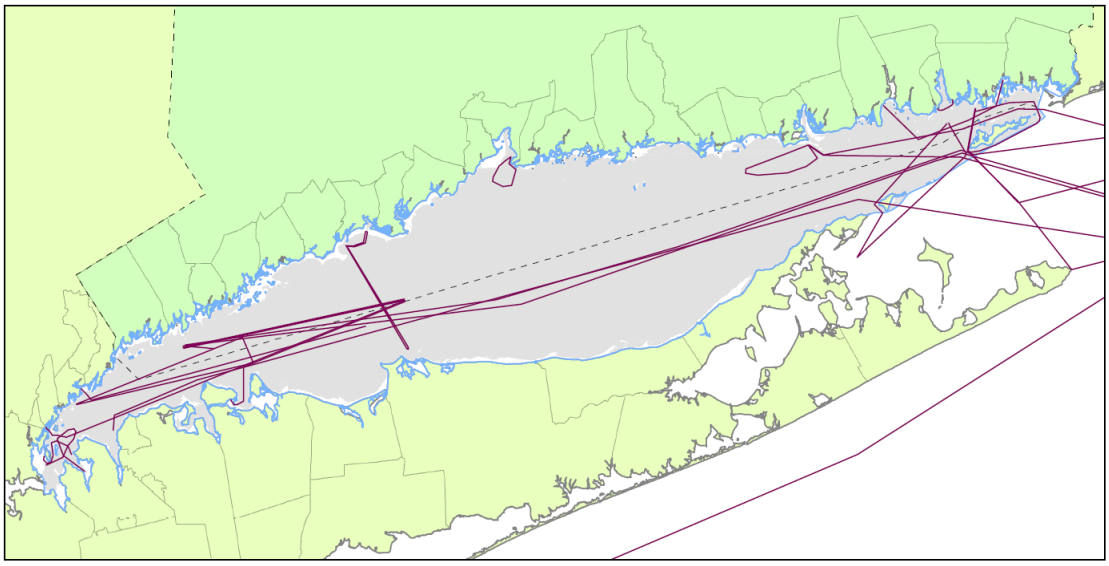
Coastal Energy Generating and Transmission Facilities	• LIS Coastal Energy Facilities (pts)	Coastal energy generating and transmission facilities and associated infrastructure, including areas of Long Island Sound adjacent thereto.
SHUA Criteria	**Supporting Datasets**	**Description**
Areas important to Fishing and Aquaculture		
Recreational Fishing	• LIS Popular Places to Fish (poly)	Areas significant for recreational fishing, as identified by DEEP Fisheries and the recreational fishing community of Long Island Sound.
Commercial Fishing	• 2000-2010 NOAA Vessel Trip Report Landings	Areas of substantial value to the commercial fishing community in Long Island Sound.
Charter and Party Boat Fishing	*No available data*	Areas of substantial value to the charter and party boat industry in Long Island Sound.
Recreational Shellfish Areas	• CT Recreational Shellfish Beds	Town and/or state managed recreational shellfishing areas.
Commercial Aquaculture Locations	• CTDABA Aquaculture Operations • CTDABA Seaweed Licenses • CTDABA Aquaculture Gear areas • CTDABA Town/State Shellfish Lease beds • NYDEC Aquaculture Sites	Shellfish leases, seaweed leases, gear areas, designated natural beds, and any other type of authorized aquaculture venture in CT and NY as applicable.

While a complete map book showing the current known extent of each SHUA described above may be found in Appendix 3, the examples in Figure 3-26 below illustrate the diversity of activities considered in the Plan.

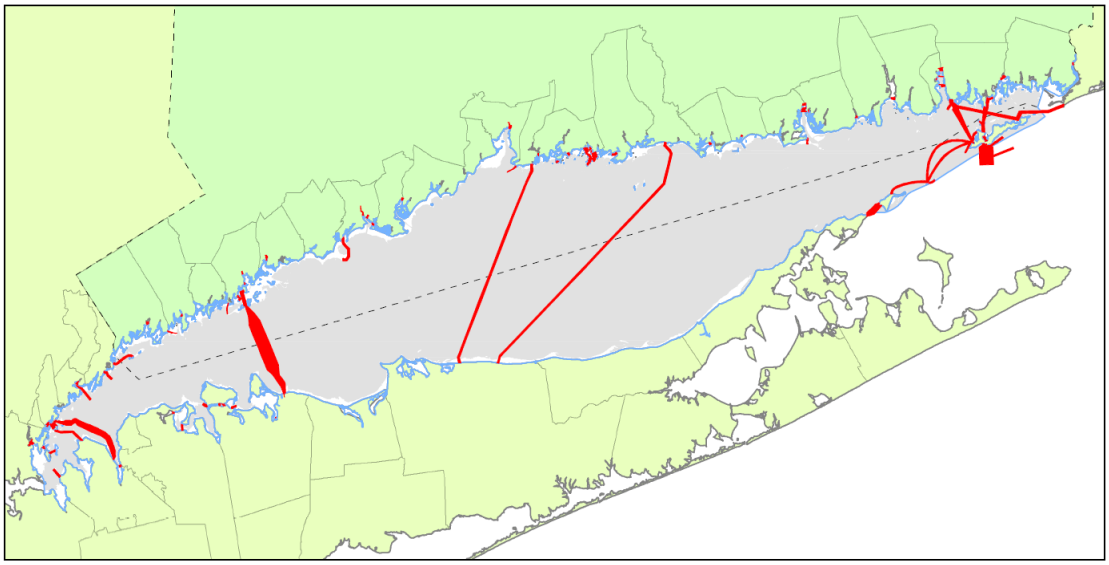
a.



b.



c.



d.

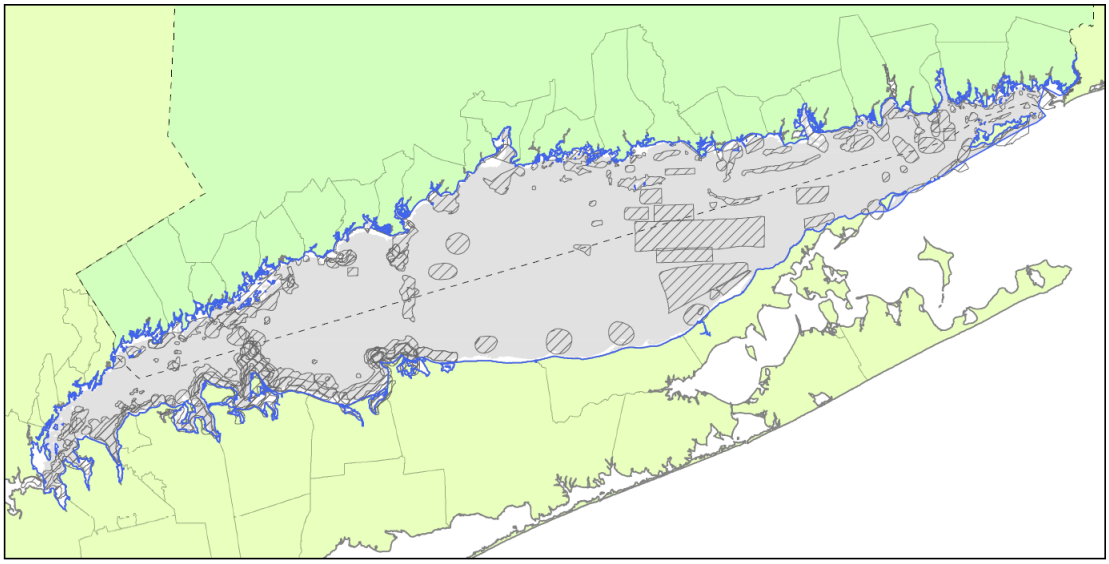


Figure 3-26 Example SHUA maps from each overarching pillar: a) Shipwrecks; b) Sail Racing Routes; c) Cable/Pipeline Areas; and d) Recreational Fishing activity.

The clustering analysis does not impact the Siting and Performance standards associated with each SHUA individually, nor does it impose any further policies for hot or cold spots. The PDT envisions that these cluster maps would help inform interested parties to better understand where activities are concentrated or not. Based on potential future interests it may be important to try and avoid areas where many things are already going or, or it may be beneficial to try and co-locate new activities where existing similar activities already take place. Therefore, these maps should not be construed to simply convey any measure of "importance" – i.e., hot spots are not intended to reflect areas that are inherently more important or valuable than cold or neutral spots, but simply reflect the number of uses in a given location. Unlike the ESA overlay maps, this clustering

analysis does not give an indication of minimum performance standards that will need to be met by an applicant.

In the end, the SHUA process should serve to reinforce and better understand what everyone who ventures out on the Sound knows inherently to be true: that Long Island Sound is busy, dynamic waterbody supporting a captivating array of human activity; that traditional uses such as lobstering and sailing coexist with the emerging industry of seaweed aquaculture; that shipwrecks are a surprising boon and support numerous interests, including SCUBA diving, archaeology, and angling. Yet it is through the resulting SHUAs that the public of Connecticut now have a mechanism to define these areas and give legal standing to support the intrinsic value of their continued existence in a changing world. The SHUAs and the process that designates them are not perfect; but they are also not static, and future iterations of the Blue Plan are opportunities to improve this, like every other, component.

Chapter 4 Blue Plan Policies and Standards

4.1 Introduction

Blue Plan policies and standards are established to identify areas and standards that avoid conflicts and impacts and encourage sustainable and compatible development. In general, proposed uses and activities subject to the Long Island Sound Blue Plan are not prohibited outright. Rather, project proponents are encouraged to develop their applications to avoid, minimize, and mitigate conflicts and impacts on Long Island Sound's natural resources and traditional human uses.

This chapter overviews the policy types that are applicable to projects proposed within Connecticut waters and waterward of the 10-foot depth contour in Long Island Sound: Sound-wide Policies (Part I), and policies that are specific to Significant Ecological Resources and Significant Human Uses (Part II). There is also a description of the various "lenses" through which each policy is encouraged to be considered (Part III).

The Blue Plan provides greater clarity and resources for the existing regulatory processes listed below that already apply to certain in-water activities in Long Island Sound. The Inventory and policies herein are intended to provide insight into use and development opportunities and constraints, from a spatial perspective (LIS Inventory and Science Subcommittee, 2019). Policies may also be utilized for guidance in in pre-application discussions between the Commissioner of Energy and Environmental Protection and applicants.

Policies of the Long Island Sound Blue Plan will be enforceable pursuant to Section 25-157t(h) of the Connecticut General Statutes (CGS) and shall be considered as a factor in the review of applications under the following regulatory programs (more information on these programs can be found in Chapter 2: Blue Plan Management Framework):

- 16-50K Certificate of environmental compatibility and public need
- 22-11h, Permits for aquaculture operations
- 22-11i, Licensing of aquaculture producers
- 22-11j, Planting and cultivating seaweed. Prohibition on interference with right of fishing or shellfishing
- 22a-6k, Emergency authorization for regulated activity. Temporary authorization for regulated activity
- 22a-359, Regulation of dredging, erection of structures, and placement of fill in tidal, coastal, or navigable waters. Sunken or grounded vessels.

- 22a-361, Permit for dredging, structures, placement of fill, obstruction or encroachment, or mooring area or facility. General permits. Removal of sand, gravel or other material.
- 22a-363b, Certificate of Permission
- 22a-363d, Emergency Authorization
- 22a-430, Permit for New Discharge
- 25-157b, Crossings of Long Island Sound. Evaluation of application's consistency with comprehensive environmental assessment plan.
- 26-194, Leasing of shellfish grounds. Fee. Utility lines and public use structures. Shellfish removal or relocation costs. Annual host payments for Long Island Sound crossings. Designation of shellfish areas to regional agricultural science and technology education centers.
- 26-257a, Local shellfish commissions
- Section 401 Federal Water Pollution Control Act

If an applicant proposes a new use in Connecticut waters, within the Blue Plan policy area (CGS § 25-157t(b)(2)), under the jurisdiction of the above regulatory programs, that may impact the resources and uses of Long Island Sound, the applicant shall consider all the appropriate policies and protection standards and shall comply with applicable state enforceable policies and standards in this chapter. Any activity that is not regulated under the listed statutes, such as ordinary fishing and boating activities that do not involve construction activities, will not be affected by the Blue Plan policies, save to be represented and protected by them, as traditional uses of the Sound. Any existing activities already authorized under the listed statutes will also not be affected by the Blue Plan policies. Additionally, the Blue Plan will not change the existing opportunities for public comment, hearings, and appeals under the above regulatory programs.

In addition, the CZMA federal consistency process described in Chapter 2 provides another avenue by which Blue Plan policies can be applied. Those Blue Plan policies that have been incorporated into Connecticut's federally-approved coastal management program will become "enforceable policies" (listed in Appendix 1, pending NOAA approval), so that DEEP may review federal agency activities and activities subject to a federal license or permit for consistency with those policies. These activities will include some in Connecticut waters but not subject to the listed state authorities, such as federal agency projects or projects such as gas pipelines that are exclusively regulated at the federal level. Within New York waters, enforceable Blue Plan policies will also apply to federal agency activities and federally permitted activities within the NOAA-approved GLD through the existing interstate federal consistency process.

4.2 Part I: Sound Wide Policies

Sound-wide policies are the highest-level policies contained in the Long Island Sound Blue Plan, as they are intended to apply everywhere in the Sound. This section includes a list of broad policies and criteria for the applicable regulatory programs, incorporating the statutory policy criteria of CGS § 25- 157t(b)(2) as integrated through the Vision & Goals Statement.

Goal 1: Healthy Long Island Sound Ecosystem

Science-based planning and practices that consider both the environment and human uses will help us understand and protect Long Island Sound ecosystems and the services they provide, now (a.) and in the future (b.):

Policies:

a. Any activity proposed within the Blue Plan policy area shall avoid, minimize, and mitigate[19] adverse impacts to natural resources in general, including ecosystem services and water quality, and Ecologically Significant Areas in particular, pursuant to CGS § 25-157t(h).

b. Any activity proposed within the Blue Plan policy area shall consider the future effects of climate change, including but not limited to water quality impacts, changes in species composition, and sea level rise, in accordance with scenarios established pursuant to CGS § 25-68o as amended by PA 18-82; and pursuant to CGS § 25-157t(h).

Goal 2: Effective Decision-Making

An inclusive, transparent, stakeholder-endorsed and science-based Blue Plan decision-making process that is consistent with other plans and legal requirements will lead to decisions supporting the long-term vision for compatibility of human uses and thriving marine life.

Policies:

a. The Blue Plan "shall establish the state's goals, siting priorities and standards for ensuring effective stewardship of the waters of Long Island Sound held in trust for the benefit of the public." (CGS § 25-157t(b)).

b. The Inventory, Blue Plan, and policies, including the maps, data, and descriptions therein, are meant to provide guidance and direction to project proponents/applicants, regulators,

[19] When applied to policies in this chapter, use of the term "avoid" shall include the minimization of unavoidable adverse impacts and the mitigation of remaining minimized impacts.

and the general public on how the state is to interpret and implement its existing authority including permit and decision- making responsibilities pursuant to CGS § 25-157t(h).

c. Any proposed regulated activities shall provide site-specific information necessary to evaluate consistency of the activities with existing regulatory criteria, as may be further informed by Blue Plan policies. Blue Plan policies do not approve or prohibit any specific regulated activity, nor do they pre- determine the outcome of any individual regulatory process.

Goal 3: Compatibility among Past, Current, and Future Ocean Uses

Science-based planning and practices that consider both human uses and the environment will sustain traditional and facilitate compatible new water-dependent uses to enhance quality of life and compatible economic development, including maintaining the ecosystem services they depend upon.

Policies:

a. Public Trust:

The Blue Plan recognizes that Long Island Sound belongs to the people of Connecticut and New York, and its waters and submerged lands are held in Public Trust[20] by those States for the people. Management of the Sound shall utilize spatial planning for the benefit of the general public, and the pursuit of traditional public trust uses including but not limited to aquaculture, fishing, recreation, and navigation.

The Sound's Blue Plan policy area includes surface and air, water column, and benthos and substrate, and shall be left as open and unrestricted as possible. New uses of the policy area shall not unreasonably restrict public access except where necessary for resource protection, public health and safety, and national security.

Multiple-use areas shall be preferred, and permanent physical or visual obstructions or encroachments shall not be allowed unless providing a substantial public benefit[21] and where necessary for water-dependent uses, resource protection/enhancement, public health and safety, or national security.

[20] A more extensive summary of Public Trust can be found in Section 2.2.

[21] "Public benefit" means a material positive impact to the well-being of the Long Island Sound ecosystem or of the general public, as opposed to any particular benefits to individual firms or economic actors, and such definition will include facilities in the national interest defined by CGS 22a-93(14), and facilities in support of the State's Comprehensive Energy Strategy (CT DEEP, 2018) and the State Plan of Conservation and Development (Office of Policy and Management, 2005-2010).

i. Any activity proposed within the Blue Plan policy area shall avoid, minimize, and mitigate conflicts with traditional public trust uses, including Significant Human Use Areas, pursuant to CGS § 25-157t(h).

ii. Offshore structures shall be minimized to the extent practicable in physical scope and visual profile.

iii. New non-water-dependent uses, including offshore industrial, commercial, or residential uses, shall not be placed within the Blue Plan policy area unless:

    a. There are no significant adverse impacts to natural resources, including ecosystem services and water quality, and to existing human uses; and

    b. There is a substantial public benefit that outweighs occupation of public trust lands and waters and any unmitigated adverse impacts; and

    c. There is no feasible[22] and less environmentally damaging land-based alternative to the proposed use.

iv. Artificially created or enhanced habitats, such as artificial reefs, islands constructed of dredged material, or barges used for seabird nesting may be authorized if:

    a. any adverse impacts to existing resources are avoided, minimized, and mitigated, and

    b. they provide resource and use benefits outweighing any adverse impacts, and

    c. they serve a primary purpose to provide a public benefit.

v. New permanent cross-Sound transportation infrastructure (e.g., bridges and tunnels) shall be avoided except in cases of significant public benefit where adverse impacts, including visual, have been minimized and mitigated to the maximum extent practicable.

vi. Offshore structures intended for flood and storm protection (e.g., tidal barriers and flood walls) shall be avoided except in cases of significant public benefit and where adverse impacts, including but not limited to changes to the Sound's tidal processes and water quality, have been minimized and mitigated to the maximum extent practicable.

[22] Feasible uses the same definition as CGS § 22a-38(17).

b. Vistas and Visual Impact
A prominent and characteristic visual feature of Long Island Sound is the unobstructed views from shore to shore; in Connecticut, across to Long Island and Fishers Island, and to the smaller islands and lighthouses which serve as visual landmarks to the public. Accordingly, no new activity may be allowed with significant permanent effect on vistas from public viewing points of state or regional significance, such as state parks or prominent viewing areas.

i. Artificial illumination shall be kept to the minimum necessary for the functioning of a water-dependent use, except for temporary exhibitions such as fireworks displays and as legally required for public health and safety.

ii. Municipal authorities are encouraged to implement Connecticut Coastal Management Act policies to identify and protect coastal and inshore visual resources that are visible at the local or neighborhood level.[23]

iii. Applicants for visible in-water or on-water activities are required to provide a visual impact analysis, including day and night digital simulations of different development scenarios, when the regulatory agency administering the programs listed in CGS § 25-157t(h) determines such analyses are necessary to review the potential visual impact of a regulated activity.

4.3 Part II: General ESA and SHUA Policies

The Blue Plan identifies a series of Ecologically Significant Areas (ESAs) and Significant Human Use Areas (SHUAs) in Long Island Sound. This section is comprised of policies that aim to protect the value of ESAs and SHUAs. This section is thus separated into two parts where more specific siting and performance standards are written based on ecological or human use category.

Policies:

1. Development, preservation, or use of Long Island Sound shall proceed in a manner consistent with the capability of the Sound's natural resources to support development, preservation, or use without significantly disrupting either the natural environment or existing human uses of the Sound;

2. In regard to new applications; preference shall be given to new uses that avoid adverse impacts on the Sound's natural resources, and avoid conflicts with existing human uses of the Sound:

[23] Refer to the Visual Impact Factsheet in the Connecticut Coastal Management Manual (CT DEEP, 2000).

a. New activities in the Blue Plan policy area of Long Island Sound shall maintain, preserve, or enhance the values of an ESA and/or SHUA.

3. A proposed activity may be located within an ESA and/or SHUA provided that it has been demonstrated, through site-specific survey, scientific data, and analysis submitted pursuant to the applicable regulatory program under CGS § 25- 157t(h) that:

    a. The project will cause no significant adverse impacts to the ESA and/or SHUA pursuant to the Ecologically Significant Areas siting and performance standards in Part IIa and the Significant Human Use Areas siting and performance standards in Part IIb, or

    b. There is no feasible, less damaging alternative and all reasonable mitigation measures and techniques have been provided to minimize adverse impact, and the public benefits of the project outweigh the harm to the ESA and/or SHUA resource, use, or value.

4. Each SHUA and ESA sub-criterion will have a map or a group of maps associated with it that will designate the best available information on the current extent of that resource or use. These maps are not enforceable standards, because the best known current extent will likely change over time with new information. The maps are meant to assist state and local governments, applicants, stakeholders, and the public by showing current SHUA and ESA locations. The ESA and SHUA policies and protection standards are applicable pursuant to the most up-to-date extent of the ESA and SHUA.

    a. Some ESAs and SHUAs are located outside the policy area, i.e., landward of the 10 ft depth contour up to the coastal boundary as defined by CGS §22a-94(b). Policies associated with such ESAs and SHUAs may only be applied within the proximate policy area.

4.3a Part IIa: Siting and Performance Standards for ESAs

This section (Table 4-1) describes the siting and performance standards applicable to each ESA criteria, based on the location of potential impact either in Air and Surface (AS), Water Column (WC), and Benthos & Substrate (BS). The General ESA and SHUA policies also apply to all the following siting and performance standards.

Table 4-1 Performance standards for locating new regulated activities within an ESA, in compliance with policies 3a-b noted above.

ESA Siting and Performance Standards			
Significant Ecological Resource Criteria	Air and Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
1. Areas with rare, sensitive, or vulnerable species, communities, or habitats			
1.1. Hard bottom and complex sea floor	No specific standards applicable. General policies apply.	No alteration, including changes in sedimentation or turbidity that would significantly adversely impact ecological characteristics and function.	No alteration that would significantly adversely impact ecological characteristics and function.
1.2. Areas of submerged aquatic vegetation	No structures or activities that would substantially shade or otherwise adversely impact growth.	No alteration, including physical impacts or changes in sedimentation or turbidity that would significantly adversely impact vegetation.	No bottom disturbance to existing vegetation. Protection and enhancement activities are encouraged pursuant to 22a - 92(c)(2)(A).
1.3. Endangered, threatened, species of concern, and candidate species listed under state and federal Endangered Species Act and their habitats	No specific standards applicable. General policies apply. Comply with applicable state and federal policies to avoid adverse impacts to designated species and habitats.		
1.4. Areas of cold water corals	No specific standards	No alteration, including changes in sedimentation,	No bottom disturbance to existing corals.

	applicable. General policies apply.	turbidity, or acidity that would significantly adversely impact corals.	
1.5. Coastal Wetlands	The Blue Plan only has jurisdiction in waters 10 feet and deeper, therefore please refer to the Connecticut Tidal Wetlands Act [CGS § 22a-28 as referenced by CGS §§ 22a-92(a)(2), 22a-92(b)(2)(E), 22a-92(c)(1)(B), and 22a-92(b)(1)(B)] and the Connecticut Coastal Management Act [CGS §§ 22a-93(15)(H) and 22a-93(15) (G)] for appropriate policies and standards.		
Significant Ecological Resource Criteria	Air & Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
2. Areas of high natural productivity (HNP), biological persistence, diversity, and abundance, including areas important for supporting or exhibiting such features, relative to these characteristics or species:[24]			
2.1. Cetaceans	No specific standards applicable. General policies apply. Comply with Marine Mammal Protection Act and other applicable federal law.		
2.2. Pinnipeds	No activities that would significantly or permanently impair use of an area by these species. Comply with Marine Mammal Protection Act and other applicable federal law.		
2.3. Sea Turtles and other Reptiles	No specific standards applicable. General policies apply. Comply with Endangered Species Act and other applicable federal law.		
2.4. Birds	No activities that would significantly adversely impact diversity or abundance of species, including but not limited to interference with migratory patterns or foraging, in these areas. Comply with Migratory Bird Treaty Act and other applicable federal law		
2.5. Fish	No activities that would significantly adversely impact diversity, persistence, or abundance of species in these areas. Comply with Endangered Species Act and other applicable federal law.		
2.6. Mobile Invertebrates	No specific standards applicable. General policies apply.		

[24] Areas where natural productivity, biological persistence, diversity, and abundance are high, as well as migratory sanctuaries, stopovers and corridors, nesting areas, feeding areas, and nursery grounds for cetaceans, pinnipeds, sea turtles, marine birds, fish, mobile invertebrates, sessile-mollusk-dominated communities, managed shellfish beds, and soft-bottom benthic communities.

2.7. Sessile-mollusk dominated communities	No specific standards applicable. General policies apply.	No activities that would significantly adversely impact diversity, persistence, or abundance of species in these areas.
2.8. Managed Shellfish Beds	No specific standards applicable. General policies apply.	No activities that would significantly adversely impact ecosystem services of managed shellfish beds, except for those activities related to such shellfish management.
2.9. Soft-bottom benthic communities	No specific standards applicable. General policies apply.	

4.3b Part IIb: Siting and Performance Standards for SHUAs

This section (Table 4-2) describes the siting and performance standards applicable to each SHUA criteria, based on the location of potential impact either in Air and Surface (AS), Water Column (WC), and Benthos & Substrate (BS). The General ESA and SHUA policies also apply to all the following siting and performance standards.

Table 4-2 Performance standards for locating new regulated activities within a SHUA, in compliance with policies 3a-b above.

SHUA Siting and Performance Standards			
Significant Human Use Criteria	Air and Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
3. Areas with features of historical, cultural, or educational significance			
3.1. Areas associated with lighthouses and other offshore historic buildings	No activity that would significantly restrict physical or visual access to the site.	No specific standards applicable. General policies apply.	

3.2. Shipwrecks	No permanent fixed or floating structures that affect the shipwreck site or access to it. Site marker buoys may be allowed.	No permanent fixed or floating structures that may affect the shipwreck site or access to it.	No bottom disturbance, including deposition or shifting of sediments.
3.3. Areas of significance, submerged archaeological sites, and submerged areas of sensitivity	No permanent fixed or floating structures that affect submerged natural or cultural resources. Site marker buoys may be allowed.	No permanent fixed or floating structures that affect submerged natural or cultural resources.	No bottom disturbance.
3.4. Discrete areas important for research, education, and monitoring	No activity that would significantly adversely affect the use of the area for such purposes.		
Significant Human Use Criteria	**Air and Surface (AS)**	**Water Column (WC)**	**Benthos & Substrate (BS)**
4. Areas of substantial recreational and/or "quality of life" value			
4.1. Sailing and Rowing Races	No fixed or floating structures that would interfere with racing activity during the season.	No activity that would interfere with racing activity during the season.	
4.2. Marine Events	General policies apply. Consult with event organizers to avoid or minimize conflict.		
4.3. High Activity Recreational Boating Areas	No fixed or floating structures that would interfere with vessel traffic.	No activity that would interfere with navigation.	

4.4. Mooring and Anchorage Areas	No fixed or floating structures that would interfere with moored vessels or anchored vessels or vessel traffic.	No activity that would interfere with moored vessels or anchored vessels or vessel traffic.	No activity that would interfere with moored vessels or anchored vessels, or the placement of mooring tackle.
4.5. Marinas, Boat Launches, and Yacht Clubs	No fixed or floating structures that would interfere with authorized facilities and associated boating activities, including access to and maintenance of navigational channels and marina infrastructure.	No activity that would interfere with authorized facilities and associated boating activities, including access to and maintenance of navigational channels and marina infrastructure.	
4.6. Waterfowl Hunting	No fixed or floating structures that would interfere with seasonal hunting activity or waterfowl habitat.	No specific standards applicable. General policies apply.	
4.7. Dive Sites	No permanent fixed or floating structures that adversely affect submerged natural or cultural resources, or unreasonably restrict divers. Site marker buoys may be allowed.	No in-water activities or structures that interfere with diver access.	No bottom disturbance that would adversely affect submerged natural or cultural resources, including deposition or shifting of sediments.
4.8. Coastal Public Use Areas	No structures or activities that would interfere with coastal public use activities.		

Significant Human Use Criteria	Air and Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
5. Areas important for navigation, transportation, military, infrastructure, and economic activities			
5.1. Working Waterfronts	No activities, or permanent fixed or floating structures that would interfere with maritime and water-dependent activities, including access to navigational channels and infrastructure. Fishing and boating activities allowed subject to operations.	No activities, or permanent fixed structures that would interfere with maritime and water-dependent activities, including navigational channels and infrastructure. Aquaculture and fishing allowed subject to operations.	No on-bottom structures or disturbance that would interfere with operations, including access to and maintenance of navigational channels and infrastructure.
5.2. Designated Navigation Channels	No permanent fixed or floating structures that interfere with navigation or channel maintenance.	No permanent structures that would interfere with navigation or channel maintenance.	No permanent bottom or sub-bottom structures that interfere with navigation or channel maintenance. Potentially appropriate to co-locate cables, pipelines, and other uses that may require bottom disturbance during installation, given the need for periodic dredging.
5.3. Commercial anchorage areas, security zones, and other designated areas	Activities shall be consistent with the regulations for that designated area.		

5.4. Areas of Lightering Activity	Activity shall comply with applicable Coast Guard and other regulations. No potentially conflicting activity during lightering operations.	No specific standards applicable. General policies apply.	
5.5. Vessel Traffic Areas	No activity or permanent fixed or floating structures that interfere with vessel traffic and navigation, including maneuvering.	No activity or permanent structure that would interfere with navigation. Fishing activities allowed subject to vessel traffic.	No specific standards applicable. General policies apply.
5.6. Dredged Material Disposal Areas: Active	No activity or permanent structures that interfere with disposal operations.		No excavation. No bottom disturbance, except as incidental to disposal operations, scientific activities, or remediation activities.
5.7. Dredged Material Disposal Areas: Historic/Closed	No specific standards applicable. General policies apply.		No excavation. No bottom disturbance, except for scientific or remediation activities.
5.8. Cables, pipelines, and cable/pipeline areas	No specific standards applicable. General policies apply.		No activities that would significantly disturb existing cables and pipelines, except that new facilities may be co- located within corridors, as appropriate to avoid impact to adjacent areas.

5.9. Coastal Energy Generating and Transmission Facilities	No activities that would interfere with facility operation or access.		No on-bottom structures or disturbance that would interfere with operations, including access to the facility by cables or pipelines.
Significant Human Use Criteria	Air and Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
6. Areas important to fishing and aquaculture			
6.1. Recreational Fishing	Permanent displacement of recreational fishing and related activity by other activity, or permanent structures shall be avoided to the maximum extent practicable.		
6.2. Commercial Fishing	Permanent displacement of commercial fishing and related activity by other activity, or permanent structures shall be avoided to the maximum extent practicable. Consultation with sector is required commensurate with intensity of commercial fishing activity potentially being impacted.		
6.3. Charter & Party Boat Fishing	Permanent displacement of charter and party boat fishing and related activity by other activity, or permanent structures shall be avoided to the maximum extent practicable.		
6.4. Recreational Shellfish	No permanent structures or activity that unreasonably restricts access to designated shellfish beds or recreational shellfishing activity.		
6.5. Commercial Aquaculture	No permanent structures or activity that significantly restricts access to commercial aquaculture activity.		

4.4 Part III Lenses for Consideration

This section describes a series of six "lenses" which are meant to be taken under consideration when applying the various policies and standards presented above. The lenses are meant to assist the applicant or agency when determining the suitability, location, and timing of a proposed project, and if that project calls for additional information and data collection. Lenses may also have additional resources associated with them that are meant to assist the user in considering the lens.

1. *Other Applicable Laws*
   Review and consider any other legal authorities that are not listed in (Section 4.1) that may apply to a specific area or activity. Examples may include the Endangered Species Act, Marine Mammal Protection Act, Federal Energy Regulatory Commission, Connecticut or New York State Fisheries Regulations. Please refer to Chapter 2: Blue Plan Management Framework for additional information.

2. *Degree of Conflict*
   Review and consider the degree of conflict a proposed project may have with various natural resources, including ecosystem services, and human uses present in Long Island Sound. Please see Appendix 4: Conflict and Compatibility Matrices for a series of conflict and compatibility matrices that outline whether two uses or a use and resource are synergistic, compatible, conditionally compatible, or in conflict.

3. *Reliability of Data*
   Review and consider the reliability of certain data sets or map products when siting a proposed project. For instance, navigational channels will likely remain constant, while recreational boating and fishing areas may change by season or year. Utilizing data that is more fluid may require additional surveying or outreach. Please see Appendices 2 and 3 and the Inventory for more information on the data utilized in this Plan and any current gaps (LIS Inventory and Science Subcommittee, 2019).

4. *Duration, Permanence, and Seasonality of Resource or Use*
   Review and consider the duration, permanence, and seasonality of the resource or use that may be impacted, and the duration and permanence of the new use proposed. For example, duck hunting and sailboat races occur seasonally while uses like ferry trips occur throughout the year.

5. *Social, Community, and Generational Equity*
   Long Island Sound is a public trust resource and shall be shared between different stakeholders, communities, and multiple generations. Review and consider how a new use may impact the greater population of Long Island Sound users, now and in the future.

Applicants should also consider how their proposed project will differentially impact various users. Please view the CT DEEP Environmental Justice policies for more information (CT DEEP, 2009).

6. *Climate Change Resilience and Mitigation*
Climate change is already evident on a global scale, and locally in Long Island Sound, including such impacts as rising air and water temperatures, increasing sea levels, extreme storm events, changes in species composition and habitat utilization, and water acidification. Further effects of climate change are anticipated in the future, and could be exacerbated by 1) natural changes from coastal processes, and 2) changes in human development patterns. In an effort to adapt to evolving knowledge and understanding of the marine environment, including adaptation to climate change and sea level rise, it is vital for future activities and projects within the Blue Plan policy area to consider a changing climate in their design by enhancing the resiliency of the proposal and, where possible, mitigating any contributions to a changing climate. Please see the CT DEEP Climate Change policies and reports for more information (CT DEEP, 2019).

Chapter 5 Implementation and Adaptive Management

5.1 Introduction

The Blue Plan enhances the existing regulatory and decision making processes of local, state, and federal entities for the offshore waters of Long Island Sound. In its implementation the Blue Plan encourages appropriate, responsible development of Long Island Sound's waters, while protecting traditional uses and natural resources.

The Blue Plan is implemented through a list of existing regulatory programs pursuant to CGS § 25-157t(h), and more detail can be found in Chapter 2: Blue Plan Management Framework, and Chapter 4: Blue Plan Policy Recommendations. Additionally, the Blue Plan is seeking to be implemented under Connecticut's Coastal Zone Management program, to become a factor in certain federal actions in Long Island Sound. Noted in statute, pursuant to CGS § 25-157t(h), "the Commissioner of Energy and Environmental Protection shall seek necessary federal approval to incorporate the Long Island Sound Blue Plan as an enforceable policy in the state's coastal management program under the federal Coastal Zone Management Act."

Although the main function of the Blue Plan is to provide resources to make better regulatory decisions, the spatial data, information, and standards presented in this plan are useful to inform various planning initiatives. Below is a summary on how to access these various resources and information.

i. Data and information that was collected to inform the Blue Plan, can be found in the Long Island Sound Resource and Use Inventory.

ii. Significant Areas maps (ESA's or SHUA's) can be found and utilized from the hard-copy appendices at the end of the Blue Plan document, and via an online Blue Plan data viewer coordinated with UConn CLEAR, via the CT ECO platform.

iii. The information to understand how spatial data will be used in the regulatory process can be found in Chapter 4: Blue Plan Policy Recommendations, and the Guide to Using the Blue Plan.

As the Blue Plan is implemented and utilized over time, it is also important that the Plan adapts and improves. CT DEEP, with the assistance of the BPAC, should monitor progress in Blue Plan implementation, revise areas that could be improved, and adapt to changing environmental and social conditions, including the availability of new datasets.

This following section will overview 1) the role and function that the BPAC, Subcommittees and Work Teams in continuing Blue Plan Implementation overtime, 2) how the Blue Plan will be

monitored, assessed, and reported on, and 3) how the Blue Plan will be adapted and improved over time with new information and data.

5.2 Role and Function of Blue Plan Advisory Committee

The BPAC, no later than six months after Blue Plan approval, shall advise the Commissioner of DEEP on the operation, implementation, and updating of the Inventory and Plan as applicable. Also, upon the adoption of the Blue Plan, the Commissioner of DEEP and the BPAC will decide if any subcommittees and work teams are needed to fulfill the continuing mission of the Plan.

The BPAC will meet on a quarterly basis to review the implementation of the Plan, identifying emerging issues and recommending any necessary or desirable alterations or improvements to such plan. The BPAC shall, within available resources, hold not less than one public hearing each year to receive comments and submissions from the public on the Inventory and the Blue Plan.

According CGS § 25-157t(h), "The Commissioner of Energy and Environmental Protection shall, within available resources, develop and implement a public outreach and information program to provide information to the public regarding the Long Island Sound Blue Plan." Stakeholders and members of the public are encouraged find continuing updates on the Blue Plan and Inventory, including new or revised data, via the Blue Plan webpage, and Listserv (CT DEEP, 2019).

Stakeholders and the public will be notified of a new proposal in Long Island Sound, according to the existing procedures of the agency coordinating the review. Anyone wishing to view public notices from CT DEEP can do so on the Public Notices page of CT DEEP's website (CT DEEP, 2019). Within available resources, agencies may consider additional forms of outreach and notification for proposals in the Blue Plan policy area.

Stakeholders and members of the public are also encouraged to continue to provide feedback and comments on Blue Plan implementation. Stakeholders and the public may submit comments directly to CT DEEP via email at deep.blueplanlis@ct.gov, or mail to:

Long Island Sound Blue Plan
Connecticut Department of Energy and Environmental Protection
Land and Water Resources Division: Blue Plan
79 Elm Street
Hartford, CT 06106

CT DEEP, along with the BPAC, will receive, track, and monitor comments from the public. CT DEEP, within available resources, will respond to comments, and appropriate revisions will be made by the next mandated Blue Plan update.

5.3 Monitoring Blue Plan Implementation

Within available resources, CT DEEP will track the initial applications that are proposed within the Blue Plan policy area and are thus required to use the Blue Plan. CT DEEP will monitor any strengths and weaknesses of the Blue Plan as applied to these initial proposals. Within available resources, CT DEEP will also monitor any changing trends in the Blue Plan planning and policy areas, including changing distributions of natural resources and human uses. CT DEEP will also track if and when new data to inform the Blue Plan becomes available.

CT DEEP will report on the progress and performance of the Blue Plan to the BPAC, and to the Connecticut legislature.

5.4 Adapting the Blue Plan

According to the Rhode Island Ocean Special Area Management Plan (Ocean SAMP), Adaptive management "*is a systematic process for continually improving management policies and practices by learning from the outcomes of previously employed policies and practices. Adaptive management requires careful implementation, monitoring, evaluation of results, and adjustment of objectives and practices. Adaptive management usually allows more reliable interpretation of results, and leads to more rapid learning and better management*." (RI CRMC, 2019) Incorporating adaptive management principles into the Blue Plan helps ensure that the document does not become static or outdated in reference to a dynamic Long Island Sound. To that end, the Statute commands regular periodic revisions of the Plan.

Pursuant to CGS § 25-157t(h), "the Commissioner of Energy and Environmental Protection shall provide for the review and update of such inventory and plan at least once every five years and any revision to such inventory and plan shall become effective upon approval by the General Assembly, in accordance with subsection (g) of this section." The Blue Plan may also undergo changes prior to the mandated five-year review and update if the BPAC finds it appropriate to do so. The Commissioner also has the authority and discretion to include new and updated data and maps into the Inventory and Blue Plan, at any time.

Although DEEP has the mandate to fulfil this adaptive management provision, duty also falls to the people of Connecticut, and LIS stakeholders out-of-state, to bring forth changes that they believe must be made to the Blue Plan documents, and information to support these changes. As is noted earlier in this document, it is important that those who know the Sound best be active participants in the evolving management and stewardship thereof.

Chapter 6 Topics for Future Consideration

6.1 Introduction

Long Island Sound will change over time, both in terms of the environmental resources and human uses. In addition to these ordinary changes over time, there will likely be future policy drivers, considering topics like a changing climate and economic development that encourage new and different uses of the Sound.

For instance, in addition to the ongoing rise of a nascent farmed seaweed industry, other potential new human uses may include:

- Renewable Energy Infrastructure
- Bio-extraction projects using shellfish or seaweed
- Artificial Reefs or Eternal Reefs
- Transportation Infrastructure, etc.

This chapter considers some of these future changes and challenges by highlighting climate change and its surrounding factors, potential future legislative proposals, and areas for future analysis. Knowing that the Sound will change over time, it is vital that the Blue Plan consider changes and new projects in its future implementation

6.2 Climate Change Considerations

According to the Intergovernmental Panel on Climate Change, it is nearly certain that human generated fossil fuel emissions have caused and will continue to cause long-term changes in the Earth's climate.

On a global scale, average temperatures are said to have increased 1.0^{o}C since pre-industrial levels, due to human activities that have released greenhouse gases (GHG) into the atmosphere and is likely to increase another 0.5^{o}C between 2030 and 2052 (IPCC, 2018). The six warmest years on record have occurred since 2010, with 2016 currently the warmest year on record (NOAA, 2018).

With the increase in GHG emissions and warming temperatures, there are compounding effects that have already and will continue to greatly impact our planet. These effects of climate change include sea level rise, ocean acidification, increase in precipitation, increase in ocean temperature, shift in wind patterns, and stronger storms (NASA, 2019).

In Connecticut specifically, the state has experienced an increase of 2-3^{o}F (1.12 – 1.68^{o}C) in the last century (EPA, 2016). The water temperature of Long Island Sound has also risen at a rate of about 1.8^{o}F (1^{o}C) per century (LISS, 2019). Correlating with local and global temperature

increase, sea level is also projected to rise in Long Island Sound 0.5 meters (1ft 8 inches) by 2050 (ODonnell, 2018).

Connecticut is also under threat of ocean acidification, where due to the absorption of CO_2 in coastal waters the water becomes more acidic and can thus dissolve shellfish. Connecticut is highly economically sensitive to ocean acidification, because shellfish aquaculture is a valuable industry in CT. It is projected that waters in the Sound could become unsuitable to shellfish by 2071-2099 due to ocean acidification (NRDC, 2015).[25]

These shifts in climate around Long Island Sound could have tremendous implications for the resources and use of the Sound, as well as how the Blue Plan is implemented. For instance, shifting temperatures and seasons could change what species inhabit the Sound. Also, with changing seasons, public users of Long Island Sound may boat, fish, or kayak on the Sound later in the fall or earlier in the spring than they normally would. Additionally, with the threats of ocean acidification entire aquaculture industries may have to change or shift their practices in the future.

The Blue Plan therefore has to track these changes and ensure that the data and information in the plan is up-to-date with climate change or at least notes recent observed shifts. As the Blue Plan tracks climate change, it can provide the most accurate resources and information to regulatory decision makers and planners.

6.3 Legislative Considerations

Below is a list of potential legislative considerations that may assist the implementation and adaptation of the Blue Plan over time.

Funding for Blue Plan Implementation and Revision
Under the statute (§ 25-157t(h)), DEEP has a continuing obligation to update, revise, and implement the Blue Plan within available resources. The legislature should insure that sufficient additional resources are available to fulfill this responsibility.

Submerged Land Leasing
New York and many other coastal states operate programs under which submerged public trust lands are leased for private use. In Connecticut, shellfish beds and submerged lands under lighthouses are leased (CGS § 22a-27w); and host payment fees are paid by utility crossings of Long Island Sound under CGS § 26-194(c). Other proposals for a broader submerged lands leasing program have been raised in Connecticut over the years, and the legislature may wish to consider such a program as an additional means to fund the implementation of the Blue Plan policies for the management of public trust lands, as well as a potential source of revenue for Long Island Sound related programs.

[25] New England shellfish stakeholders and representative are starting to analyze and combat ocean acidification through The Shellfish Growers Climate Coalition (The Nature Conservancy, 2019).

6.4 Other Areas for Future Consideration

Below is a list of policy and data research topics that may be considered in future iterations of the Blue Plan.

Priority Use Areas

A topic for future consideration and analysis may be to develop "priority use areas." Priority use areas may encourage similar types of uses to cluster within an area or region. For instance, a new type of marine infrastructure or development may be encouraged to be sited in the Thames River because it already has a concentration of military and marine focused infrastructure and development projects. Rhode Island and Massachusetts both designated areas preferred for wind energy development within their respective ocean plans. If priority use areas are considered needed and appropriate in future iterations of the Blue Plan, a process should be developed by which to designate those areas including allowing areas to be nominated by stakeholders and the public. A few examples of what these priority use areas could include are:

- Designating Specific Pipeline and Cable Corridors
- Designating potential Tidal Energy Areas

Notification of New Projects in Blue Plan Policy Area

A future consideration may be to create a consistent method to notify the public or certain stakeholder groups of new projects that are being proposed in the Blue Plan policy area, and under the regulatory programs identified in CGS § 25-157t(h).

Priority Future Research Areas

A number of data gaps are identified in the Inventory, and in the Advisory Committee may wish to establish priorities for future research to fill data gaps in cooperation with UConn. Also, please see Appendix 2 and 3 for more information on currently available data and possible future directions.

Below is a list of potential priority data gaps to be filled in future iterations of the Blue Plan:

- Benthic Habitat Mapping across Long Island Sound
- Marine Mammal and Sea Turtle Observational Data in Long Island Sound
- Commercial and Charter Boat Important Fishing Areas in Long Island Sound
- Areas of Particular Tribal Interest and Importance

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Appendix 1. Blue Plan Policies for Federal Consistency Consideration

Appendix Tables

1. This appendix contains all the policies and standards to be considered federally consistent in the Blue Plan. The policies and standards are organized in two parts, 1) Sound Wide Policies and 2) Policies that apply to ESAs and SHUAs. These policies are a subset of the policies outlined in Chapter 4: Blue Plan Policy Recommendations, and are within this appendix for the purposes of the Federal CZMA Federal Consistency provision (16 U.S.C. § 1456 and 15 C.F.R. part 930).

2. Sound-Wide Policies

   Sound-wide policies are the highest-level policies contained in the Long Island Sound Blue Plan, as they are intended to apply everywhere in the Sound. This section includes a list of broad policies and criteria for the applicable regulatory programs, incorporating the statutory policy criteria of CGS § 25- 157t(b)(2) as integrated through the Vision & Goals Statement.

   <u>Goal 1: Healthy Long Island Sound Ecosystem</u>
   Science-based planning and practices that consider both the environment and human uses will help us understand and protect Long Island Sound ecosystems and the services they provide, now (a.) and in the future (b.):

   Policies

   a. Any activity proposed within the Blue Plan policy area shall avoid, minimize, and mitigate[26] adverse impacts to natural resources in general, including ecosystem services and water quality, and Ecologically Significant Areas in particular, pursuant to CGS § 25-157t(h).

   <u>Goal 2: Effective Decision-Making</u>
   An inclusive, transparent, stakeholder-endorsed and science-based Blue Plan decision-making process that is consistent with other plans and legal requirements will lead to

[26] When applied to policies in this chapter, use of the term "avoid" shall include the minimization of unavoidable adverse impacts and the mitigation of remaining minimized impacts.

decisions supporting the long-term vision for compatibility of human uses and thriving marine life.

No Policies per this Goal

Goal 3: Compatibility among Past, Current, and Future Ocean Uses
Science-based planning and practices that consider both human uses and the environment will sustain traditional and facilitate compatible new water-dependent uses to enhance quality of life and compatible economic development, including maintaining the ecosystem services they depend upon.

Policies:

a. Public Trust:

The Blue Plan recognizes that Long Island Sound belongs to the people of Connecticut and New York, and its waters and submerged lands are held in Public Trust[27] by those States for the people. Management of the Sound shall utilize spatial planning for the benefit of the general public, and the pursuit of traditional public trust uses including but not limited to aquaculture, fishing, recreation, and navigation.

The Sound's Blue Plan policy area includes surface and air, water column, and benthos and substrate, and shall be left as open and unrestricted as possible. New uses of the policy area shall not unreasonably restrict public access except where necessary for resource protection, public health and safety, and national security.

Multiple-use areas shall be preferred, and permanent physical or visual obstructions or encroachments shall not be allowed unless providing a substantial public benefit[28]and where necessary for water-dependent uses, resource protection/enhancement, public health and safety, or national security.

i. Any activity proposed within the Blue Plan policy area shall avoid, minimize, and mitigate conflicts with traditional public trust uses, including Significant Human Use Areas, pursuant to CGS § 25-157t(h).

ii. Offshore structures shall be minimized to the extent practicable in physical scope and visual profile.

[27] A more extensive summary of Public Trust can be found in Section 2.2.

[28] "Public benefit" means a material positive impact to the well-being of the Long Island Sound ecosystem or of the general public, as opposed to any particular benefits to individual firms or economic actors, and shall definition will include facilities in the national interest defined by CGS 22a-93(14), and facilities in support of the State's Comprehensive Energy Strategy and the State Plan of Conservation and Development.

iii. New non-water-dependent uses, including offshore industrial, commercial, or residential uses, shall not be placed within the Blue Plan policy area unless:

a. There are no significant adverse impacts to natural resources, including ecosystem services and water quality, and to existing human uses; and

b. There is a substantial public benefit that outweighs occupation of public trust lands and waters and any unmitigated adverse impacts; and

c. There is no feasible[29] and less environmentally damaging land-based alternative to the proposed use.

iv. Artificially created or enhanced habitats, such as artificial reefs, islands constructed of dredged material, or barges used for seabird nesting may be authorized if:

a. any adverse impacts to existing resources are avoided, minimized, and mitigated, and

b. they provide resource and use benefits outweighing any adverse impacts, and

c. they serve a primary purpose to provide a public benefit.

v. New permanent cross-Sound transportation infrastructure (e.g., bridges and tunnels) shall be avoided except in cases of significant public benefit where adverse impacts, including visual, have been minimized and mitigated to the maximum extent practicable.

vi. Offshore structures intended for flood and storm protection (e.g., tidal barriers and flood walls) shall be avoided except in cases of significant public benefit and where adverse impacts, including but not limited to changes to the Sound's tidal processes and water quality, have been minimized and mitigated to the maximum extent practicable.

b. Vistas and Visual Impact

A prominent and characteristic visual feature of Long Island Sound is the unobstructed views from shore to shore; in Connecticut, across to Long Island and Fishers Island, and to the smaller islands and lighthouses which serve as

[29] Feasible uses the same definition as CGS § 22a-38(17).

visual landmarks to the public. Accordingly, no new activity may be allowed with significant permanent effect on vistas from public viewing points of state or regional significance, such as state parks or prominent viewing areas.

i. Artificial illumination shall be kept to the minimum necessary for the functioning of a water-dependent use, except for temporary exhibitions such as fireworks displays and as legally required for public health and safety.

ii. Municipal authorities are encouraged to implement Connecticut Coastal Management Act policies to identify and protect coastal and inshore visual resources that are visible at the local or neighborhood level.

iii. Applicants for visible in-water or on-water activities are required to provide a visual impact analysis, including day and night digital simulations of different development scenarios, when the regulatory agency administering the programs listed in CGS § 25-157t(h) determines such analyses are necessary to review the potential visual impact of a regulated activity.

3. Part II: General ESA/SHUA Policy

The Blue Plan identifies a series of Ecologically Significant Areas (ESAs) and Significant Human Use Areas (SHUAs) in Long Island Sound. This section is comprised of policies that aim to protect the value of ESAs and SHUAs. This section is thus separated into two parts where more specific siting and performance standards are written based on ecological or human use category.

Policies:

1. Development, preservation, or use of Long Island Sound shall proceed in a manner consistent with the capability of the Sound's natural resources to support development, preservation, or use without significantly disrupting either the natural environment or existing human uses of the Sound;

2. In regard to new applications; preference shall be given to new uses that avoid adverse impacts on the Sound's natural resources, and avoid conflicts with existing human uses of the Sound:

    a. New activities in the Blue Plan policy area of Long Island Sound shall maintain, preserve, or enhance the values of an ESA and/or SHUA.

3. A proposed activity may be located within an ESA and/or SHUA provided that it has been demonstrated, through site-specific survey, scientific data, and analysis submitted pursuant to the applicable regulatory program under CGS § 25- 157t(h) that:

a. The project will cause no significant adverse impacts to the ESA and/or SHUA pursuant to the Ecologically Significant Areas siting and performance standards in Part IIa and the Significant Human Use Areas siting and performance standards in Part IIb, or

b. There is no feasible, less damaging alternative and all reasonable mitigation measures and techniques have been provided to minimize adverse impact, and the public benefits of the project outweigh the harm to the ESA and/or SHUA resource, use, or value.

4. Part IIa. Siting and Performance Standards by Ecologically Significant Resource Category

    1. This section (Table 1a-1) describes the siting and performance standards applicable to each ESA criteria, based on the location of potential impact either in Air and Surface (AS), Water Column (WC), and Benthos & Substrate (BS). The General ESA and SHUA policies also apply to all the following siting and performance standards.

Table 1a-1 Performance standards for locating regulated activities within an ESA, in accordance with policies 3, a-b. For federal consistency consideration.

Significant Ecological Resource Criteria	Air and Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
1. Areas with rare, sensitive, or vulnerable species, communities, or habitats			
1.1. Hard bottom and complex sea floor	No specific standards applicable. General policies apply.	No alteration, including changes in sedimentation or turbidity that would significantly adversely impact ecological characteristics and function.	No alteration that would significantly adversely impact ecological characteristics and function.
1.2. Areas of submerged aquatic vegetation	No structures or activities that would substantially shade or otherwise adversely impact growth.	No alteration, including physical impacts or changes in sedimentation or turbidity that would significantly adversely impact vegetation.	No bottom disturbance to existing vegetation.
1.3. Endangered, threatened, species of concern, and candidate species listed under state and federal Endangered Species Act and their habitats	No specific standards applicable. General policies apply. Comply with applicable state and federal policies to avoid adverse impacts to designated species and habitats.		

1.4. Areas of cold water corals	No specific standards applicable. General policies apply.	No alteration, including changes in sedimentation, turbidity, or acidity that would significantly adversely impact corals.	No bottom disturbance to existing corals.
1.5. Coastal Wetlands	The Blue Plan only has jurisdiction in waters 10 feet and deeper, therefore please refer to the Connecticut Tidal Wetlands Act [CGS § 22a-28 as referenced by CGS §§ 22a-92(a)(2), 22a-92(b)(2)(E), 22a-92(c)(1)(B), and 22a-92(b)(1)(B)] and the Connecticut Coastal Management Act [CGS §§ 22a-93(15)(H) and 22a-93(15) (G)] for appropriate policies and standards.		
Significant Ecological Resource Criteria	Air & Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
2. Areas of high natural productivity (HNP), biological persistence, diversity, and abundance, including areas important for supporting or exhibiting such features, relative to these characteristics or species: [30]			
2.1. Cetaceans	No specific standards applicable. General policies apply. Comply with Marine Mammal Protection Act and other applicable federal law.		
2.2. Pinnipeds	No activities that would significantly or permanently impair use of an area by these species. Comply with Marine Mammal Protection Act and other applicable federal law.		
2.3. Sea Turtles and other Reptiles	No specific standards applicable. General policies apply. Comply with Endangered Species Act and other applicable federal law.		
2.4. Birds	No activities that would significantly adversely impact diversity or abundance of species, including but not limited to interference with migratory patterns or foraging, in these areas. Comply with Migratory Bird Treaty Act and other applicable federal law		
2.5. Fish	No activities that would significantly adversely impact diversity, persistence, or abundance of species in these areas. Comply with Endangered Species Act and other applicable federal law.		
2.6. Mobile Invertebrates	No specific standards applicable. General policies apply.		
2.7. Sessile-mollusk dominated communities	No specific standards applicable. General policies apply.	No activities that would significantly adversely impact diversity, persistence, or abundance of species in these areas.	

[30] Areas where natural productivity, biological persistence, diversity, and abundance are high, as well as migratory sanctuaries, stopovers and corridors, nesting areas, feeding areas, and nursery grounds for cetaceans, pinnipeds, sea turtles, marine birds, fish, mobile invertebrates, sessile-mollusk-dominated communities, managed shellfish beds, and soft-bottom benthic communities.

2.8. Managed Shellfish Beds	No specific standards applicable. General policies apply.	No activities that would significantly adversely impact ecosystem services of managed shellfish beds, except for those activities related to such shellfish management.
2.9. Soft-bottom benthic communities	No specific standards applicable. General policies apply.	

5. Siting and Performance Standards by Significant Human Use Category

    1. This section (Table 1a-2) describes the siting and performance standards applicable to each SHUA criteria, based on the location of potential impact either in Air and Surface (AS), Water Column (WC), and Benthos & Substrate (BS). The General ESA and SHUA policies also apply to all the following siting and performance standards.

Table 1a-2 Performance standards for locating new regulated activities within a SHUA, in compliance with policies 3, a-b. For federal consistency consideration.

Significant Human Use Criteria	Air and Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
3. Areas with features of historical, cultural, or educational significance			
3.1. Areas associated with lighthouses and other offshore historic buildings	No activity that would significantly restrict physical or visual access to the site.	No specific standards applicable. General policies apply.	
3.2. Shipwrecks	No permanent fixed or floating structures that affect the shipwreck site or access to it. Site marker buoys may be allowed.	No permanent fixed or floating structures that may affect the shipwreck site or access to it.	No bottom disturbance, including deposition or shifting of sediments.
3.3. Areas of archaeological significance, submerged archaeological sites, and submerged areas of sensitivity	No permanent fixed or floating structures that affect submerged natural or cultural resources. Site marker buoys may be allowed.	No permanent fixed or floating structures that affect submerged natural or cultural resources.	No bottom disturbance.
3.4. Discrete areas important for research, education, and monitoring	No activity that would significantly adversely affect the use of the area for such purposes.		

Significant Human Use Criteria	Air and Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
4. Areas of substantial recreational and/or "quality of life" value			
4.1. Sailing and Rowing Races	No fixed or floating structures that would interfere with racing activity during the season.	No activity that would interfere with racing activity during the season.	
4.2. Marine Events	General policies apply.		
4.3. High Activity Recreational Boating Areas	No fixed or floating structures that would interfere with vessel traffic.	No activity that would interfere with navigation.	
4.4. Mooring and Anchorage Areas	No fixed or floating structures that would interfere with moored vessels or anchored vessels or vessel traffic.	No activity that would interfere with moored vessels or anchored vessels or vessel traffic.	No activity that would interfere with moored vessels or anchored vessels, or the placement of mooring tackle.
4.5. Marinas, Boat Launches, and Yacht Clubs	No fixed or floating structures that would interfere with authorized facilities and associated boating activities, including access to and maintenance of navigational channels and marina infrastructure.	No activity that would interfere with authorized facilities and associated boating activities, including access to and maintenance of navigational channels and marina infrastructure.	
4.6. Waterfowl Hunting	No fixed or floating structures that would interfere with seasonal hunting activity or waterfowl habitat.	No specific standards applicable. General policies apply.	

4.7. Dive Sites	No permanent fixed or floating structures that adversely affect submerged natural or cultural resources, or unreasonably restrict divers. Site marker buoys may be allowed.	No in-water activities or structures that interfere with diver access.	No bottom disturbance that would adversely affect submerged natural or cultural resources, including deposition or shifting of sediments.
4.8. Coastal Public Use Areas	No structures or activities that would interfere with coastal public use activities.		
Significant Human Use Criteria	**Air and Surface (AS)**	**Water Column (WC)**	**Benthos & Substrate (BS)**
5. Areas important for navigation, transportation, military, infrastructure, and economic activities			
5.1. Working Waterfronts	No activities, or permanent fixed or floating structures that would interfere with maritime and water-dependent activities, including access to navigational channels and infrastructure. Fishing and boating activities allowed subject to operations.	No activities, or permanent fixed structures that would interfere with maritime and water-dependent activities, including navigational channels and infrastructure. Aquaculture and fishing allowed subject to operations.	No on-bottom structures or disturbance that would interfere with operations, including access to and maintenance of navigational channels and infrastructure.
5.2. Designated Navigation Channels	No permanent fixed or floating structures that interfere with navigation or channel maintenance.	No permanent structures that would interfere with navigation or channel maintenance.	No permanent bottom or sub-bottom structures that interfere with navigation or channel maintenance.
5.3. Commercial anchorage areas, security zones, and other designated areas	Activities shall be consistent with the regulations for that designated area.		
5.4. Areas of Lightering Activity	Activity shall comply with applicable Coast Guard and other regulations. No potentially conflicting activity during lightering operations.	No specific standards applicable. General policies apply.	

5.5. Vessel Traffic Areas	No activity or permanent fixed or floating structures that interfere with vessel traffic and navigation, including maneuvering.	No activity or permanent structure that would interfere with navigation. Fishing activities allowed subject to vessel traffic.	No specific standards applicable. General policies apply.
5.6. Dredged Material Disposal Areas: Active	No activity or permanent structures that interfere with disposal operations.		No excavation. No bottom disturbance, except as incidental to disposal operations, scientific activities, or remediation activities.
5.7. Dredged Material Disposal Areas: Historic/Closed	No specific standards applicable. General policies apply.		No excavation. No bottom disturbance, except for scientific or remediation activities.
5.8. Cables, pipelines, and cable/pipeline areas	No specific standards applicable. General policies apply.		No activities that would significantly disturb existing cables and pipelines, except that new facilities may be co-located within corridors, as appropriate to avoid impact to adjacent areas.
5.9. Coastal Energy Generating and Transmission Facilities	No activities that would interfere with facility operation or access.		No on-bottom structures or disturbance that would interfere with operations, including access to the facility by cables or pipelines.
Significant Human Use Criteria	Air and Surface (AS)	Water Column (WC)	Benthos & Substrate (BS)
6. Areas important to fishing and aquaculture			
6.1. Recreational Fishing	Permanent displacement of recreational fishing and related activity by other activity, or permanent structures shall be avoided to the maximum extent practicable.		
6.2. Commercial Fishing	Permanent displacement of commercial fishing and related activity by other activity, or permanent structures shall be avoided to the maximum extent practicable.		

6.3. Charter & Party Boat Fishing	Permanent displacement of charter and party boat fishing and related activity by other activity, or permanent structures shall be avoided to the maximum extent practicable.
6.4. Recreational Shellfish	No permanent structures or activity that unreasonably restricts access to designated shellfish beds or recreational shellfishing activity.
6.5. Commercial Aquaculture	No permanent structures or activity that significantly restricts access to commercial aquaculture activity.

Appendix 2. Ecologically Significant Areas: Supplemental Information and Maps

Appendix Figures

Appendix Tables

1. Introduction

This appendix is primarily serving to present the full set of ESA results including data and maps for all 14 criteria. It also includes the complete set of ESA Layer Construction Tables. The Appendix starts with filling in some of the details of the "ESA Approach, Rationale and Methodology" section 3.4a of the Blue Plan document. For this portion, it is meant to be used as a companion to section 3.4a.

2. ESA Approach, Rationale and Methodology

The following additional notes are added to these section 3.4a:

i. *Blue Plan Ecological Characterization Work Team (ECWT):*
As part of beginning development of the Blue Plan in 2016 by the Blue Plan Advisory Committee and CT DEEP, the ECWT was formed to give direction and provide output for all ecological aspects of the Blue Plan formation process. This was a bi-state group that generally met by conference call on a monthly basis. Its members included Sylvain De

Guise, William Gardella, Mary-beth Hart, Leah Schmalz, Karen Chytalo, Melissa Albino-Hegeman, Victoria O'Neill, Brian Thompson, David Blatt, Sheryll Jones, Kevin O'Brien, Ian Yue and Emily Hall. Nathan Frohling served as the team lead. It provided the structure for how to move forward and eventually be able to identify ESA. It was the core team for overseeing and contributing to preparation of the ecological elements of Inventory.

ii. *Diagram of the ESA Process:*

The following diagram (Figure 2a-1) graphically depicts the basic ESA process that was followed:

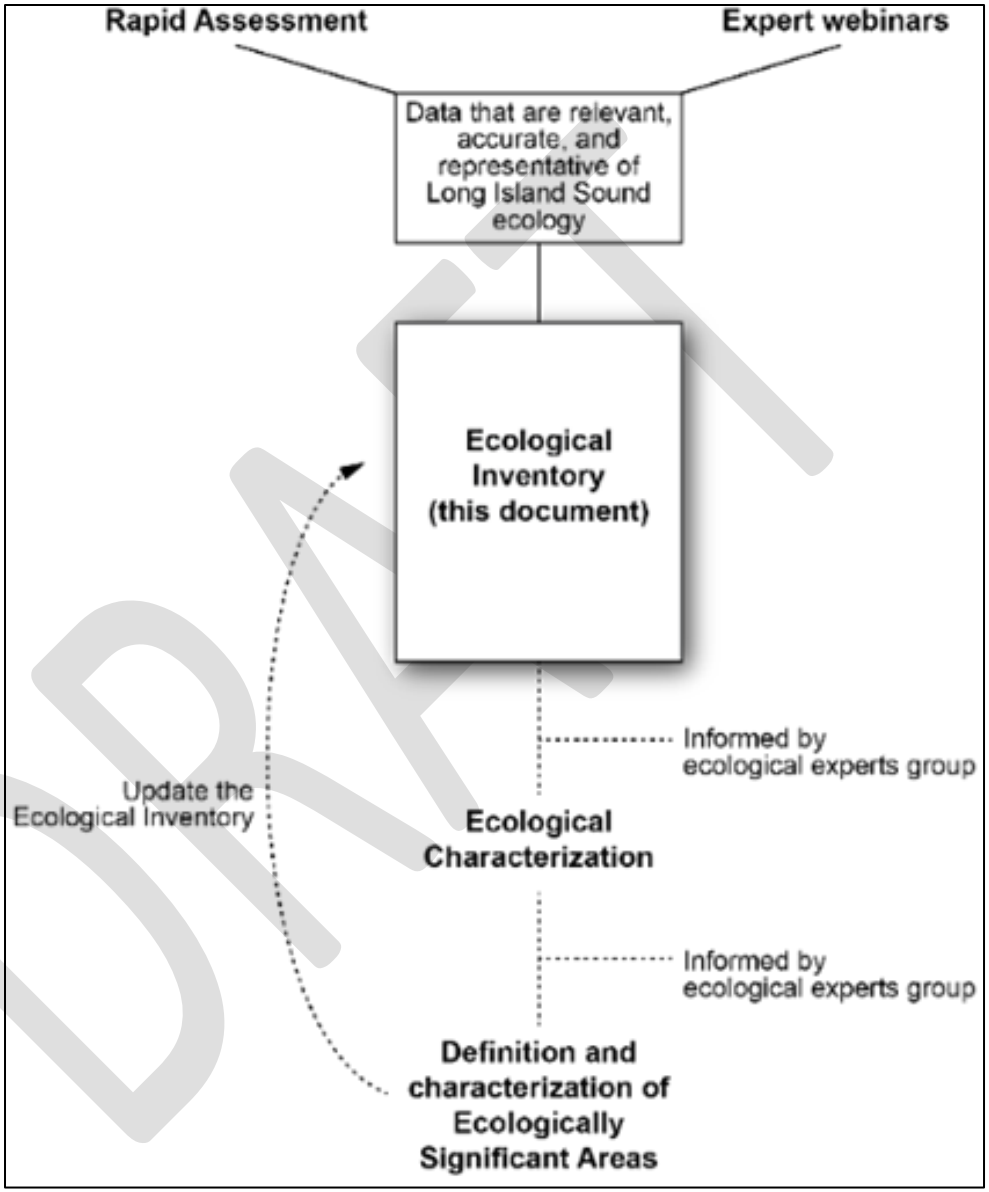


Figure 2a-1 Ecologically Significant Area designation process.

iii. *Ecological Characterization:*

The Ecological Characterization (EC) process was used in preparation for and as an active part of the effort to identify the ESA. A by-product of the EC effort was a stand-along document called the Ecological Characterization Summary (ECS). Although this does not capture the history of full process of EC, it does capture key parts of the broader set of information used to identify ESA that the ESA alone may leave out.

The Ecological Characterization Summary catalogs and present a more complete picture of the map products used for developing the ESA. Map products noted and shown in the EC stem from using data references in the Inventory. The EC work also includes map product development work – that is, additional map products developed by utilizing the data referenced in the Inventory to generate particular results or insights not yet portrayed or available. For example, Terrain Ruggedness Index (TRI) is a model/process that was used with existing data sources in the Inventory to create a critical component of "Seafloor Complexity." Seafloor Complexity is one of the factors that make up ESA, however, such a map product or data layer had to be produced, it did not exist in the Inventory even though the data used by the model is referred to in the Inventory. Also, because the ESA are intended to represent the most significant areas, typically the top 20%, to only show the 20% areas does not allow the underlying 80% to be seen. The EC helps show the broader story, the 100%. Being able to see this full picture may be important in many contexts including use and implementation of Blue Plan policy.

iv. *The Ecological Experts Group (EEG):*

A major activity critical to the success of identifying ESA was the formation of the "Ecological Experts Group (EEG)" which was completed in March 2018. This body of marine ecologists, researchers and other ecological experts provided the scientific horsepower along with the Consultant and Blue Plan leadership to form and carryout the ESA process. This group was formed from the Ecological "Interested Parties". The EEG members were invited by the CT DEEP Commissioner and contributed considerable voluntary time. The EEG participated in 2 webinars and 4 day-long workshops in addition to numerous one on one contacts as of December 2018. The members were selected based on their area of expertise to assure there was sufficient coverage of the range of ecological topics to be addressed. They were also selected to assure a high level of credibility to the process. The EEG continues to serve in process of review and revision of the identified ESA.

v. *Endorsement:*

The EEG in their November 30th, 2018 day-long workshop expressed unanimous support for the ESA that had been developed at that point in time including the definitions of ESA Criteria. It was recognized that this endorsement was to be followed up with a few agreed on updates, particularly for the fish results. Although the EEG was deeply immersed in identifying the ESA, achieving consensus of the EEG on the draft ESA results was not easy but was achieved. Endorsement by the EEG has been informally recognized within the Blue Plan process as the most critical "party" to assure the validity of the ESA.

vi. *Review by Scientists and the Public:*

During 2018 there were multiple communications with scientists and experts outside the EEG that assisted in moving the ESA process forward. At the end of 2018 a series of formal presentations of the draft ESA were made to the larger body of Ecological "Interested Parties" and the public. Specifically, two webinars to over 50 scientists were held. Additional data sources were reported by the scientists (that have since been integrated), constructive input offered, and general support expressed for the draft ESA. Three public meetings were held with attendance totaling approximately 60 people, one at the UConn Avery Point Campus, one at Stony Brook University School of Marine and Atmospheric Sciences and one at Bridgeport City Hall, CT. In addition to many questions and comments, general support was expressed.

3. <u>Methodology: Technical Process</u>

i. *ESA Criteria:*

The following shows the connection between the natural resource categories of the Inventory and the ESA Criteria:

i. Plants
    a. Seaweed/Algae: Considered, did not emerge as ESA
    b. Submerged Aquatic Vegetation (SAV): included as ESA
    c. Phytoplankton: Considered, did not emerge as ESA see Zooplankton below
ii. Animals
    a. Birds: included as ESA
    b. Fish: included as ESA
    c. Marine mammals & Sea Turtles: both included as ESA

d. Zooplankton: Considered, did not emerge as ESA. Data and information for both Phyto and Zooplankton were reviewed and discussed. Both forms of plankton are critical to the ecology of LIS, are at the base of the food chain and a fundamental expression of "productivity" which is a pillar ESA Criteria. The challenge was identifying meaningful criteria and a clear, defensible rationale for selecting areas as ecologically significant - one area over another. In this case, "most" or "highest" is not necessarily an appropriate metric for ecological integrity or even balance (i.e. water quality considerations). Plankton may be an important and more viable category for the next iteration of ESA

e. Marine Invertebrates & Benthic Fauna: included as ESA within different ESA Criteria

iii. Environmental Characteristics
   a. Water Chemistry/Quality: Considered, did not emerge as ESA as discussed above.
   b. Meteorology: Considered, did not emerge as ESA as discussed above.
   c. Physical Oceanography: Considered, did not emerge as ESA as discussed above.

iv. Habitats Physical
   a. Geology/Sediments/Topography: included as ESA within different ESA Criteria
   b. Bathymetry: included as ESA within different ESA Criteria

v. Habitats Biological
   a. Species Persistence Areas: included as ESA, especially for fish

vi. Habitats Ecological
   a. Seafloor Complexity: included as ESA
   b. Ecological Marine Units: Considered, but not needed to convey ESA
   c. Habitat Classes/Units: included as ESA within different ESA Criteria
   d. Benthic: included as ESA within different ESA Criteria
   e. Water Column: included as ESA within different ESA Criteria (e.g. fish)

ii. Framework for Translating Data and Criteria into ESA:

With draft ESA Criteria in hand, the EEG, ECWT and E & C Enviroscape identified a framework for how ESAs would be synthesized and presented, even before all datasets were assembled. Other state and regional ocean plans were studied including and beyond New England regarding such a framework (e.g. The Draft Summary of Marine Life Data and Approaches to define Ecologically Important Areas and Measure Ocean Health produced by the Northeast Regional Ocean Plan (2014) was used). The following is a diagram (Figure 2a-2) used to communicate about the Framework:

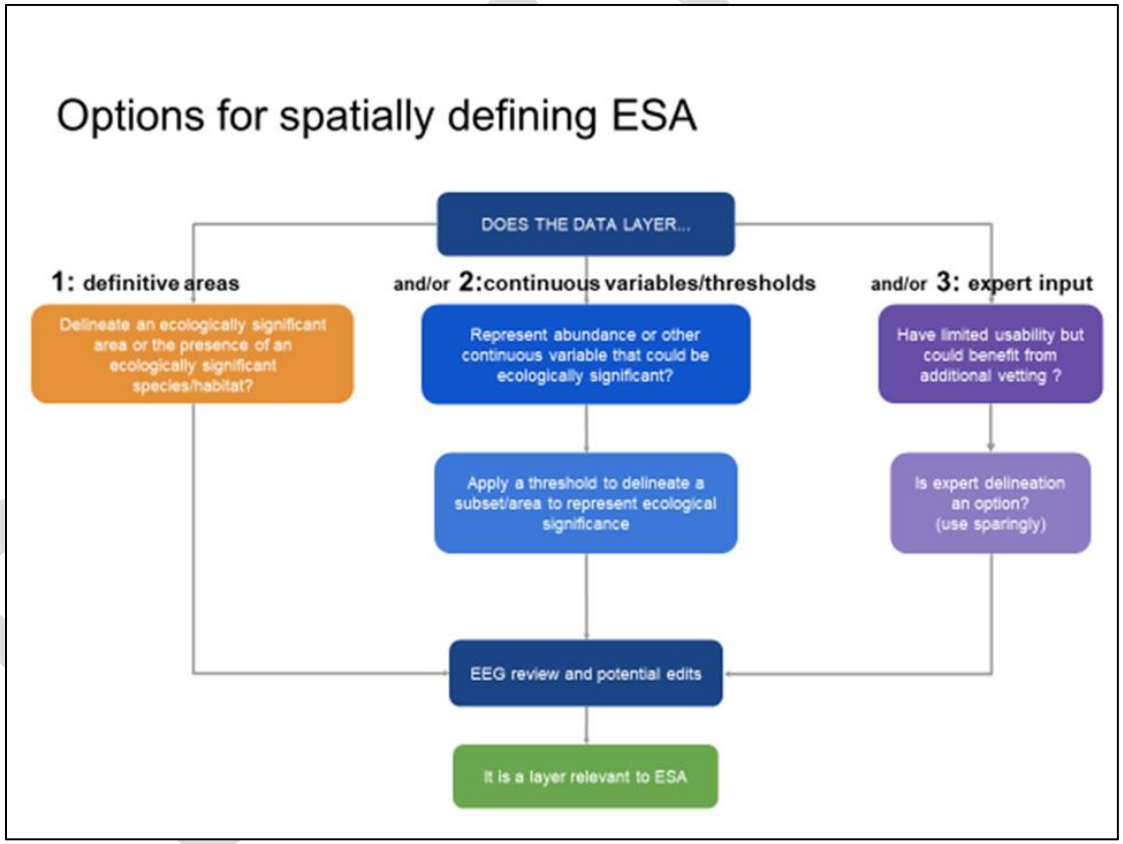


Figure 2a-2 Framework for Spatially Identifying ESAs.

iii. Technical Steps:

There are 12 technical steps that have been outlined to generally describe how the ESA were identified and depicted on maps:

i. Identify datasets; most were identified in the Blue Plan Inventory; there was a need to address data gaps in the Inventory, notably for birds and sea turtles. See "ESA Results" below.

ii. Obtain the datasets; many are publicly available and downloadable, but some are held by private entities (e.g., Mystic Aquarium, Riverhead Foundation) or not easily downloaded online (e.g., CT DEEP Marine Fisheries data) but were obtained and used for the ESA.

iii. Map the full extent of each dataset in a Geographic Information System: ArcGIS 10.5. Almost all datasets were already provided in geospatial format, but some were tabular and needed to be plotted on a map (e.g., lobster projected thermal refuge)

iv. Some datasets required analysis (e.g., buffering of point observations to create "areas", calculation of metrics like total abundance, complexity, or richness) and synthesis (e.g., modeling predicted bird occurrences using environmental variables). Simple analyses like buffering were done using ArcGIS; more complex analyses and map algebra were done using R (coding language) in R Studio (a software/program used to implement it). Resulting outputs were either polygon or raster datasets.

v. Re-project each dataset to a common geographic coordinate system so each dataset or layer can be seen, analyzed and depicted interchangeably.

vi. Convert each dataset into a common raster grid with 8-meter pixel size. This means the finest resolution of data was at or larger than an 8-meter square (point data was buffered to be visible) and datasets with lower resolution were converted into the 8-meter system so all maps could be linked and interchangeable with both the overall geographic coordinate system and the internal data pixel size.

vii. Clip each dataset to the Long Island Sound Blue Plan planning area boundary (essentially the shoreline).

viii. Iterative EEG review and discussion of each individual ESA criterion definition and the associated dataset(s) to determine: if the available data sufficiently represent the ecological components described by the ESA criteria, if the data could be logically subset to identify ESA, if the resulting map matched their expectations given their individual experience and expertise. The EEG weighed in at each step to provide review and suggest addition or different datasets. Examples: additional high resolution bathymetry data for Fisher's Island Sound were added after the seafloor complexity map was drafted to improve depictions of seafloor complexity; locations of oyster

seed beds ("natural beds") were added to the managed shellfish criterion; additional years and seasons were added to the fish criterion after consultation with the EEG and CT DEEP Marine Fisheries.

ix. For each criterion (or sub-criteria), identify preliminary subsets for what represents "ecologically significant". For several datasets, the full distribution (i.e., anywhere the ecological component occurred) was deemed ecologically significant; for example, submerged aquatic vegetation, coastal wetlands or cold water corals. In cases where the dataset showed various levels of abundance or numbers of species present, the EEG opted to select the top quintile of the data distribution as "ecologically significant".

x. Within each criterion, overlay all of the relevant contributing data to display a single coverage of ESA. For example, buffered points of hard bottom observations, buffered points of wrecks and obstructions, hard bottom polygons (broader hard bottom areas than point observations), and the top 20% of complex seafloor grid cells (the most complex) are all overlaid to represent the ESA coverage for the hard bottom and complex seafloor criterion. The draft ESA map for hard bottom and complex seafloor shows all of these datasets merged together and represents areas where the ESA criterion for hard bottom and complex seafloor are present or absent. A user can click on an area where it is present and determine if that location contains a hard bottom observation, a wreck or obstruction, a hard bottom polygon, and/or a highly complex seafloor grid cell.

xi. Once each of the ESA criterion layers have been completed, the ESA have been identified. The single or multiple sources used to make the given ESA criterion (and associated map layer) are all turned into presence/absence – that is, a place either has the ESA or not for that criterion. These are the final ESA maps for each criterion. The next step is for purposes of seeing how it all adds up. To see which and how many ESA may exist in any given 8-meter square, the ESA layers are stacked up, overlaid or "rolled-up" together. A roll-up map was made for the ESAs within each of the two ESA Criteria "pillars" (2-maps) and for all ESAs together (1-map). These represent the "minimum number of ESA's" as noted above given the limitations of data. A user can click on an area and determine which combination of ESA criteria overlap in any given place.

xii. Where possible, code was written in R using R Studio to accelerate steps 5-7 and 9-11 so that draft products could be quickly updated with additional data, different thresholds, or different summary/roll-up methods. Geotiffs were exported from R and imported into ArcGIS 10.5. All of the visualization of ESA maps was done using ArcGIS 10.5.

4. ESA Results

The full set of ESA results follows. These include the table of all the ESA Criteria with associated descriptions and list of supporting data sources (Table 2a-1). The 14 individual ESA criteria and associated ESA layers are then presented, prefaced by a summary of the relevant overarching Criteria Pillar. For each ESA criterion, a short narrative of its ecological significance is included followed by descriptions of the principal, underlying data and associated maps used to form the ESA layer.[31] These maps are the building blocks that are combined to 1) show how the underlying layers overlap and 2) create a presence/absence layer that depicts the final map for the given ESA criterion. Next, a synthesis of all the 14 ESA criteria is presented that shows the overlay and density of all the ESA when seen together. Finally, the full set of ESA Layer Construction Tables is presented.

It is again noted that the Ecological Characterization Summary is an important part of the full ESA documentation. As a stand-along document, it is not included in this Appendix.

i. Map Viewer:
Please note that the ESA maps will be available to view and navigate through a public on-line map viewer being established. This will allow the viewer to zoom in for details or to unpack the layers to see which ESA are present in a particular area or which data overlap within a single ESA criterion.

Table 2a-1 ESA criteria supporting datasets, and descriptions. Mapped data layers can be found in Appendix 2 and in a LIS Blue Plan mapping portal. Some ESA sub-criteria do not have associated datasets, but descriptions have been included so that these areas may be recognized in policy and designated if spatial information is provided in the future.

ESA Criteria	Supporting Datasets	Description
Areas with rare, sensitive, or vulnerable, species, communities, or habitats		
Hard bottom and complex sea floor	• Long Island Sound Ecological Assessment (LISEA) hard bottom (pts)	Areas of hard bottom are characterized by exposed bedrock or concentrations of boulder, cobble, pebble, gravel, or other similar hard substrate distinguished from surrounding

[31] "ESA layers" refers to the maps of ESA that are used to depict the ESA criteria. ESA criteria are the written descriptions of the ESA and because they point to the "ideal" ESA, they are often more comprehensive and/or specific than the maps (and underlying data) are able to provide.

	• USGS Surficial sediment map, gravel areas (polys) • Long Island Sound Mapping and Research Collaborative (LISMaRC) Phase II SEABOSS hard bottom observations (pts) • Terrain Ruggedness Index (top quintile) • Wrecks and obstructions (pts)	sediments and provide a substrate for sensitive sessile suspension-feeding communities and associated biodiversity. Complex seafloor is a morphologically rugged seafloor characterized by high variability in neighboring bathymetry around a central point. Biogenic reefs and man-made structures, such as artificial reefs, wrecks, or other functionally equivalent structures, may provide additional suitable substrate for the development of hard bottom biological communities. Areas of hard bottom and complex seafloor are areas characterized singly or by any combination of hard seafloor, complex seafloor, artificial reefs, biogenic reefs, or wrecks and obstructions.
Areas of submerged aquatic vegetation	Seagrass surveys from 2002, 2006, 2009, 2012, 2017 (polys)	Areas where submerged aquatic vegetation, e.g., eelgrass (Zostera marina), etc., are present or have been found to be present in the past.

Endangered, threatened, species of concern, or candidate species listed under state or federal ESA, and their habitats	• Atlantic sturgeon gear restriction areas (polys) • Atlantic sturgeon and shortnose sturgeon high and medium use areas (polys) • Atlantic sturgeon migratory corridor (polys) • Predicted summer occurrence of roseate tern (raster) • Connecticut Natural Diversity Database approximate locations of endangered, threatened, species of concern (polys) • Connecticut Critical Habitats (estuarine, polys) • New York rare plants and rare animals (polys) • New York Significant Natural Communities (polys) • New York Significant Coastal Fish and Wildlife Habitats (polys) • US Endangered Species Act Critical Habitat for Atlantic sturgeon (polys)	The species listed by federal or state statutes (e.g., the US Endangered Species Act, the CT Endangered Species Act, the NY Endangered Species Act) as endangered, threatened, species of concern, or candidates for listing, and their associated habitats, recognizing that detailed spatial data depicting the distribution and abundance for these marine species in Long Island Sound are potentially unavailable.
Areas of cold water corals	LISMaRC Phase I and Phase II cold water coral observations near Stratford Shoals and eastern LIS (polys)	Areas where cold-water corals have been observed or where habitat suitability or other scientific models predict they occur.

Coastal wetlands[32]	National Wetlands Inventory, clipped to Long Island Sound Study boundary (polys)	According to Connecticut General Statute (CGS) 22a-29: "Those areas which border on or lie beneath tidal waters, such as, but not limited to banks, bogs, salt marshes, swamps, meadows, flats, or other low lands subject to tidal action, including those areas now or formerly connected to tidal waters, and whose surface is at or below an elevation of one foot above local extreme high water; and upon which may grow or be capable of growing some, but not necessarily all, of [a list of specific plant species found in CGS section 22a-29(2)].
ESA Criteria	**Supporting Datasets**	**Description**
Areas of high natural productivity (HNP), biological persistence, diversity, and abundance, including areas important for supporting or exhibiting such features, relative to the following characteristics or species.[33]		
Cetaceans (marine mammals)	• Cetacean density models for the US Atlantic Coast, Duke University Marine Geospatial Ecology Lab, for species with predictions in LIS (raster)	Areas where cetaceans occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support cetaceans (e.g. particular feeding areas, nursery grounds).

[32] Long Island Sound Blue Plan policies do not apply to areas landward of the 10-foot contour, and therefore, while considered Ecologically Significant Areas, Coastal Wetlands and any associated existing statutes or policies relevant to Coastal Wetlands are not within the scope of the Long Island Sound Blue Plan.

[33] Areas where natural productivity, biological persistence, diversity, and abundance are high, as well as migratory sanctuaries, stopovers and corridors, nesting areas, feeding areas, and nursery grounds for cetaceans, pinnipeds, sea turtles, marine birds, fish, mobile invertebrates, sessile-mollusk-dominated communities, managed shellfish beds, and soft-bottom benthic communities.

	• Expert participatory mapping (polys; P. Comins, Connecticut Audubon Society, 1/4/19)	
Pinnipeds (seals)	• NOAA Environmental Sensitivity Index seal concentration areas (polys) • Expert participatory mapping included in the Blue Plan Inventory (polys)	Areas where pinnipeds occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support pinnipeds (e.g. particular haul-out locations, feeding areas).
Sea turtles and other reptiles	• Northern diamondback terrapin probability of occurrence (polys) • Locations of 2018 coastal CT sea turtle strikes (pts) • Live sea turtle stranding's, rescues, and in-water observations, Riverhead Foundation for Marine Research and Preservation (pts) • Live sea turtle strandings and rescues, Mystic Aquarium (pts)	Areas where sea turtles and other reptiles occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support sea turtles and other reptiles (e.g. particular feeding areas, nesting grounds, hibernation areas).
Birds	• Seabird occurrence models, University of Connecticut (raster) • Expert participatory mapping (polys; P. Comins, Connecticut Audubon Society, 1/4/19)	Areas where birds are abundant or diverse including feeding areas; areas of high bird productivity including nesting areas.

Fish	• Persistently productive places for fish (polys; LISEA high weighted persistence) • Areas of high fish abundance and concentration (polys; CT DEEP Marine Fisheries Long Island Sound Trawl Survey, 1995-2004 and 2005-2014, spring and fall data for species caught in >5 tows)	Areas of high weighted fish persistence and high fish abundance and concentration.
Mobile invertebrates	• Areas of high mobile invertebrate biomass and concentration (polys; CT DEEP Marine Fisheries Long Island Sound Trawl Survey, 1995-2004 and 2005-2014, spring and fall data for crabs, lobster, squid, and horseshoe crab) • Horseshoe crab offshore hotspots (polys) • Horseshoe crab predicted high and medium use areas (polys) • Horseshoe crab predicted spawning beaches (polys) • American lobster projected thermal refuge (polys)	Areas of high mobile invertebrate (e.g., lobster, other crustaceans, squid) abundance and concentration.
Sessile-mollusk-dominated communities	LISMaRC Phase I and Phase II observations of Slipper shell (*Crepidula fornicata*) aggregations and blue mussel (*Mytilus edulis*) aggregations near Stratford Shoals and eastern LIS (polys)	Areas where wild, natural sessile-mollusk-dominated communities occur.

Managed shellfish beds	• Oyster seed beds (CT Natural Shellfish Beds) (polys) • CT Recreational Shellfish Beds (polys) • CT State-managed Shellfish Beds (polys) • CT Town-managed Shellfish Beds (polys)	Locations of commercial and recreational shellfishing harvest areas, including shellfish restoration activities and areas closed to shellfishing.
Soft-bottom benthic communities	*Adequate data not available*	Areas of soft-bottom seafloor communities where natural productivity, biological persistence, diversity, and/or abundance of marine flora and fauna are high, as well as areas of soft-bottom seafloor communities known to support important life history or important ecological functions of mobile species (e.g., migratory stopovers and corridors, feeding areas, and nursery grounds).
Zooplankton	*Adequate data not available*	Not an ESA criterion at this time, but noted for ecological relevance to productivity.

ii. Criteria Pillar 1: Areas with rare, sensitive, or vulnerable species, communities, or habitats

The first set of criteria considered by the EEG encompass the concepts of "special", "sensitive", and "unique" that were articulated in the statute definition. In naming this set of criteria the EEG attempted to avoid using words that could be considered to be value-laden. The criteria in this category correspond to similar components of ecological importance identified by other ocean planning and management efforts. For example, these criteria match the components "Areas of vulnerable marine resources" and "Areas of rare marine resources" that were described by the Northeast and Mid-

Atlantic regional ocean plans. Some of the criteria in this category match directly to the twelve "Special, Sensitive, or Unique (SSU) Resources" described in the Massachusetts Ocean Plan, such as the MA hard or complex seafloor and eelgrass SSUs.

The ecological components in this category play critical roles in the Long Island ecosystem but are rare or particularly vulnerable to disturbance and/or environmental change. Many already confer special protection via local, state, and federal regulations.

i. **Criterion 1: Hard bottom and complex seafloor**

Definition: Areas of hard bottom are characterized by exposed bedrock or concentrations of boulder, cobble, pebble, gravel, or other similar hard substrate distinguished from surrounding sediments and provide a substrate for sensitive sessile suspension-feeding communities and associated biodiversity. Complex seafloor is a morphologically rugged seafloor characterized by high variability in neighboring bathymetry around a central point. Biogenic reefs and man-made structures, such as artificial reefs, wrecks, or other functionally equivalent structures, may provide additional suitable substrate for the development of hard bottom biological communities. Areas of hard bottom and complex seafloor are areas characterized singly or by any combination of hard seafloor, complex seafloor, artificial reefs, biogenic reefs, or wrecks and obstructions.

Significance of Hard bottom and complex seafloor

Areas of hard bottom and complex seafloor are known to attract a variety of mobile organisms like fish and seabirds and serve as attachment sites for sessile creatures such as corals, anemones, sponges, and tube-building worms, which in-turn create additional structure and complexity that attracts and shelters marine organisms. Species diversity tends to be higher in areas of complex seafloor when compared to adjacent homogeneous seafloor, and this relationship also influences ecosystem functioning and increases ecosystem efficiency (Zeppilli, Pusceddu, Trincardi, & Danovaro, 2016). The hard bottom and complex seafloor criterion is a proxy for all of these characteristics and components. Multiple datasets were required to characterize hard and complex seafloor.

Hard bottom component

The EEG described "hard bottom" as any substrate coarser than "very coarse sand" on the Wentworth grain size scale, which is equivalent to particles greater than 2 mm in size, and includes granules, pebbles, and cobbles (collectively called "gravel"), as well as boulders. Outcrops of bedrock are also considered hard bottom. Any locations where hard bottom occurred were considered ecologically significant and contributed to the summary map of hard and complex seafloor ESA. The following data sources and associated maps each contributed to depicting the extent of known hard bottom in LIS. They were combined into one map (Figure 2a-3) to create the hard bottom portion of the overall Hard bottom and complex seafloor ESA criterion.

The Nature Conservancy's Long Island Sound Ecological Assessment (LISEA) known occurrences of hard bottom

The LISEA known occurrences of hard bottom map integrates data several sources (below). The resulting layer is a point dataset depicting the locations of hard bottom. The maps and data can be accessed via The Nature Conservancy's Conservation Gateway (The Nature Conservancy, 2017).

- USGS usSEABED database - scientific measurements of seafloor type and grain size
- USGS East Coast Sediment Texture Database - scientific measurements of seafloor type and grain size
- NOAA Electronic Nautical Chart data - notations on charts of bottom type

USGS Long Island Sound Surficial Sediment map

This map represents sediment types in Long Island Sound by polygons, interpreted by USGS scientists from bottom samples, bottom photography, and side scan sonar data. The map and data were published in an academic journal (Poppe, Knebel, Mlodzinska, Hastings, & Seekins, 2000)and in a USGS open file report (US Geological Survey, 2000).

Long Island Sound Mapping and Research Collaborative (LISMaRC) Phase II SEABOSS hard bottom observations

LISMaRC, as part of the Long Island Sound Habitat Mapping Initiative, characterized seafloor type in eastern Long Island Sound in 2017 (LISS, 2017). Locations described as gravel and coarser seafloor types were included in the criterion map. These unpublished data were provided by Dr. Christian Conroy, University of Connecticut.

Figure 2a-3 integrates the datasets for hard bottom and shows the extent of hard bottom that contributes to the Hard bottom and complex seafloor ESA Criterion. The points have a 160 meter buffer so they are visible.

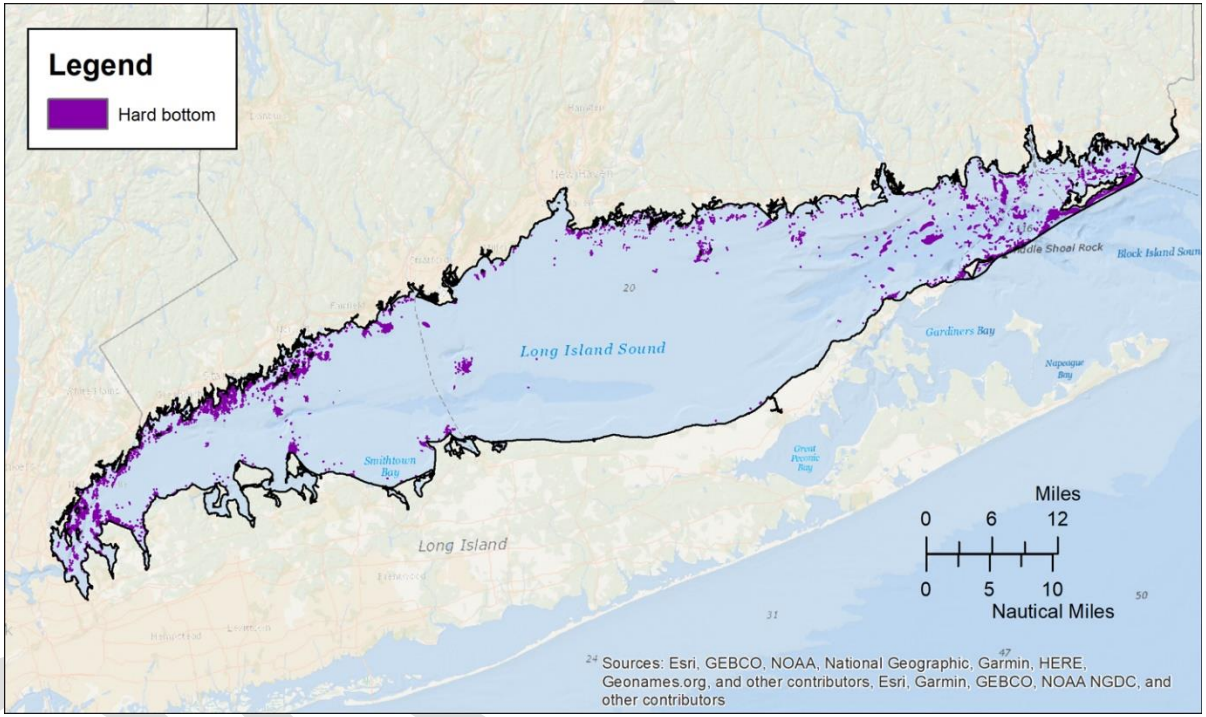


Figure 2a-3 The extent of hard bottom in Long Island Sound mapped from the Long Island Sound Ecological Assessment (LISEA), USGS Long Island Sound surficial sediment map, and Long Island Sound Mapping and Research Collaborative SEABOSS surveys.

Complex seafloor component

The EEG identified areas of complex seafloor using the Terrain Ruggedness Index (TRI) (Riley, DeGloria, & Elliot, 1999). The TRI metric reflects the difference between the depth at each point on the seafloor and the depth of the points surrounding it. Complex seafloor has greater differences between focal points and their surroundings (which equals higher TRI), whereas featureless seafloor has smaller differences between focal points and their surroundings (which equals lower TRI). The data required to calculate TRI are full-coverage bathymetry, or depth, data. A composite

bathymetry dataset with a horizontal resolution of 8 meters was created for Long Island Sound by mosaicking the most recent federal and local datasets from the NOAA National Ocean Service. Data sources including high-resolution multibeam survey data wherever available (ranging in resolution from 0.5m to 8m), and the NOAA Coastal Relief Model data (83m resolution) where high-resolution data were not available. The mosaic resolution of 8m was chosen to optimize the detail conveyed by the highest resolution datasets in the final bathymetry map. TRI was calculated at the scale of a single pixel (8m) and so the resulting TRI map has a resolution of 8m. In order to identify ESA for complex seafloor, the EEG classified the data into quintiles and extracted the top quintile (top 20%) as ecologically significant (Figure 2a-4).

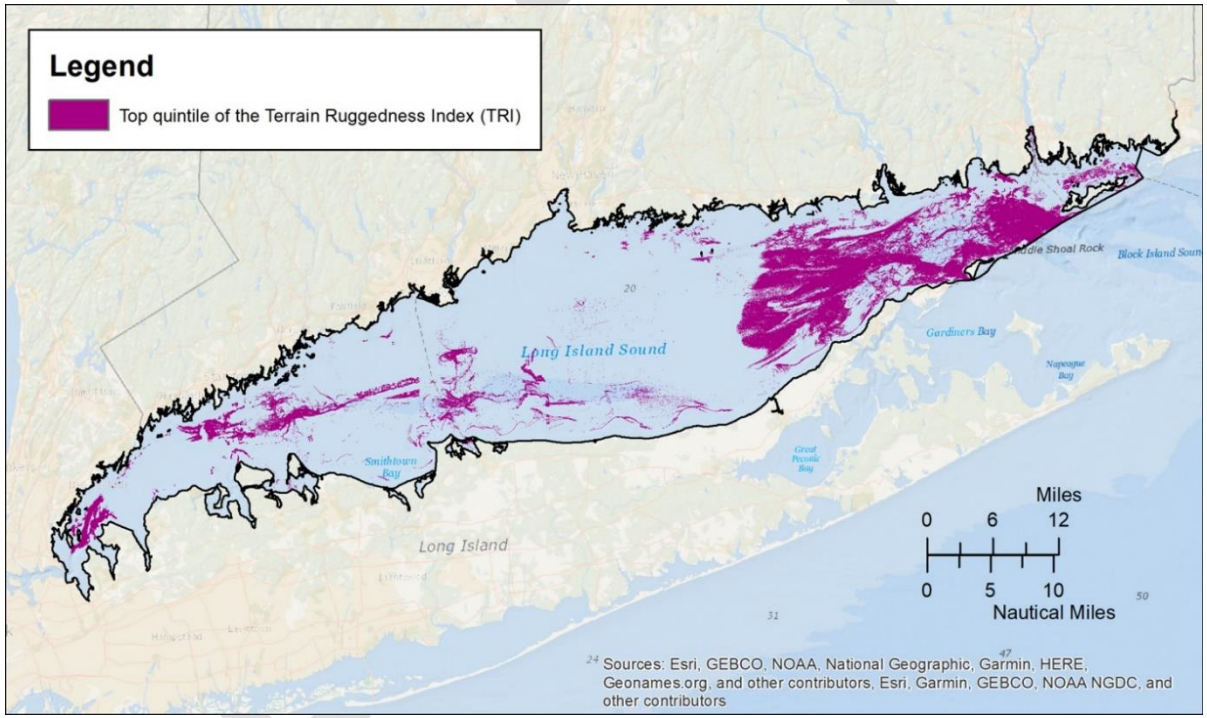


Figure 2a-4 The top quintile of the Terrain Ruggedness Index (TRI) calculated at 8-meter resolution for Long Island Sound.

Wrecks and obstructions component

The EEG included wrecks and obstructions in the map of hard bottom and complex seafloor. Wrecks tend to serve as artificial reefs, and obstructions can include boulders or other hard bottom not delineated in geologic maps. The NOAA Automated Wreck and Obstruction Information System was clipped to the Blue Plan planning area for inclusion in this criterion map. Any locations where wrecks and obstructions occurred were considered ecologically significant (Figure 2a-5). These also have a 160 meter buffer to be visible.

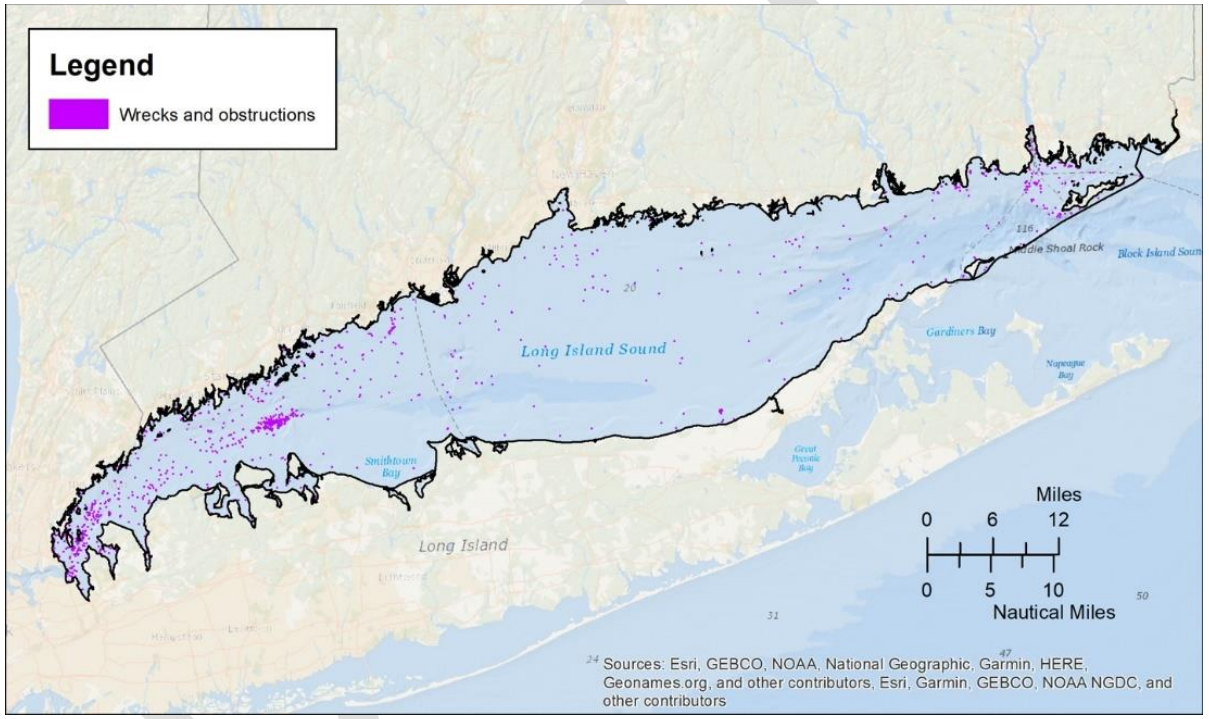


Figure 2a-5 Locations of wrecks and obstructions in LIS from the NOAA Automated Wreck and Obstruction Information System.

Integration of components

Each of the datasets described above (hard bottom, complex seafloor, wrecks and obstructions) were mapped together to represent the full extent of hard bottom and complex seafloor. Figure 4 shows the number of overlaps in those datasets. Figure 2a-6 shows all of the datasets dissolved together to show a single presence/absence layer of

Ecologically Significant Areas for hard and complex seafloor. Figure 2a-7 shows the final ESA hard bottom and complex seafloor map.

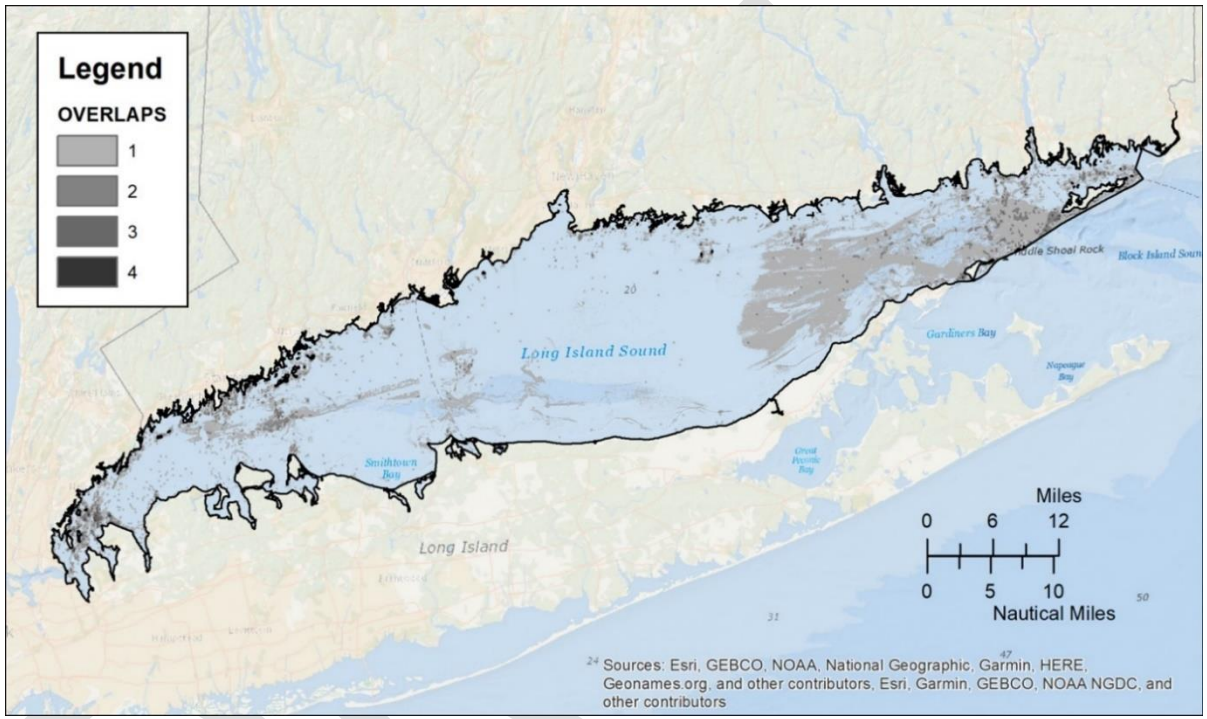


Figure 2a-6 Overlaps among each of the input datasets representing the hard bottom and complex seafloor criterion.

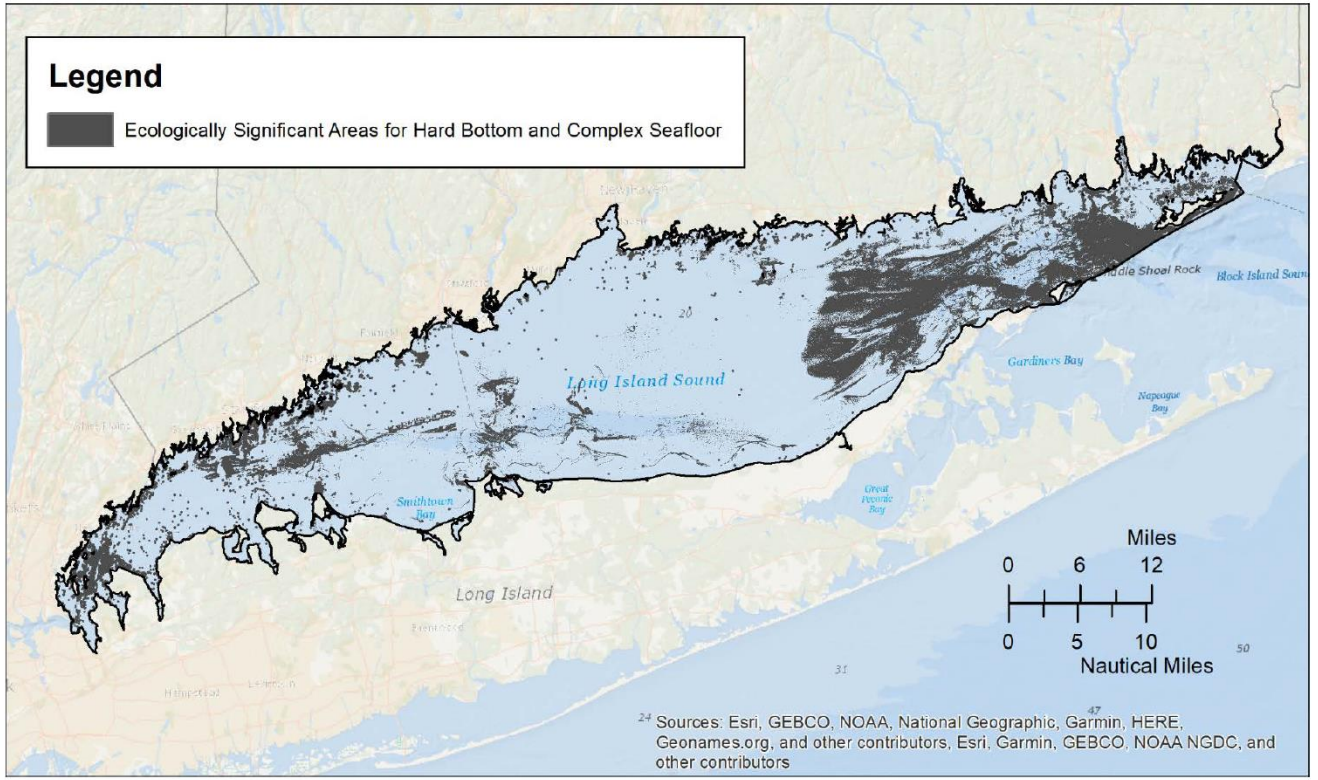


Figure 2a-7 Final ESA map for Hard Bottom and Complex Seafloor.

Updates and potential future work

Additional seafloor observations from the Long Island Sound Seafloor Mapping Initiative and similar projects will improve the identification of both hard bottom and complex seafloor in this criterion. Additional high-resolution multibeam bathymetry surveys by these projects and/or federal agencies will also improve the identification of complex seafloor.

ii. **Criterion 2: Areas of submerged aquatic vegetation**

Definition: Areas where submerged aquatic vegetation, e.g., eelgrass (Zostera marina), etc., are present or have been found to be present.

Significance of submerged aquatic vegetation (SAV):

Submerged aquatic vegetation refers to rooted, vascular plants that occur in the shallow waters of Long Island Sound. Species such as eelgrass can form large, dense meadows that serve as important nursery habitat for fish and shellfish species. Connecticut Public Act 02-50, Section 4 states that the Commissioner of Environmental Protection shall adopt regulations, in accordance with chapter 54 of the general statutes, to protect and restore eelgrass, including the protection of existing eelgrass beds from degradation, the development of a restoration plan to restore eelgrass and the periodic monitoring of the effectiveness of such measures to protect and restore eelgrass.

Delineation of SAV Areas:

Although eelgrass has historically been found throughout Long Island Sound, its current distribution is limited to the eastern Sound (Latimer, Tedesco, Yarish, Stacey, & Garza, 2014). The EEG discussed whether or not to include historical eelgrass data in the delineation of ESA as a way to acknowledge that eelgrass can often be restored or regrow naturally into areas of historical distribution when water quality and other environmental conditions improve. However, the decision to include multiple years of eelgrass survey results ultimately reflected the need to offset the high variability in the results of each survey that result from the high natural spatial/temporal variability in eelgrass meadow extent itself and the high variability inherent in the survey methods (Dr. Jamie Vaudrey, personal communication, December 11, 2018). A multi-year composite map more accurately portrays recent eelgrass distribution.

The US Fish and Wildlife Service National Wetland Inventory mapped eelgrass in Long Island Sound in 2002, 2006, 2009, 2012, and 2017. Each of these datasets can be downloaded from the CT DEEP GIS website (CT DEEP, 2019).

Integration of datasets:

Each of the five years of eelgrass survey datasets described above were mapped together to represent the recent extent of submerged aquatic vegetation. Figure 2a-8 shows all of the datasets dissolved together to show a single presence/absence layer of ESA for submerged aquatic vegetation, which is spatially limited to eastern Long Island Sound (Figure 2a-9).

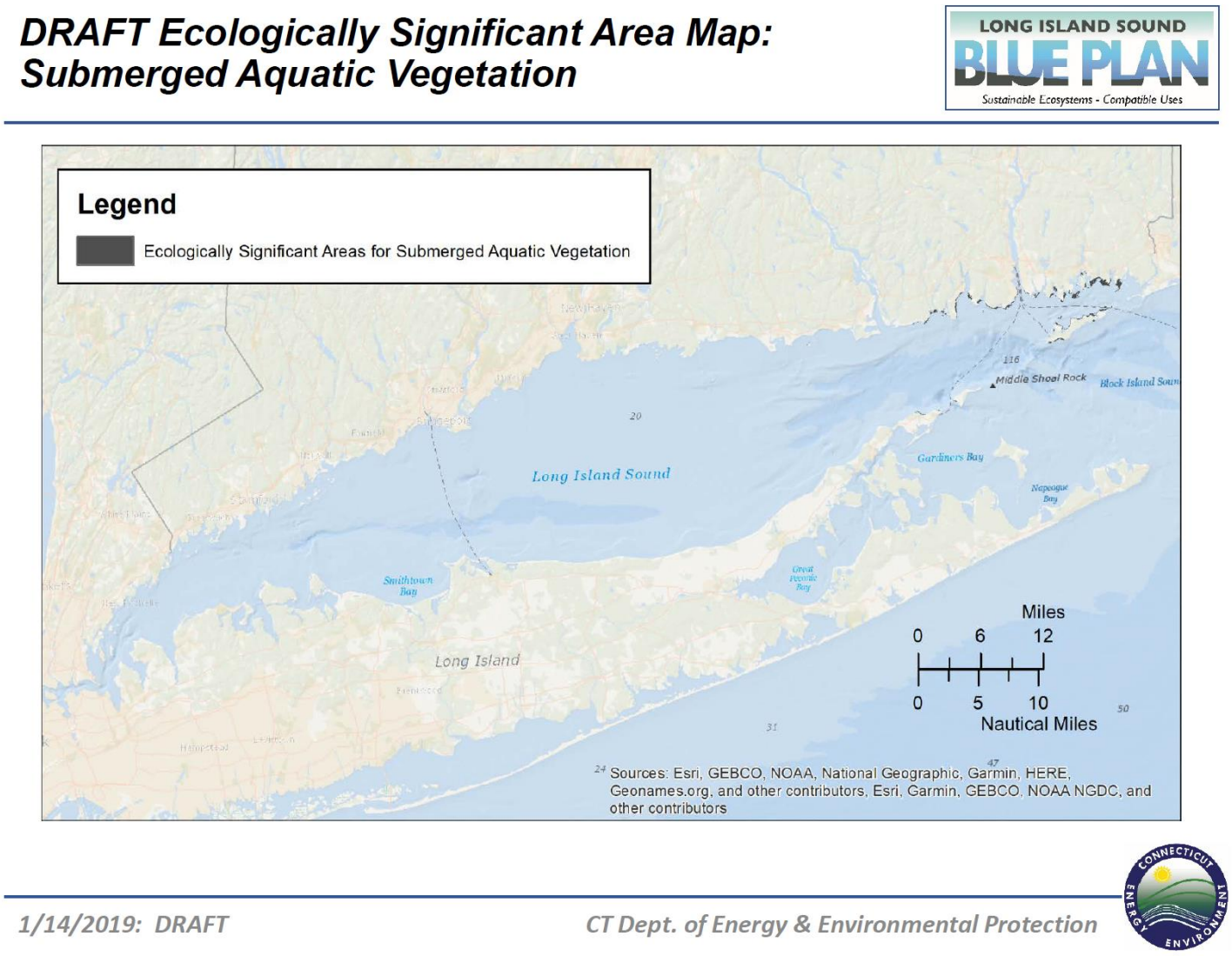


Figure 2a-8 Final ESA map for Submerged Aquatic Vegetation. Note: The Blue Plan Planning Area boundary is removed in this map to more clearly depict submerged aquatic vegetation features. Figure 2a-9 shows the eastern Sound in detail to better discern submerged aquatic vegetation features.

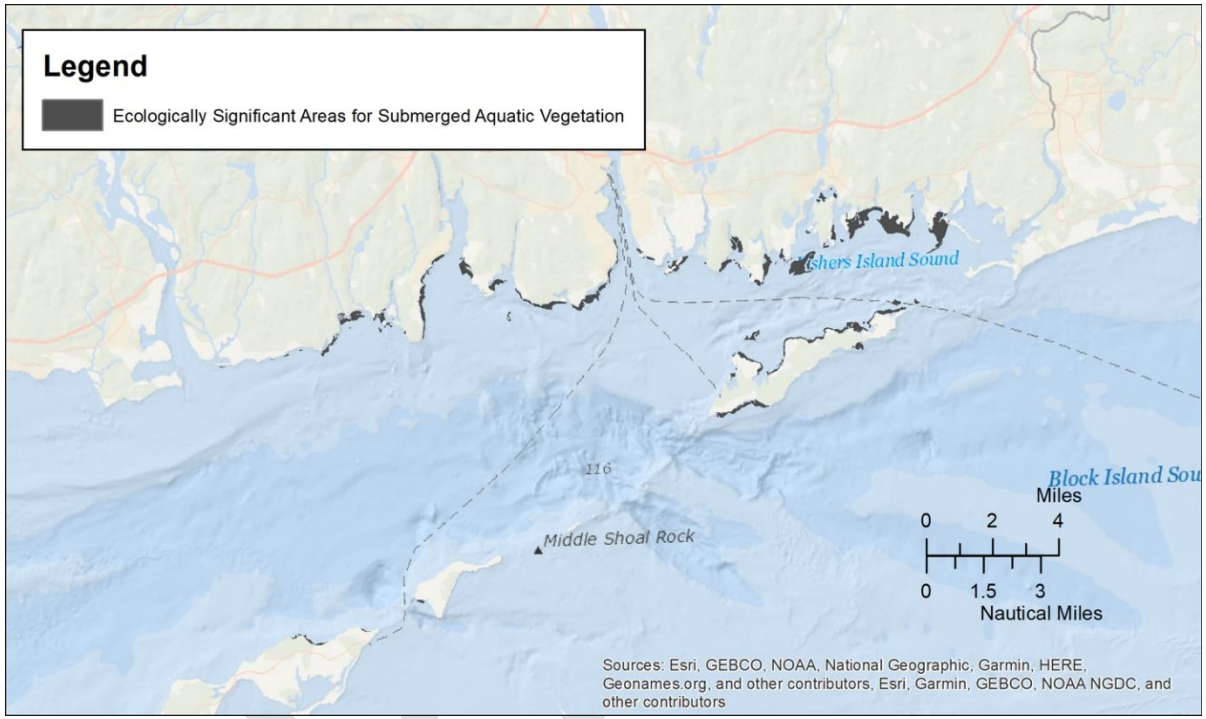


Figure 2a-9 Zoomed-in map showing the extent of the ESA for submerged aquatic vegetation. Note: The Blue Plan Planning Area boundary is removed in this map to more clearly depict submerged aquatic vegetation features.

Updates and potential future work

As discussed above, the natural spatial and temporal variability in eelgrass meadows necessitates frequent updates of these data to accurately reflect current conditions. Additionally, eelgrass habitat suitability models that combine physical and biological environmental conditions with observations of eelgrass to predict eelgrass occurrence, could be used as an input for this criterion that would identify areas that could potentially be ecologically important for eelgrass.

iii. **Criterion 3: Endangered, threatened, species of concern, or candidate species listed under state or Federal Endangered Species Act and their habitats**

Definition: *The species listed by federal or state statutes (e.g., the US Endangered Species Act, the CT Endangered Species Act, the NY Endangered Species Act) as endangered, threatened, species of concern, or candidates for listing, and their associated habitats, recognizing that detailed spatial data depicting the distribution and abundance for these marine species in Long Island Sound are potentially unavailable.*

Significance of Criterion 3:

The marine life represented by this criterion, by their special status of being endangered, threatened, etc., are significant because of that status. That significance is already recognized officially. This criterion is also a clear representation of the meaning of Criteria Pillar 1.

Components/data sources for Criterion 3:

This criterion relates to species that are protected by existing state and/or Federal regulations and laws. The EEG indicated that the data required to fully characterize this criterion would consist minimally of species occurrence data, but also could include abundance data and/or habitat maps for each individual endangered, threatened, species of concern, and candidate species found to occur in the BP planning area. However, for most of these species, this level of data and information is currently unavailable. Species listed under the Connecticut Endangered Species Act were used as the basis for this criterion because the New York Endangered Species Act is relevant to both Long Island Sound and the New York Bight ecosystem, which is fundamentally different from Long Island Sound. The listed species that are expected to occur within the BP planning area are shown in Table 2a-2. The following data sources and associated maps serve as components of the ESA for Criterion 3.

Table 2a-2 Connecticut Endangered Species Act-listed species occurring within the Blue Plan planning area.

Common name	**Scientific name**	**CT Status**	**NY Status**	**Federal Status**
Mammals				
Harbor porpoise	*Phocoena phocoena spp. phocoena*	SC	SC	

Birds - Loons, Shorebirds, Terns, and others				
Common loon	*Gavia immer*	SC	SC	
Common tern	*Sterna hirundo*	SC	T	
Least tern	*Sternula antillarum*	T	T	
Piping plover	*Charadrius melodus*	T	T	T
Roseate tern	*Sterna dougalii*	E	E	E
Upland sandpiper	*Bartramia longicauda*	E	T	
American oystercatcher	*Haematopus palliatus*	T		
Eskimow curlew	*Numenius borealis*	SC		
Fish				
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	E	E	E
Blueback herring	*Alosa aestivalis*	SC		
Sand tiger shark	*Carcharius taurus*	SC		
Shortnose sturgeon	*Acipenser brevirostrum*	E	E	E
Reptiles - sea turtles and brackish turtles				
Atlantic green sea turtle	*Chelonia mydas*	T	T	T
Atlantic ridley	*Lepidochelys kempii*	E	E	E
Leatherback sea turtle	*Dermochelys coriacea*	E	E	E
Loggerhead sea turtle	*Caretta caretta*	T	T	E

Northern diamondback terrapin	*Malaclemys terrapin terrapin*	SC		

For three of the five endangered species, Atlantic sturgeon, shortnose sturgeon, and roseate tern, datasets at the individual species level were available for inclusion in the maps for this criterion. Several of the other threatened or special concern species are characterized spatially in other ESA criteria (e.g., harbor porpoise, diamondback terrapin). However, for this criterion, state endangered species spatial databases were used to characterize Ecologically Significant Areas for these non-endangered species. One limitation of the state spatial databases is that they are focused on the coast and coastal habitats even though many of the endangered, threatened, and species of concern have open-water distributions. Individual layers for the endangered sturgeon species and roseate tern partly address this limitation.

Atlantic sturgeon and shortnose sturgeon

CT DEEP Marine Fisheries provided several datasets relevant to these two sturgeon species. First, they provided a layer that delineates the sturgeon migratory corridor in the Sound. Second, the provided the boundaries of areas where certain fishing gears (e.g., otter trawl, beam trawl, sink or anchored gillnet) are restricted to protect Atlantic sturgeon. Lastly, areas of high and medium sturgeon use were identified from the CT DEEP Marine Fisheries Long Island Sound Trawl Survey (LISTS). The sturgeon migratory corridor, the gear restriction areas, and the medium and high use areas were all considered ecologically significant (Figure 2a-10). For more detail on LISTS and its methods, see the Fish criterion.

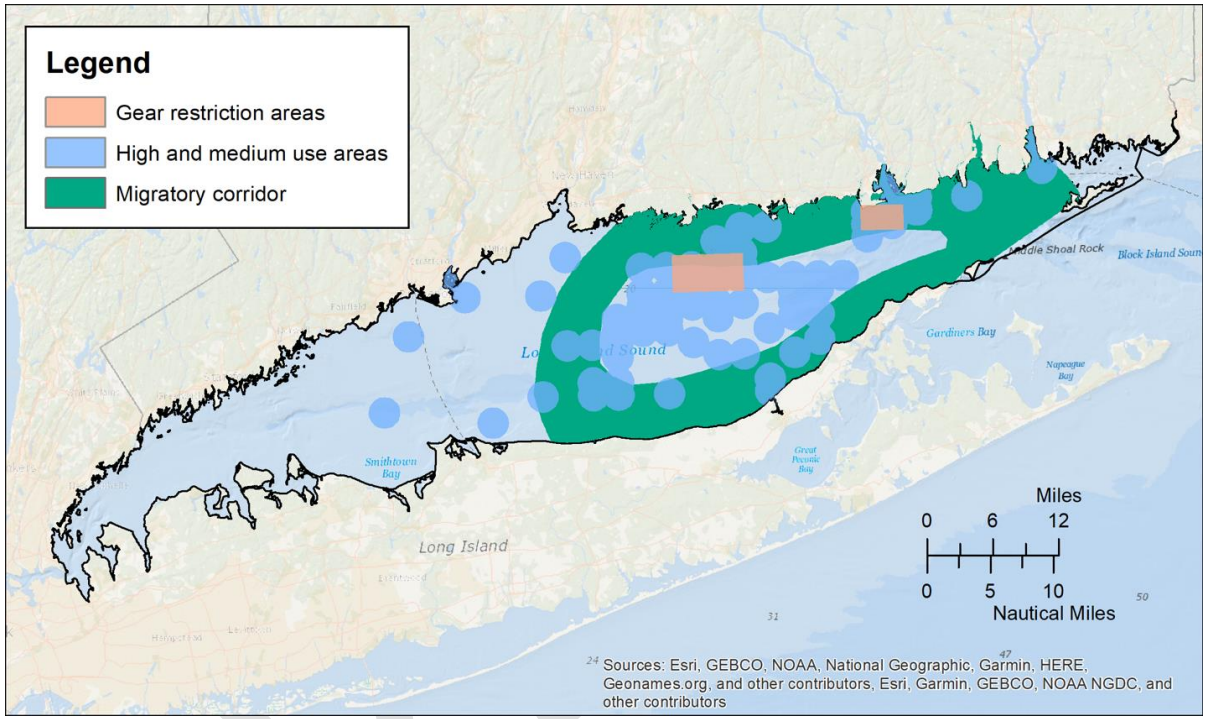


Figure 2a-10 Data layers relevant to Atlantic and shortnose sturgeon ESA including Atlantic sturgeon gear restriction areas, high and medium use sturgeon areas, and Atlantic sturgeon migratory corridor from CT DEEP Marine Fisheries.

Roseate tern

A summer (May - September) predicted occurrence map for roseate tern was provided by the University of Connecticut. All areas where roseate tern was predicted to be present were considered ecologically significant (Figure 2a-11). For more detail on this layer, see the Birds criterion.

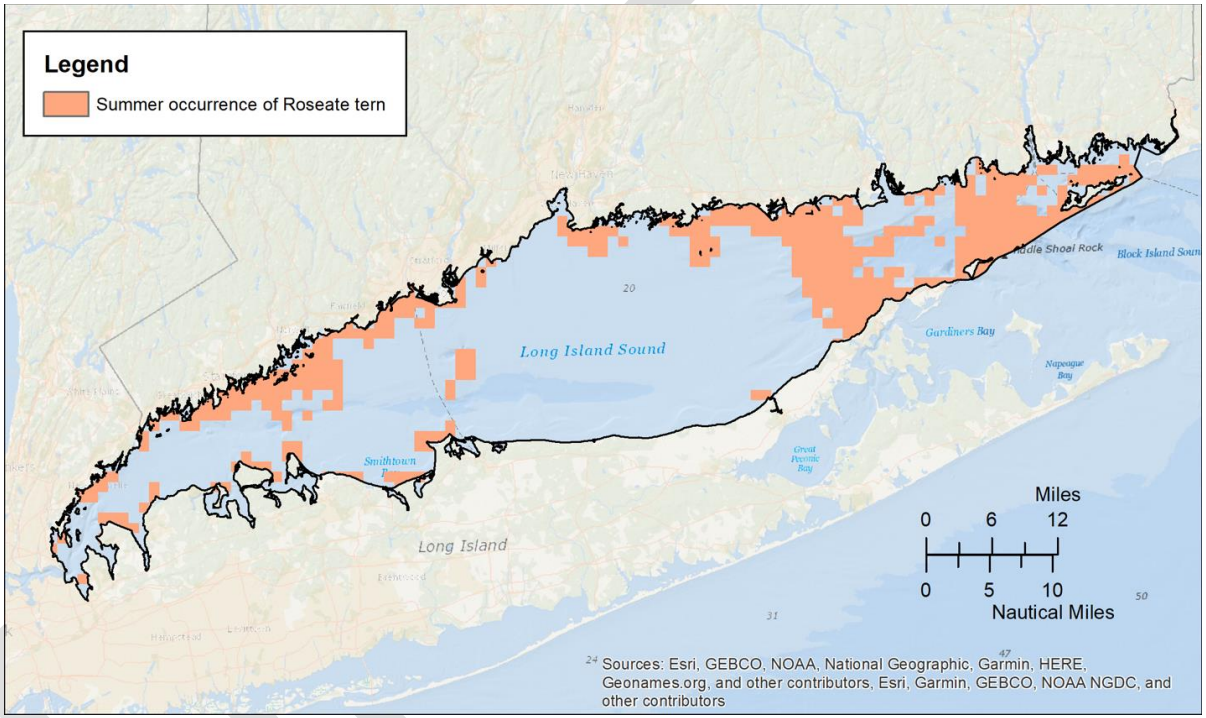


Figure 2a-11 Predicted summer occurrence of roseate tern in LIS.

Connecticut Natural Diversity Database

The Connecticut Natural Diversity Database maintains maps that represent approximate locations of endangered, threatened and special concern species and significant natural communities in Connecticut, compiled from CT DEEP staff, scientists, conservation groups, and landowners (Figure 2a-12) (CT DEEP, 2019). The data are updated approximately every 6-months and are meant to serve as a pre-screening tool to identify potential impacts to state-listed species. The Connecticut Natural Diversity Database was updated in December 2018, and are available for download on the CT DEEP GIS website (CT DEEP, 2019).

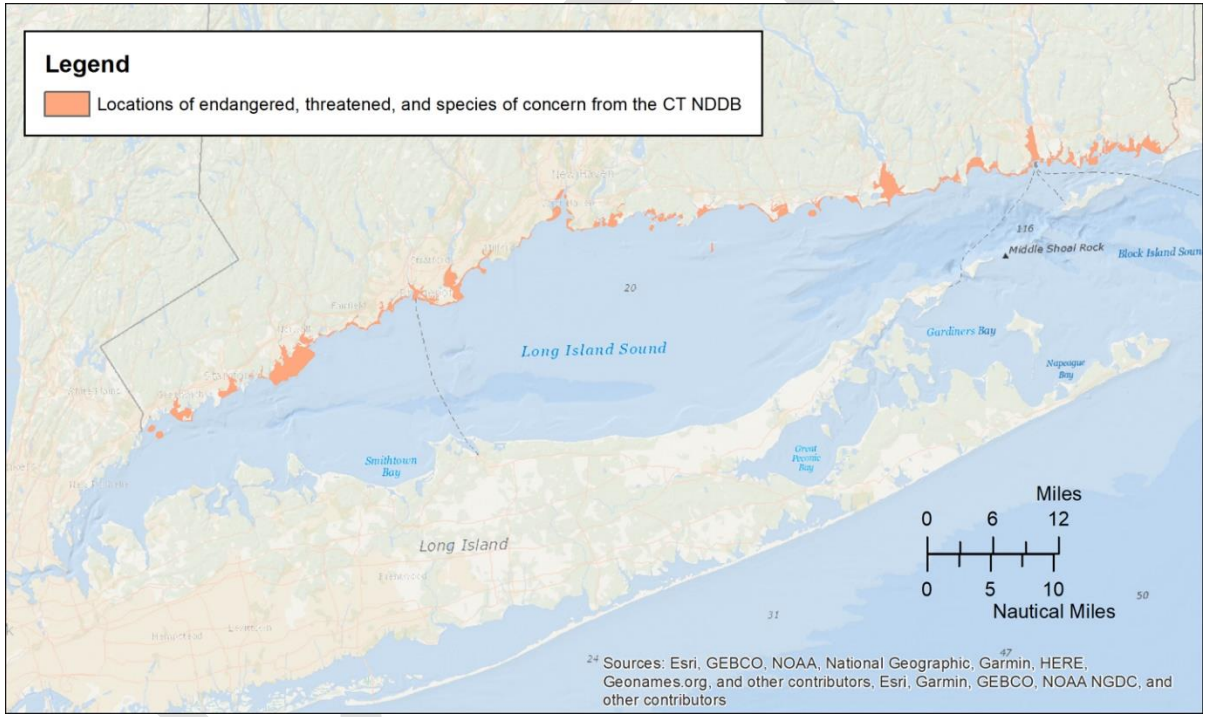


Figure 2a-12 Approximate locations of endangered, threatened, and special concern species and significant natural communities in Long Island Sound, as reflected in the Connecticut Natural Diversity Database (CT NDDB). Note: The Blue Plan Planning Area boundary is removed in this map to more clearly depict features.

Connecticut Critical Habitats

Connecticut Critical Habitats provides the identification and distribution of a subset of important wildlife habitats identified in the Connecticut Comprehensive Wildlife Conservation Strategy. Critical Habitats in estuarine environments were extracted from the full dataset for mapping in the BP planning area (Figure 2a-13). The full dataset is available for download on the CT DEEP GIS website (CT DEEP, 2019).

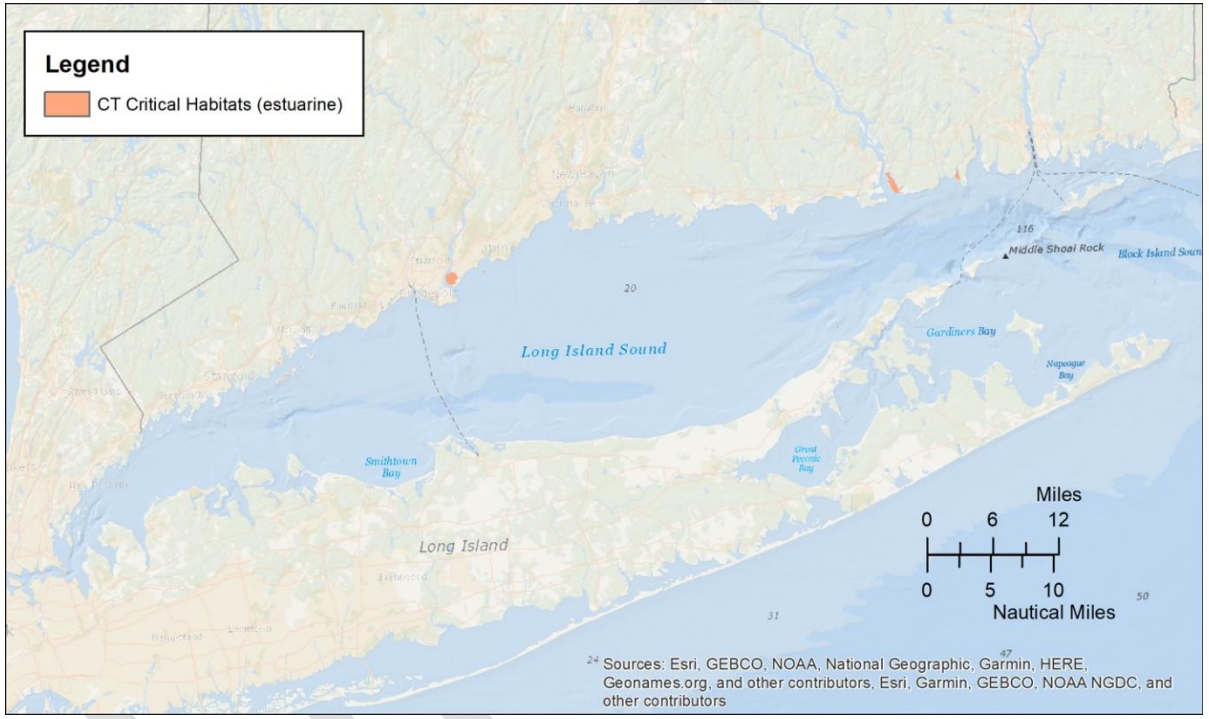


Figure 2a-13 Connecticut Critical Habitats in estuarine environments within the LIS Blue Plan planning area. Polygons are located on the north shore of the Sound. Note: The Blue Plan Planning Area boundary is removed in this map to more clearly depict features.

New York Rare Plants and Rare Animals

The New York Natural Heritage Program actively surveys rare animal species, including those listed as threatened, endangered, and of species concern by the state (Figure 2a-14). The data can be accessed via the New York State Department of Environmental Conservation Environmental Resource Mapper (NY DEC, 2019).

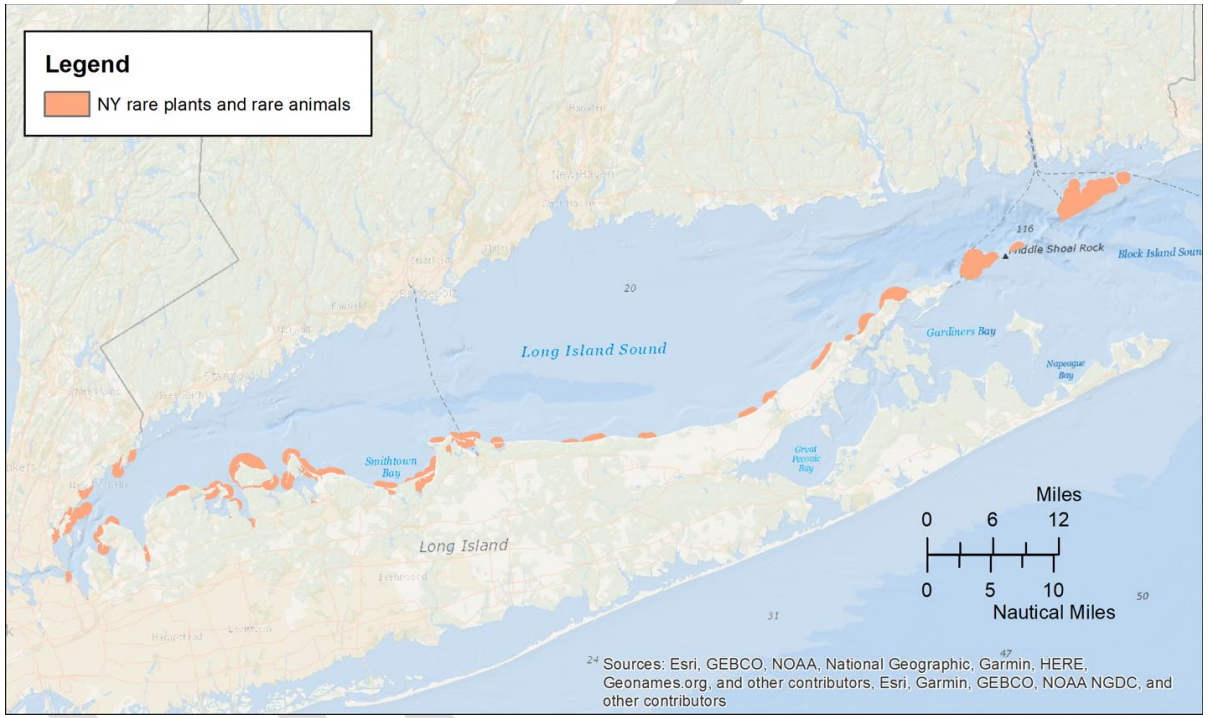


Figure 2a-14 Approximate locations of rare plants and animals in New York waters of LIS from the New York Department of Environmental Conservation. Note: The Blue Plan Planning Area boundary is removed in this map to more clearly depict features.

New York Significant Natural Communities

The New York Natural Heritage Program maintains a database of locations of rare or high-quality wetlands, forests, grasslands, ponds, streams, and other types of habitats, ecosystems, and ecological areas (Figure 2a-15). Because some significant natural communities contain rare plants and/or rare animals, there is some overlap between this layer and the New York Rare Plants and Rare Animals layer. The data can be accessed via the New York State Department of Environmental Conservation Environmental Resource Mapper (NY DEC, 2019).

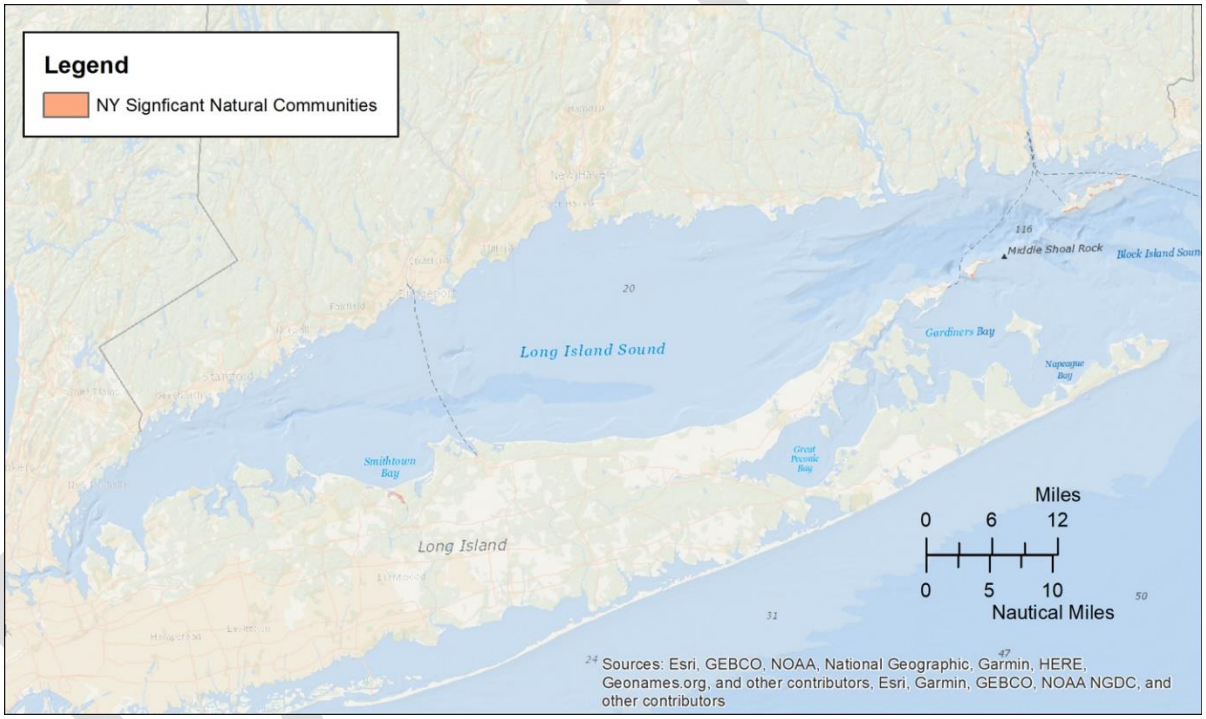


Figure 2a-15 Locations of New York Significant Natural Communities, on the Long Island shore of the Sound. Note: The Blue Plan Planning Area boundary is removed in this map to more clearly depict features.

New York Significant Coastal Fish and Wildlife Habitats

New York State Significant Coastal Fish and Wildlife Habitats (NY Office of Planning and Development, 2019) have been designated and mapped by the New York Department of State, after recommendation by the New York Department of Environmental Conservation, which applied a rating system (Ozard, 1984) to identify and rate the habitats (Figure 2a-16). Generally, the habitats must: be essential to the survival of a large portion of a particular fish or wildlife population; support populations of species which are endangered, threatened or of special concern; support populations having significant commercial, recreational, or educational value; or exemplify a habitat type which is not commonly found in the State or in a coastal region.

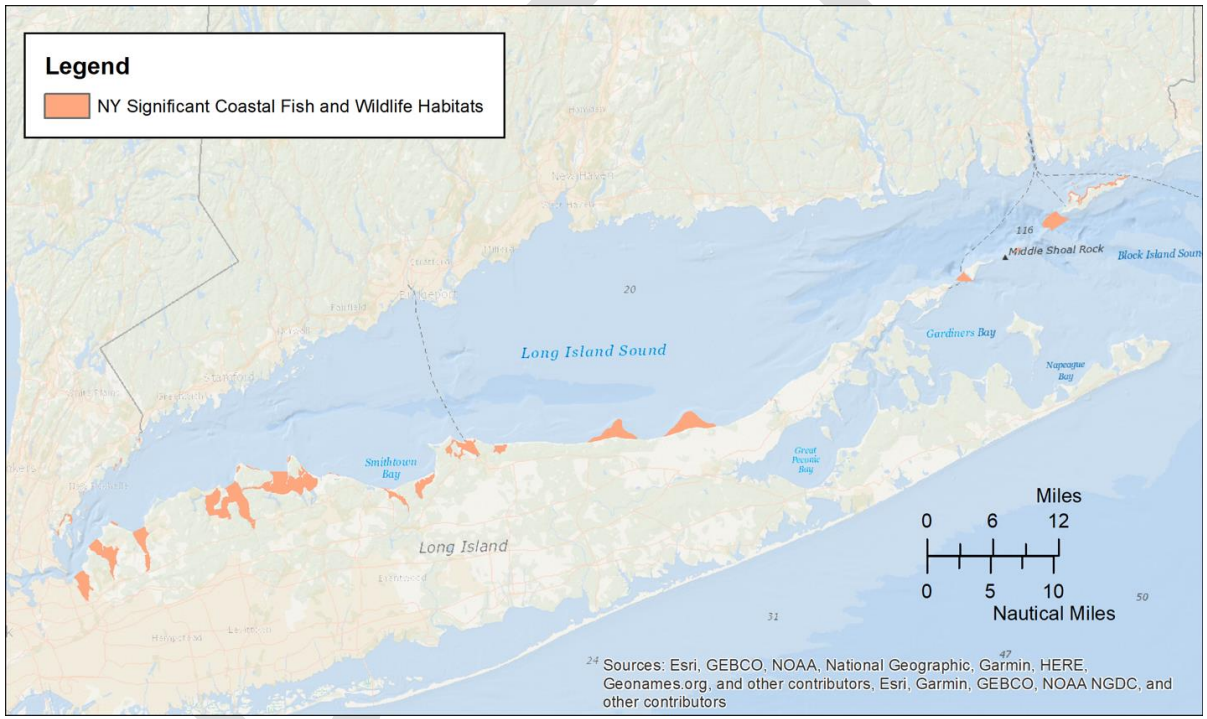


Figure 2a-16 Locations of New York Significant Coastal Fishing and Wildlife Habitats. Note: The Blue Plan Planning Area boundary is removed in this map to more clearly depict features.

US Endangered Species Act Critical Habitats

One of the six federally endangered species known to occur in Long Island Sound (Table 2a-2) has Critical Habitat spatially defined under the US Endangered Species Act by the NOAA Greater Atlantic Region Fisheries Office (GARFO) Protected Resources Division (NOAA Fisheries, 2017). Atlantic sturgeon Critical Habitat is defined for Connecticut River and Housatonic River segments (Figure 2a-17). The other endangered species known to occur in Long Island Sound do not have Critical Habitats defined under the US Endangered Species Act. The NOAA GARFO Protected Resources Division developed and maintains the ESA Section 7 Mapper, which allows users to identify any Critical Habitats and protected species present in a project action area (Fisheries, 2019).

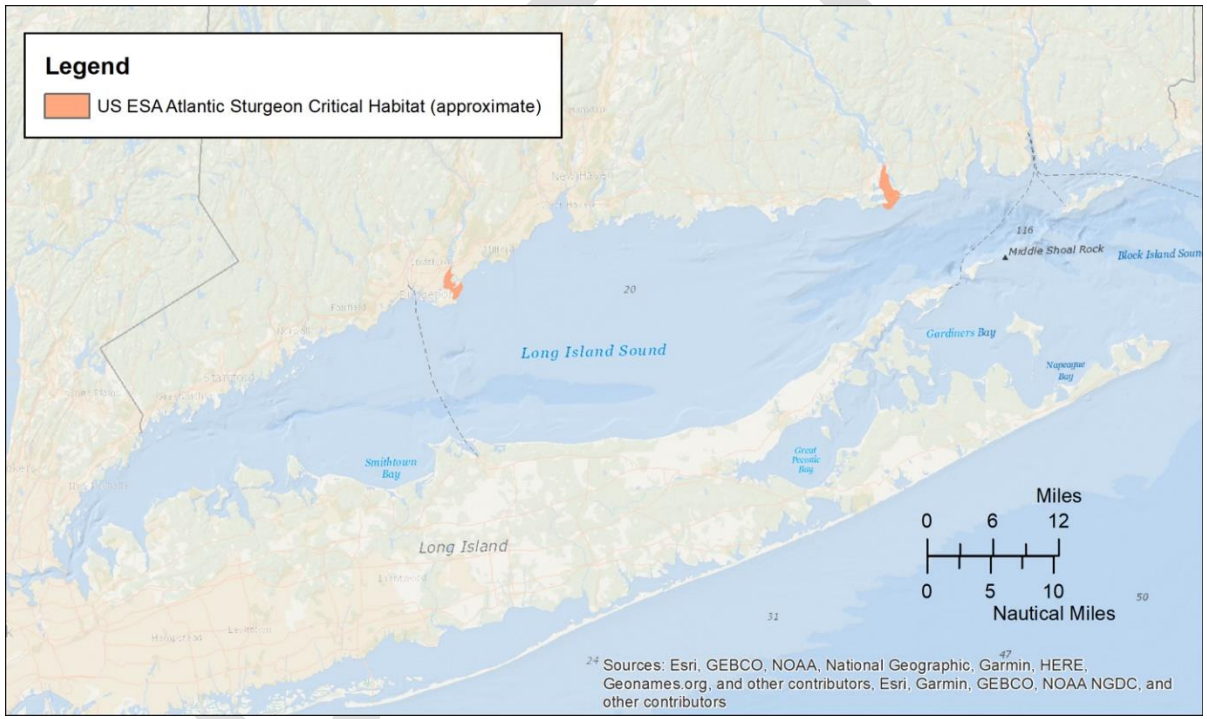


Figure 2a-17 Approximate location of Critical Habitats delineated for Atlantic sturgeon under the US Endangered Species Act (US ESA). The river segments affected by this regulation have been buffered to increase visibility on this map and in the Ecologically Significant Areas analysis. Note: The Blue Plan Planning Area boundary is removed in this map to more clearly depict features.

Integration of components/data sets

Each of the datasets described above were mapped together to represent the extent of endangered, threatened, species of concern, or candidate species listed under state or Federal Endangered Species Act and their habitats. Figure 2a-18 shows the number of overlaps in those datasets. Figure 2a-19 shows all of the datasets dissolved together to show a single presence/absence layer of ESA for endangered, threatened, species of concern, or candidate species listed under state or Federal Endangered Species Act and their habitats.

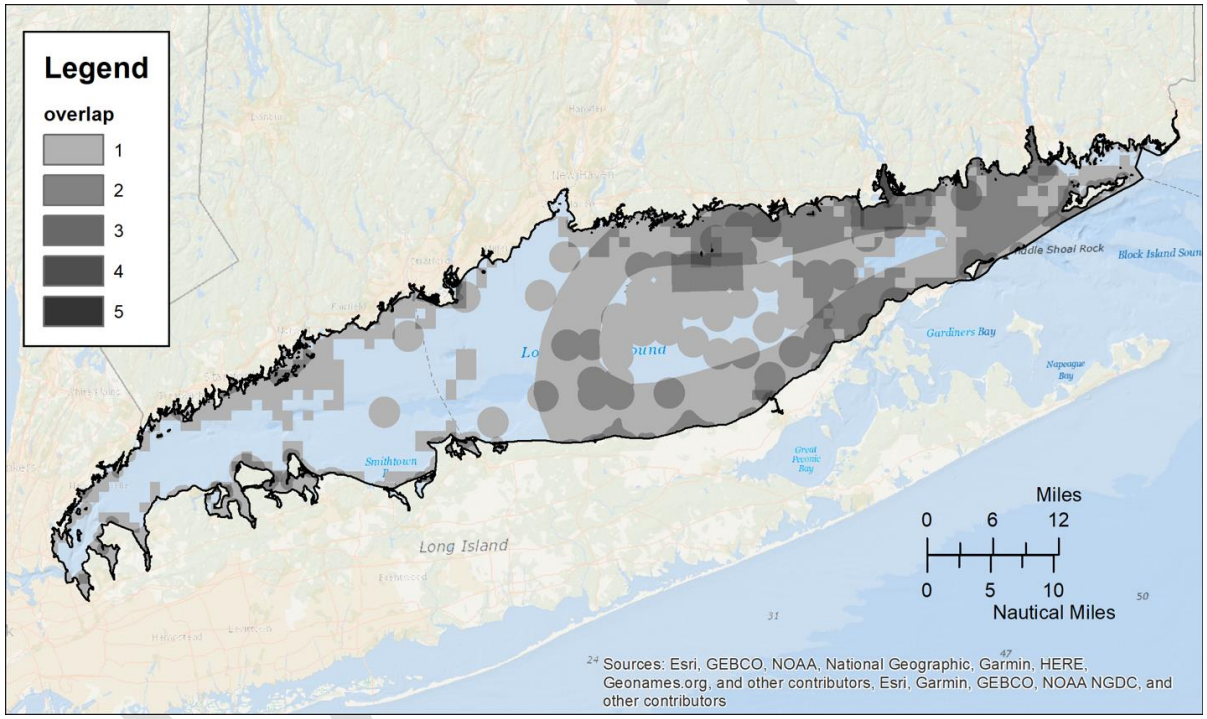


Figure 2a-18 Overlaps among each of the input components/datasets representing Criterion 3: Ecologically Significant Areas for Endangered, threatened, species of concern, or candidate species listed under state or Federal Endangered Species Act and their habitats.

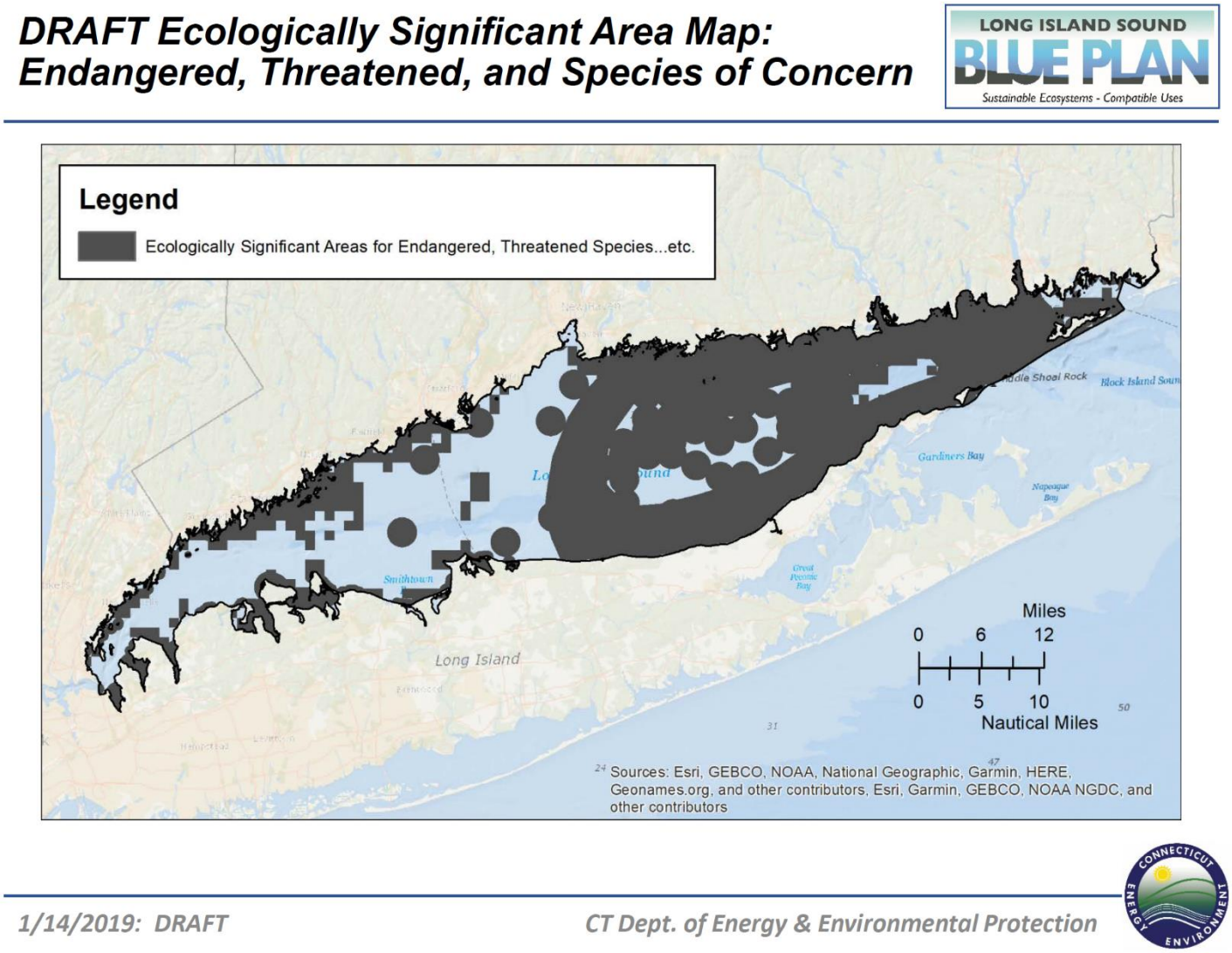


Figure 2a-19 Final ESA map for the Endangered, threatened, species of concern, or candidate species listed under state or federal Endangered Species Act and their habitats.

Updates and potential future work
Additional species-specific layers depicting the occurrence of endangered, threatened, species of concern, and candidate species will improve this criterion. Specifically, characterizations of protected species in open water, versus in coastal habitats, are particularly needed.

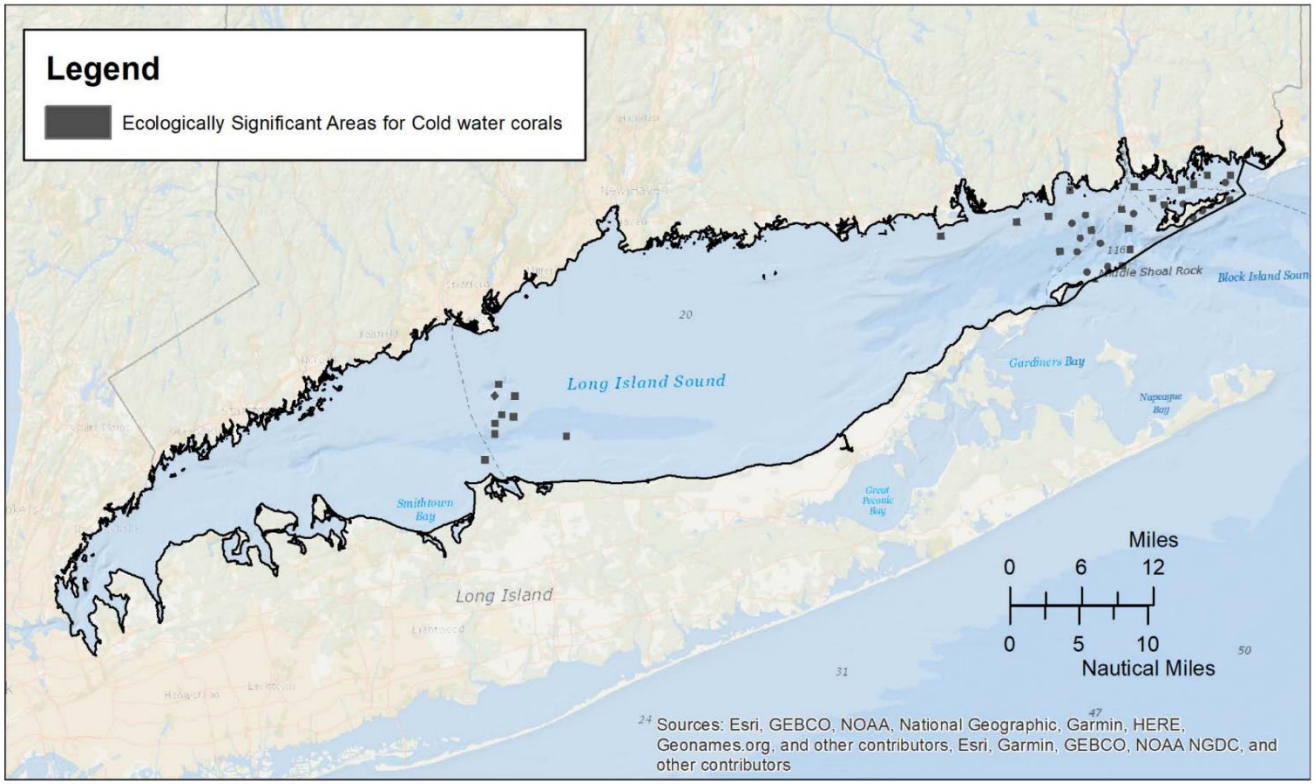
iv. **Criterion 4: Cold water corals**
Definition: Areas where cold-water corals have been observed or where habitat suitability or other scientific models predict they occur.

Significance of Cold water corals
Cold water corals are colonial animals similar to tropical reef corals, but many species don't require sunlight for survival. Because they catch food from the surrounding water, they are usually found in areas with higher current speeds, including on ledges and mounds. There are stony cold water corals and soft cold water corals. A common species of stony cold water coral in New England, the northern star coral (*Astrangia poculata*), can house symbiotic zooxanthellae, as tropical corals do, and can survive in a variety of water depths. In general, cold water corals are slow-growing and fragile, meaning they are vulnerable to physical disturbance. Invertebrates and fish are attracted to cold water coral aggregations for food and shelter. Additionally, Cold water corals are a visibly unique expression of a healthy, thriving marine ecosystem; they are a direct example of the ecological character of the Sound the Blue Plan is seeking to sustain.

Data sources for Cold water corals
There have been no comprehensive surveys of cold water coral distribution and abundance in Long Island Sound. However, the Long Island Sound Mapping and Research Collaborative (LISMaRC), through the Long Island Sound Seafloor Mapping Initiative, have mapped the occurrence of *Astrangia poculata* at discrete sampling locations near Stratford Shoals and eastern Long Island Sound. These observations create an incomplete picture of where ESA for cold water corals exist. First, while each survey area is shown on the map at its true size, cold water corals likely only exist in a fraction of each survey area. In other words, cold water corals only needed to be found to occur once within the entire survey area for that survey area to be included as ecologically significant. Second, it is important to reiterate that simply because the ESA maps do not indicate presence of cold water corals in other areas of the Sound, they do not reflect their absence - they merely indicate the lack of survey effort in those parts of the Sound. Only survey areas

where cold water corals have been observed (anywhere within the survey area) are considered ecologically significant (Figure 2a-20).

DRAFT Ecologically Significant Area Map: Cold Water Corals



1/14/2019: DRAFT

CT Dept. of Energy & Environmental Protection

Figure 2a-20 Final ESA map of cold water corals.

Updates and potential future work

It is plausible to assume that with additional analysis, a habitat suitability model for cold water corals in Long Island Sound could be developed. The benefit of using a habitat suitability model is that an existing and limited set of observations could be used to predict habitat suitability across the entire Long Island Sound, rather than rely on a piece-meal sampling approach that may never sample every Long Island Sound habitat. This type of model would use combinations of physical and biological features of the marine environment, along with known locations of cold water corals, to predict where cold water corals might occur throughout the entire Sound. The EEG's definition for this criterion explicitly included the results of habitat suitability models as adequate inputs for characterizing this criterion.

v. **Criterion 5: Coastal wetlands**

Definition: According to Connecticut General Statute (CGS) 22a-29: "Those areas which border on or lie beneath tidal waters, such as, but not limited to banks, bogs, salt marshes, swamps, meadows, flats, or other low lands subject to tidal action, including those areas now or formerly connected to tidal waters, and whose surface is at or below an elevation of one foot above local extreme high water; and upon which may grow or be capable of growing some, but not necessarily all, of [a list of specific plant species found in CGS section 22a-29(2)].

Significance of Coastal wetlands

Coastal Wetlands serve multiple ecological purposes and have been identified as one of the most important natural communities of LIS. They serve as nursery grounds and nesting habitat for many species, and also provide ecosystem services such as wave attenuation and nutrient cycling. Since coastal wetlands tend to occur in environments landward of the 10-foot contour, Blue Plan policies, which apply seaward of the 10-foot contour, are not expected to apply to coastal wetland habitats. However, as discussed in section 3.4a, the EEG included these coastal habitats in the ESA framework because of their importance as supporting habitats for the Long Island Sound ecosystem.

Data Sources for Coastal wetlands

The EEG used National Wetlands Inventory data, clipped to the Long Island Sound Study boundary, to depict coastal wetlands for this criterion. Figure 2a-21 shows a single presence/absence layer of ESA for coastal wetlands.

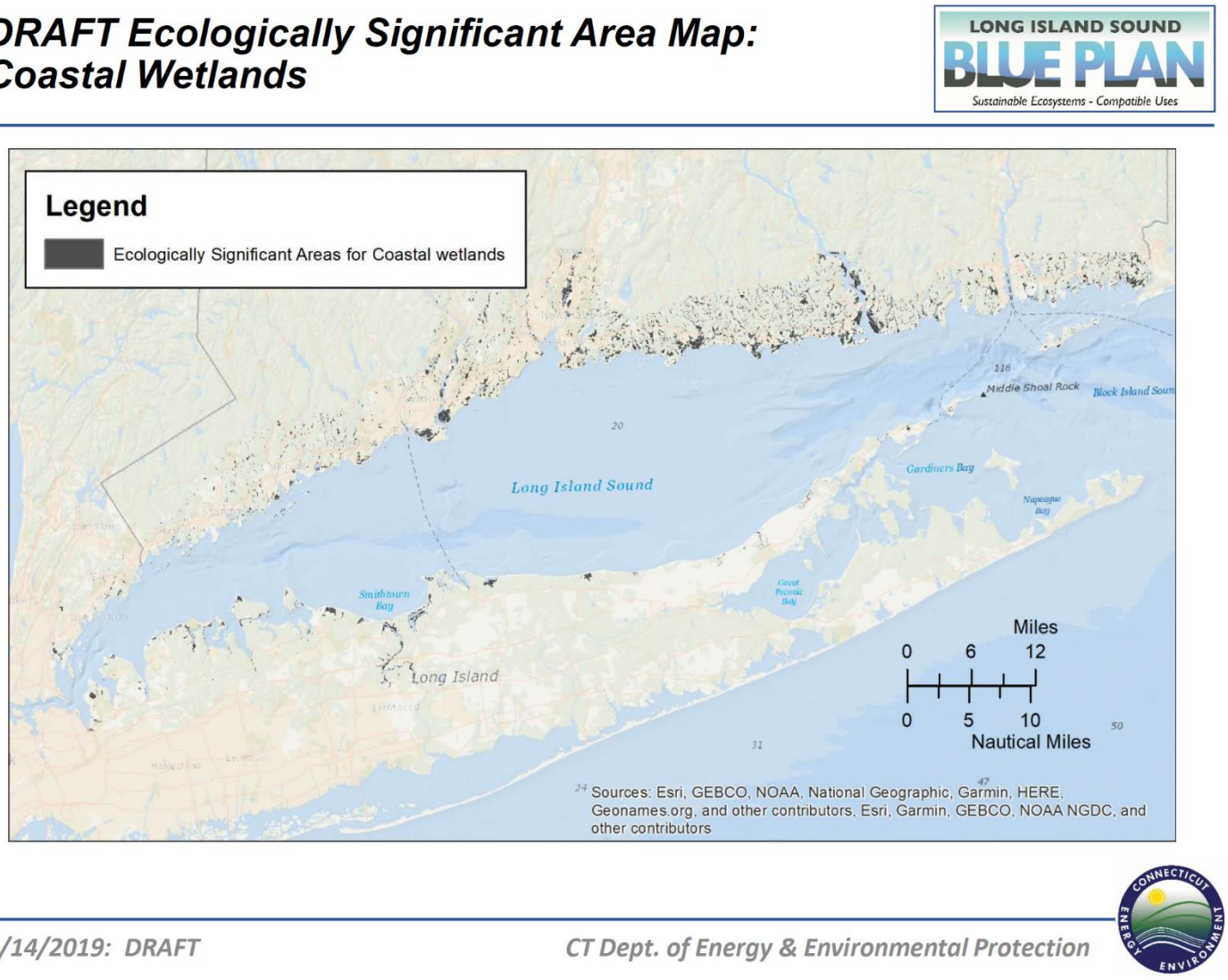


Figure 2a-21 Final ESA map of coastal wetlands. Note: The BP Planning Area boundary is removed in this map to more clearly depict coastal wetland features.

Updates and potential future work

Like any other coastal biological feature, coastal wetland extent is naturally variable and highly susceptible to human development and disturbance. For these reasons, data from the most recent coastal wetland surveys should continue to be integrated into this criterion.

5. Criteria Pillar 2: Areas of high natural productivity, biological persistence, diversity, and abundance, including areas important for supporting or exhibiting such features, relative to the following characteristics or species (see footnote 28 above for complete title)

The second set of criteria considered by the EEG expand on the concept of "productive" places articulated in the statute. From an ecological perspective, productivity refers to the processes of reproduction and growth. If organisms throughout the ecosystem grow and reproduce to their potential, the ecosystem is considered balanced and efficient. This balance is important for the provisioning of ecosystem services on which humans depend. Productivity as a set of processes is difficult to measure, so ecologists often use abundance, and other metrics like diversity and persistence, to understand productivity. Furthermore, the places where behaviors that allow organisms to be productive, such as feeding areas, nesting areas, nursery grounds, and migratory routes were considered important to include in this category. The EEG decided to take a taxa-based approach to gather data on these topics because the data were usually collected and presented by species group or at the taxa level. The criteria within this category are similar to the components of ecological importance identified by the Northeast and Mid-Atlantic regional ocean planning efforts "Areas of high productivity", "Areas of high diversity", and "Areas of high abundance". The Massachusetts Ocean Plan also took a taxa-based approach for several of its SSUs, including important fish resources and colonial waterbirds important nesting habitat, among others.

The broad taxonomic categories used to organize these data can potentially mask or obscure relevant spatial patterns in individual species or groups of species within a taxon. Species within a taxonomic group have diverse behaviors, life history traits, and habitat requirements, and so it could be necessary, once at the project-scale, to drill into underlying datasets to better understand how Ecologically Significant Areas for individual species could be captured by the taxonomic group's ESA, or not.

i. **Criterion 6: Cetaceans**

Definition: Areas where cetaceans occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support cetaceans (e.g. particular feeding areas, nursery grounds).

Significance of Cetaceans

Cetaceans include whales, dolphins, and porpoises. Porpoises, specifically the harbor porpoise, are the most common cetacean inhabitant of Long Island Sound (Dr. Robert Kenney, personal communication, December 5, 2018). The harbor porpoise is a species of Special Concern in the state of Connecticut. Some whale species, such as humpback whales, have been more commonly observed in recent years in western Long Island Sound. However, since large whales have not historically been observed in the Sound, they are not listed as endangered species in Connecticut. Many large whales retain protection by the federal Endangered Species Act wherever they occur in US waters. All cetacean species are also protected by the US Marine Mammal Protection Act. Cetaceans are susceptible to human activities, particularly boat strikes and entanglement.

Data Sources for Cetaceans

Duke University Cetacean Models

To map cetacean occurrence in the Sound, the EEG used the same datasets being used for regional ocean planning in the Northeast and Mid-Atlantic - Duke University Marine Geospatial Ecology Lab cetacean density models (Curtice, Cleary, Shumchenia, & Halpin, 2018) (Roberts, et al., 2016) (Roberts, Mannocci, & Halpin, 2016-2017). These data were accessed via the Northeast Ocean Data Portal (NROC, 2019). Predicted density maps were available for eleven cetacean species or species guilds with coverage in Long Island Sound. Several of those maps were annual averages whereas others were monthly predictions. For the species with monthly predicted densities, the twelve months were averaged to create an annual summary layer for each species. The eleven annual summary layers were added up to reflect the predicted total annual average density of cetaceans in the Sound. The EEG selected the area in the eastern Sound where 5 or more individuals of any species were predicted to occur on an annual basis as ecologically significant (Figure 2a-22). In this area, densities of harbor porpoise were predicted to be the highest of any other species; very low densities were predicted in this area for the remaining cetacean species.

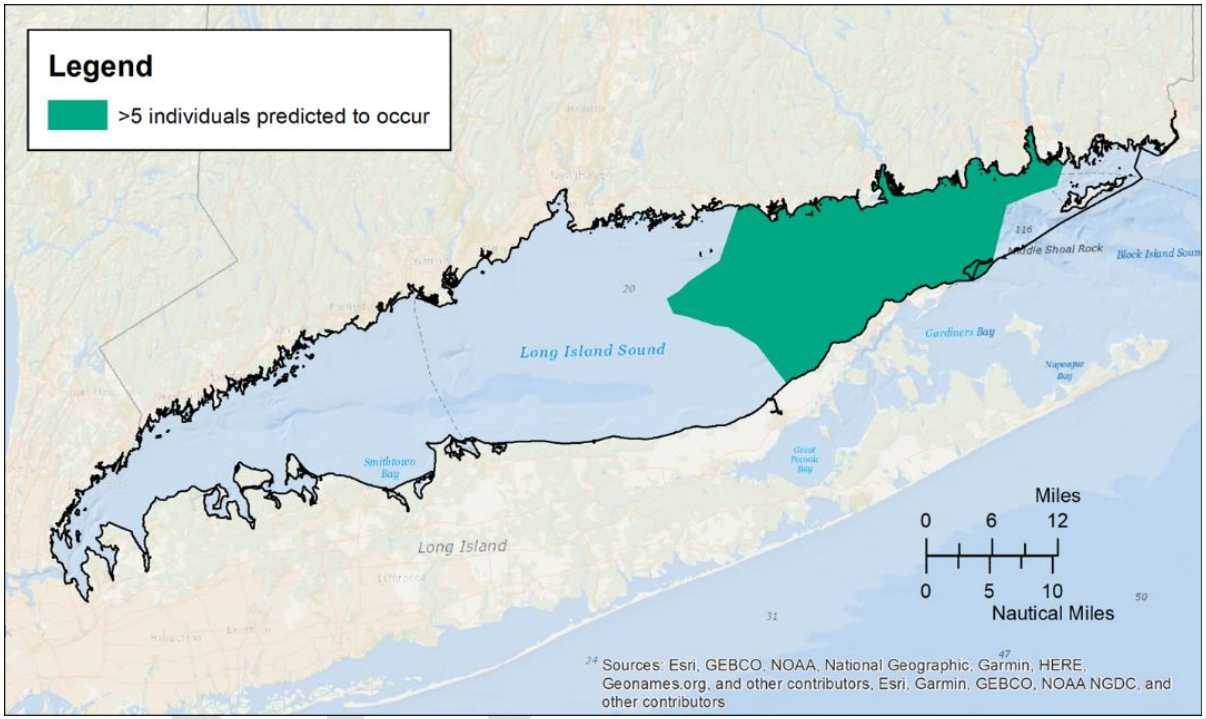


Figure 2a-22 Area where greater than 5 individual cetaceans (of any species) are predicted to occur annually in LIS, extracted from the Duke Marine Geospatial Ecology Lab's cetacean density models for the US Atlantic Coast.

Expert Participatory Mapping

After reviewing the draft area selected by the EEG that was derived from the Duke University Cetacean Models, experts recommended that ESA for cetaceans be amended to include an area where humpback whales had been recently observed in western Long Island Sound. On January 3, 2019, Patrick Comins, Executive Director of the Connecticut Audubon Society, delineated this area off of New Rochelle, NY, for inclusion as ESA (Figure 2a-23).

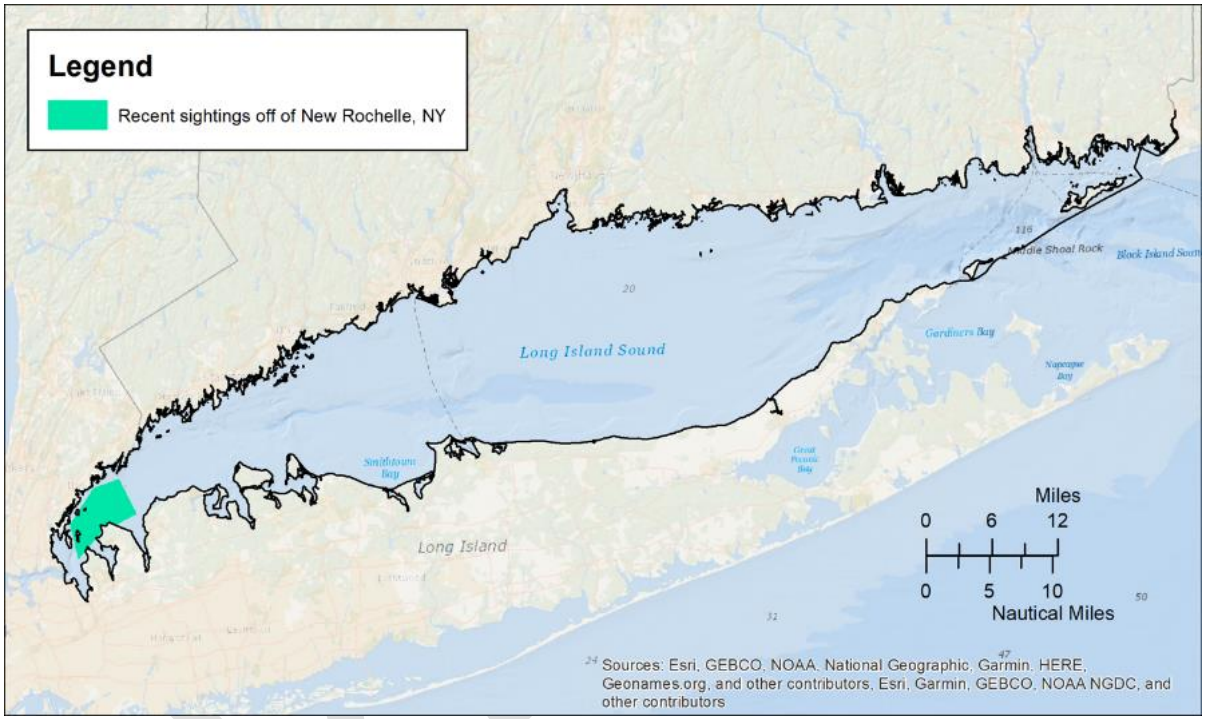


Figure 2a-23 Area identified through expert participatory mapping depicting recent sightings of humpback whales in western LIS.

Integration of information sources

Each of the datasets described above were mapped together to areas where cetaceans occur in higher concentrations and/or particular significant areas. Figure 2a-24 shows both datasets together on the same map of ESA for cetaceans.

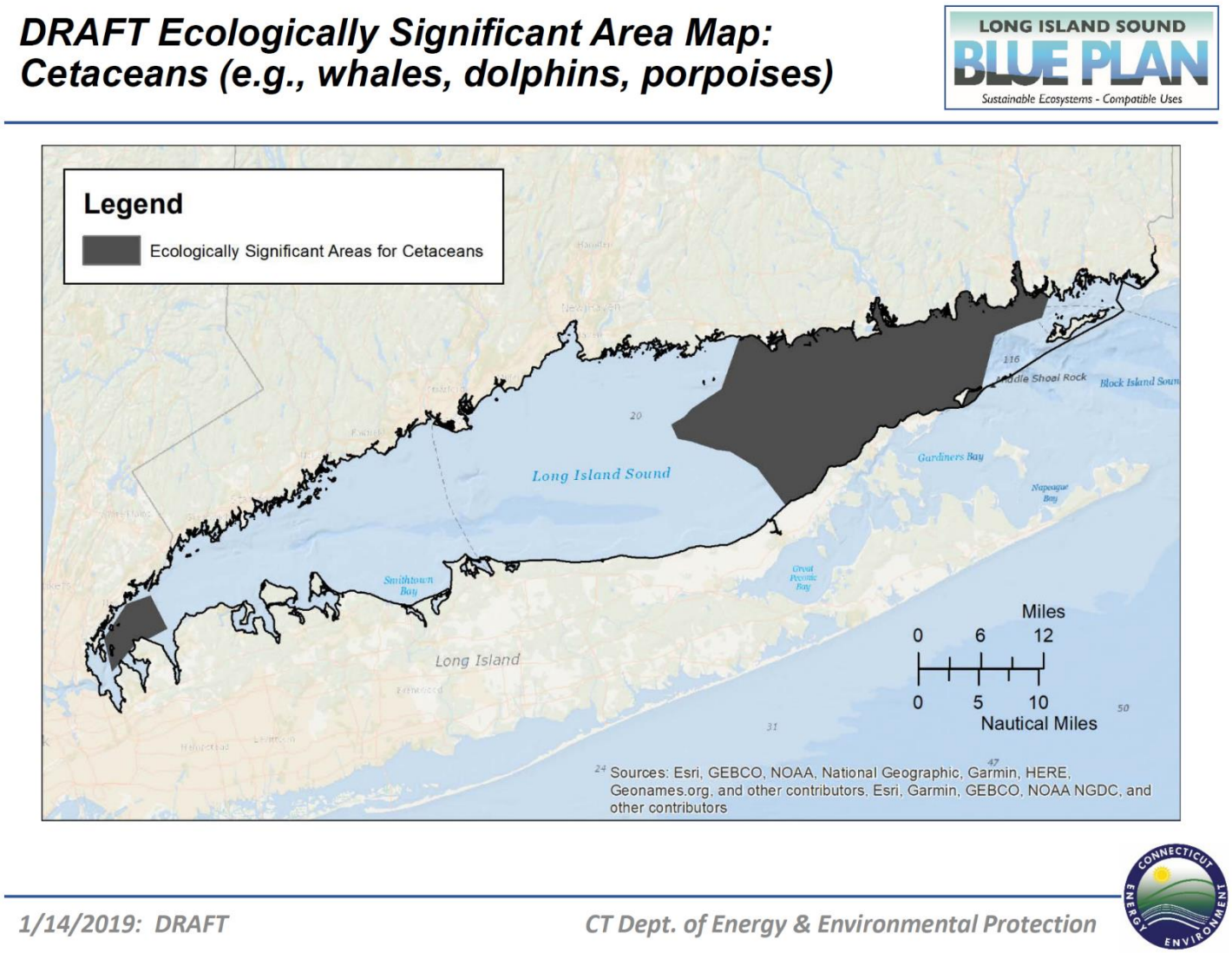


Figure 2a-24 Final ESA map of cetaceans.

Updates and potential future work

The occurrence of some large whale species in the western Sound has increased very recently. For this reason, and due to shifting environmental conditions that may be driving these new patterns, additional data collected by citizens, conservation organizations, and whale-watching groups should be considered as supporting information for this criterion.

ii. **Criterion 7: Pinnipeds**

Definition: *Areas where pinnipeds occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support pinnipeds (e.g. particular haul-out locations, feeding areas).*

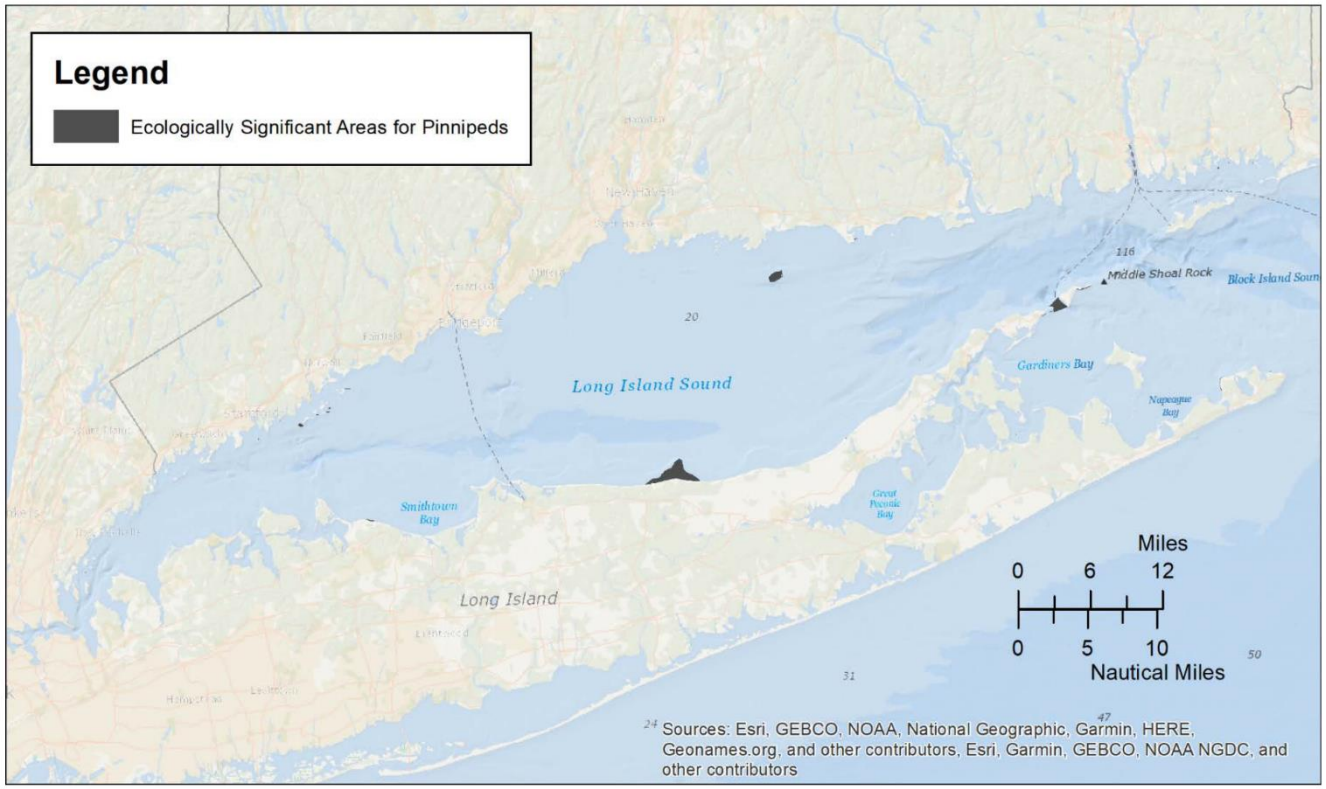
Significance of Pinnipeds

Pinniped species found on Long Island (including outside LIS) include Harbor, Grey, Harp, Hooded, and Ringed seals. Although no seal species have protected status under the Connecticut Endangered Species Act, they are protected federally by the US Marine Mammal Protection Act. Like cetaceans, seals are susceptible to boat strikes and entanglement.

Data sources for Pinnipeds

As a result of the science webinars and outreach that supported the Inventory, a data layer representing important areas for seals, including haul-out sites, was developed. The NOAA Environmental Sensitivity Index (ESI) map of seal haul-out sites was used as a starting point. Using participatory mapping, experts identified and/or augmented areas on the ESI map to create a more up-to-date and accurate map of Ecologically Significant Areas for pinnipeds. The resulting map was included in the Blue Plan Inventory and used by the EEG to map ESA for pinnipeds (Figure 2a-25).

DRAFT Ecologically Significant Area Map: Pinnipeds (e.g., seals)



1/14/2019: DRAFT

CT Dept. of Energy & Environmental Protection

Figure 2a-25 Final ESA map for Pinnipeds. Note: The Blue Plan Planning Area boundary is removed in this map to more clearly depict areas where pinnipeds occur in higher concentrations.

Updates and potential future work

When compared with the locations of haul-out sites, relatively little is known about the spatial patterns of seals' use of the waters of Long Island Sound for activities like feeding, migrating, etc. Therefore, future work could focus on improving spatial representations of these activities. In addition, the population of seals has increased in the Sound in recent years, and so frequent updates may be required to continue to accurately depict ESA for seals.

iii. **Criterion 8: Sea turtles and other reptiles**

Definition: Areas where sea turtles and other reptiles occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support sea turtles and other reptiles (e.g. particular feeding areas, nesting grounds, hibernation areas).

Significance of Sea turtles and other reptiles

The criterion "Sea turtles and other reptiles" includes sea turtle species common in the Sound such as Loggerhead, Kemp's Ridley, and Green, as well as a different species of turtle, the Northern diamondback terrapin (CT DEEP, 2019). Diamondback terrapins are not sea turtles but are more similar to terrestrial and aquatic turtle species. They are a species of Special Concern in Connecticut. Diamondback terrapins live in coastal habitats where fresh and salt water meet, and often hibernate in muddy habitats like coastal marshes and wetlands. This behavior makes diamondback terrapins particularly susceptible to coastal construction and dredging activities via habitat disturbance and direct mortality. Sea turtles are extremely vulnerable to boat strikes as they swim and drift slowly at the water surface. Loggerhead (threatened), Green (threatened), and Leatherback (endangered) sea turtles are protected by the Connecticut Endangered Species Act as well as the US Endangered Species Act. Leatherback sea turtles are not common in the Sound. In recent years, there have been several documented boat strikes of Green and Loggerhead sea turtles that resulted in severe injury or mortality.

Data sources for Sea turtles and other reptiles

Northern diamondback terrapin probability of occurrence

During the 2018 science review webinars on Ecologically Significant Areas, experts sharing information with the EEG regarding available diamondback terrapin spatial data, which had been lacking in the draft ESA maps. Even though diamondback terrapin habitat is not expected to overlap with the Blue Plan policy area, the data are included as ecologically significant. The available data was compiled by the Conserve Wildlife Foundation of New Jersey and is available via the North Atlantic Landscape Conservation Cooperative website (Conservation Biology Institute,

2016)and the USGS. The point layer represents documented occurrences of the northern diamondback terrapin between 2000-2012 from Massachusetts to Virginia, provided by the Diamondback Terrapin Working Group. The map depicts the predicted probability of occurrence on a 0 - 1 scale, with 0.7722 being the highest possible value. A threshold of 0.3188 was generated by the modeling program (Maxent) and is considered a relatively conservative threshold that has been used as an indicator for suitable habitat in other studies. The EEG selected occurrences above the 0.3188 threshold to include as ESA (Figure 2a-26).

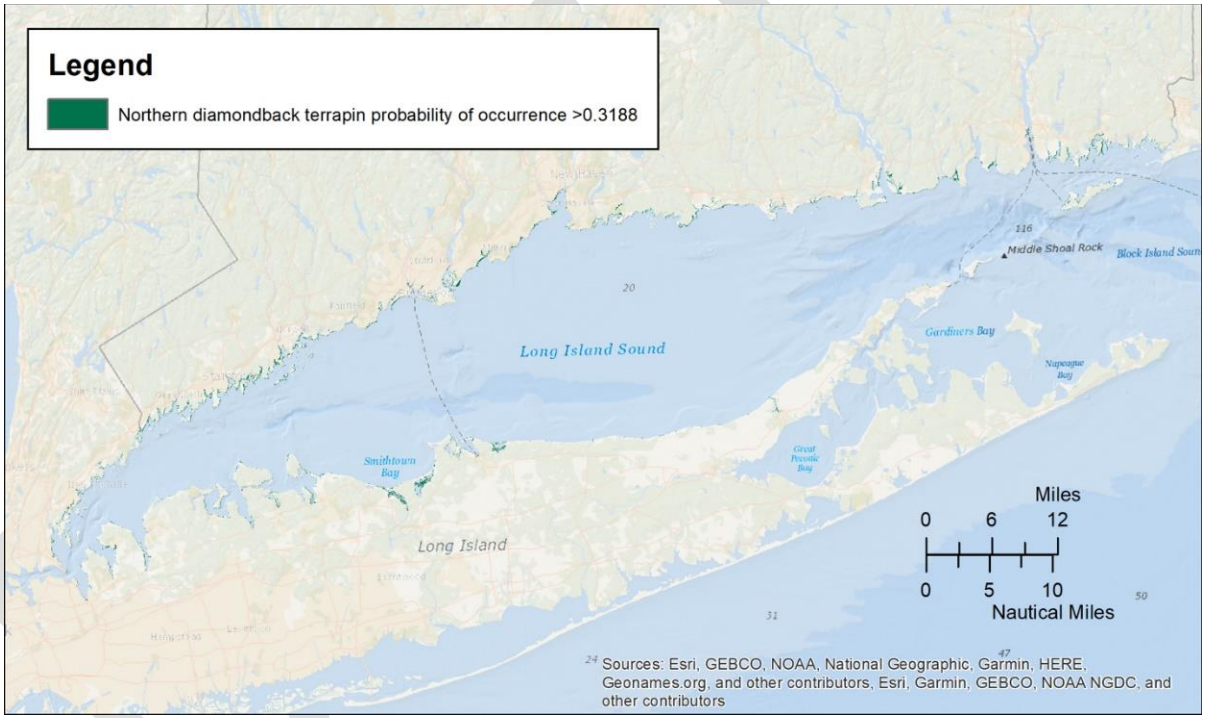


Figure 2a-26 Areas where Northern diamondback terrapin probability of occurrence is greater than 0.3118. Note: The Blue Plan Planning Area boundary is removed in this map to more clearly depict these areas.

Sea turtle live strandings and recent mortality events

The EEG investigated several sea turtle datasets described in the Blue Plan Inventory for use in identifying ESA. The EEG recommended the use of recent verified live strandings, rescues, and in-water observations to reflect places where sea turtles were actively using Sound habitats. The records of these point locations were obtained from Mystic Aquarium (Mystic Aquarium, 2016) (for the CT coast) and the Riverhead Foundation for Marine Research and Preservation (Riverhead Foundation, 2018) (for the Long Island coast). These datasets may be available from each entity upon request. In addition, the point locations of three 2018 boat-strike mortality events in the Stratford area were included in the ESA map (Figure 2a-27).

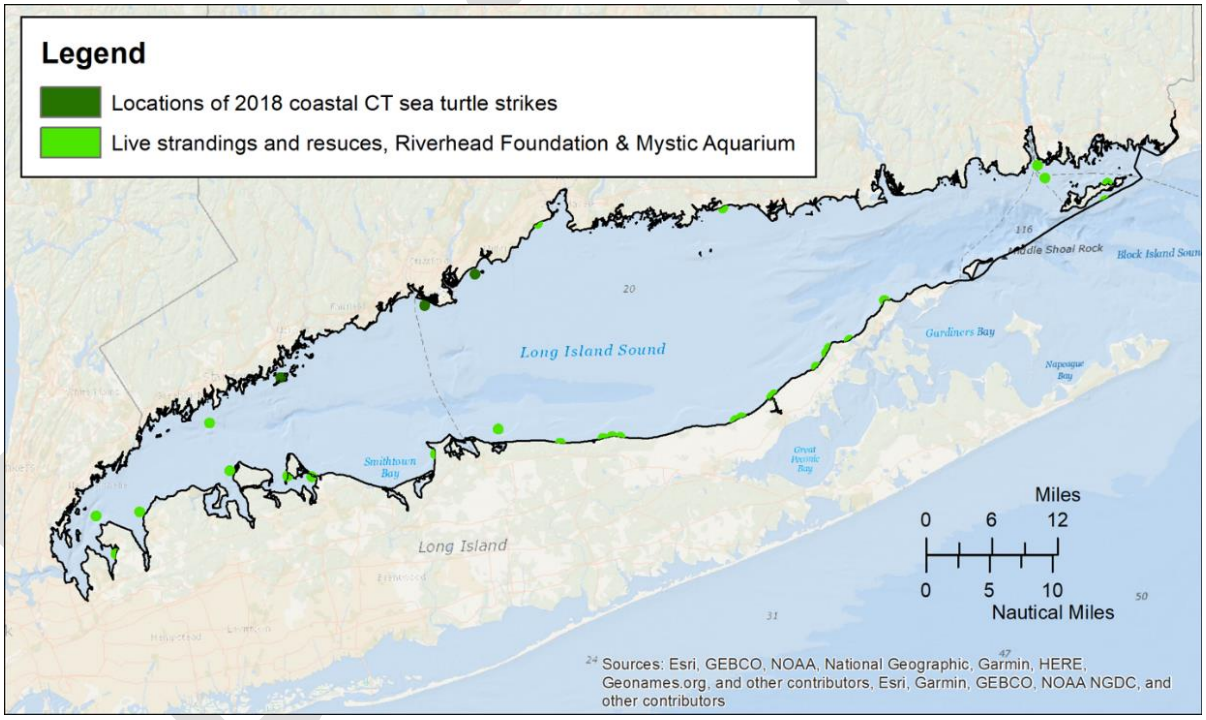


Figure 2a-27 Locations of 2018 coastal Connecticut sea turtle strikes and live sea turtle strandings and rescues from the Riverhead Foundation and Mystic Aquarium

Integration of data sets

Each of the datasets described above were mapped together to represent the extent of Ecologically Significant Areas for sea turtles and other reptiles. Figure 2a-28 shows all of the datasets dissolved together to show a single presence/absence layer of ESA for sea turtles and other reptiles.

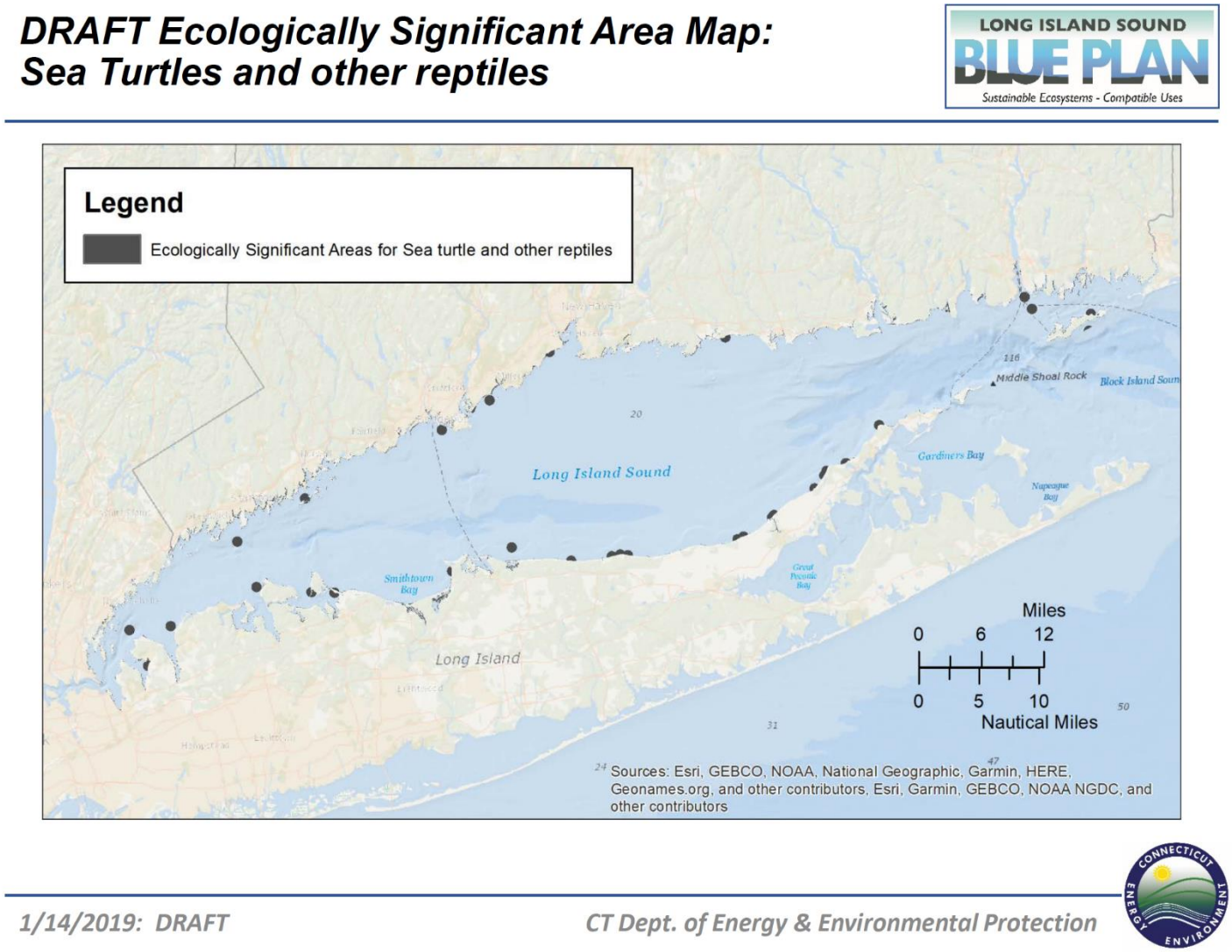


Figure 2a-28 Final ESA map of Sea Turtles and other Reptiles. Note: The Blue Plan Planning Area boundary is removed in this map to more clearly depict these areas.

Updates and potential future work

Changing environmental conditions may be influencing sea turtle use of the Sound, and updates should be made frequently enough to capture significant changes in occurrence.

iv. **Criterion 9: Birds**

Definition: Areas where birds are abundant or diverse including feeding areas; areas of high bird productivity including nesting areas.

Significance of Birds

This criterion focuses on seabird species that are expected to use the open-water habitats of Long Island Sound (i.e., within the Blue Plan policy boundary). Many of these seabird species use the Sound for feeding, nesting, and/or as a migratory stopover, and therefore use both open-water and coastal habitats. Other more strictly-coastal bird species (including some endangered, threatened, and species of concern) use the Sound, but these habitats may be outside of the Blue Plan policy area. Because of the range of behaviors and habitats in this species group, it will likely be necessary to examine data at the species-level to best understand any potential conflicts between birds and human activities.

The roseate tern is endangered in the state of Connecticut and the entire US. The third largest roseate tern colony in North America exists in Connecticut at Falkner Island, where approximately 175 to 200 pairs of terns breed every year (CT DEEP, 2019). Roseate terns' nesting habitats are vulnerable to human activities that cause physical disturbances in coastal areas, like recreation or development. Human activities have greatly reduced available nesting habitat for roseate terns. See the section on Endangered, Threatened, Species of Concern, and Candidate Species for a list of protected coastal birds and seabirds.

Data and Information Sources for Birds

Seabird occurrence models

At the time of EEG formation, there were no Sound-wide maps of seabird occurrence. However, the Blue Plan Inventory described the eBird Database, which contains thousands of records of seabird observations in multiple seasons in Long Island Sound. Valerie Steen, a University of Connecticut (UConn) postdoctoral fellow working with

EEG member Chris Elphick, used the eBird Database and several environmental datasets from the Blue Plan Inventory (e.g., bathymetry, eelgrass) to create maps of predicted seabird occurrence in Long Island Sound. Separate models were constructed for 7 species' summer (May - September) occurrence and 23 species' winter (October - April) occurrence (Table 2a-3). Five species had both summer and winter occurrence maps. A simple evaluation of the models' performance indicated that although the patterns depicted in the output maps were better than relying on anecdotal information, they could be improved if more data were available (both seabird observations and environmental/habitat covariates). Unpublished presence/absence maps were generated for each species and incorporated by the EEG for this criterion.

Table 2a-3 Species for which predicted presence/absence maps were available and included in the Birds criterion.

Summer	Winter
• Common tern • Double-crested cormorant • Great black-backed gull • Herring gull • Laughing gull • Ring-billed gull • Roseate tern	• American black duck • Black scoter • Bonaparte's gull • Brant • Bufflehead • Common eider • Common goldeneye • Common loon • Double-crested cormorant • Great black-backed gull • Great cormorant • Greater scaup • Herring gull • Horned grebe • Laughing gull • Lesser scaup • Long-tailed duck • Northern gannet • Red breasted merganser • Red throated loon

	• Ring-billed gull • Surf scoter • White-winged scoter

Presence/absence maps for the 7 summer species were overlaid and summed to create a summer species richness map. The presence/absence maps for the 23 winter species were also overlaid and summed to create a winter species richness map. Each richness map was classified into quintiles and the top quintile of each was considered ESA (Figure 2a-29).

Participatory mapping

After reviewing the draft areas selected by the EEG that were derived from the UConn models, experts recommended that ESA for birds be amended to include additional areas, including, for example, staging, nesting, and foraging areas in summer, and roosting, foraging, and wintering areas in winter. On January 3, 2019, Patrick Comins, Executive Director of the Connecticut Audubon Society, delineated these areas (Figure 2a-30).

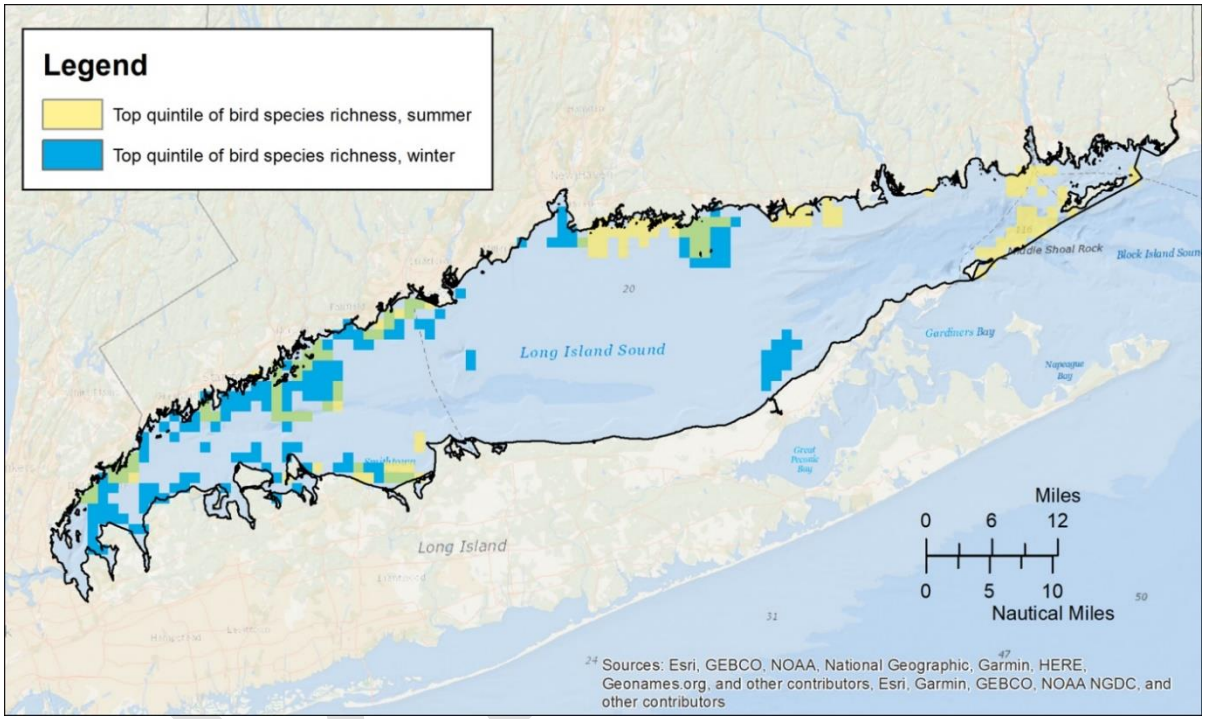


Figure 2a-29 Top quintile maps for both summer and winter predicted species richness for birds, from University of Connecticut preliminary models. The summer areas (yellow) are partially transparent to better show where summer areas overlap with winter areas.

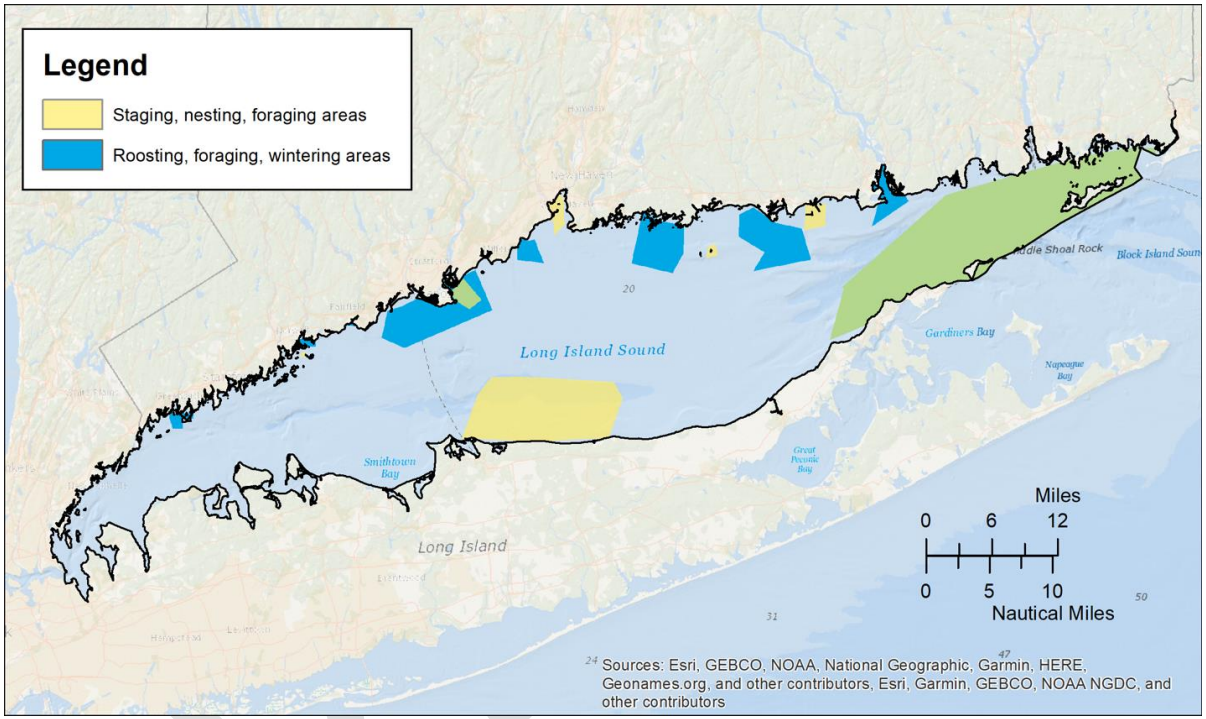


Figure 2a-30 Areas important to bird staging, nesting, foraging, roasting, and wintering identified through expert participatory mapping. The summer staging, nesting and foraging areas (yellow) are partially transparent to better show where these areas overlap with roosting, foraging, and wintering areas. The Race appears green because it is where roseate and common terns forage in summer, and is also an important wintering area for razorbills (Patrick Comins, personal communication, 1/3/19).

Integration of data and information

The datasets described above were mapped together to represent the extent of Ecologically Significant Areas for birds. Figure 2a-31 shows all of the datasets dissolved together as a single presence/absence layer of ESA for birds.

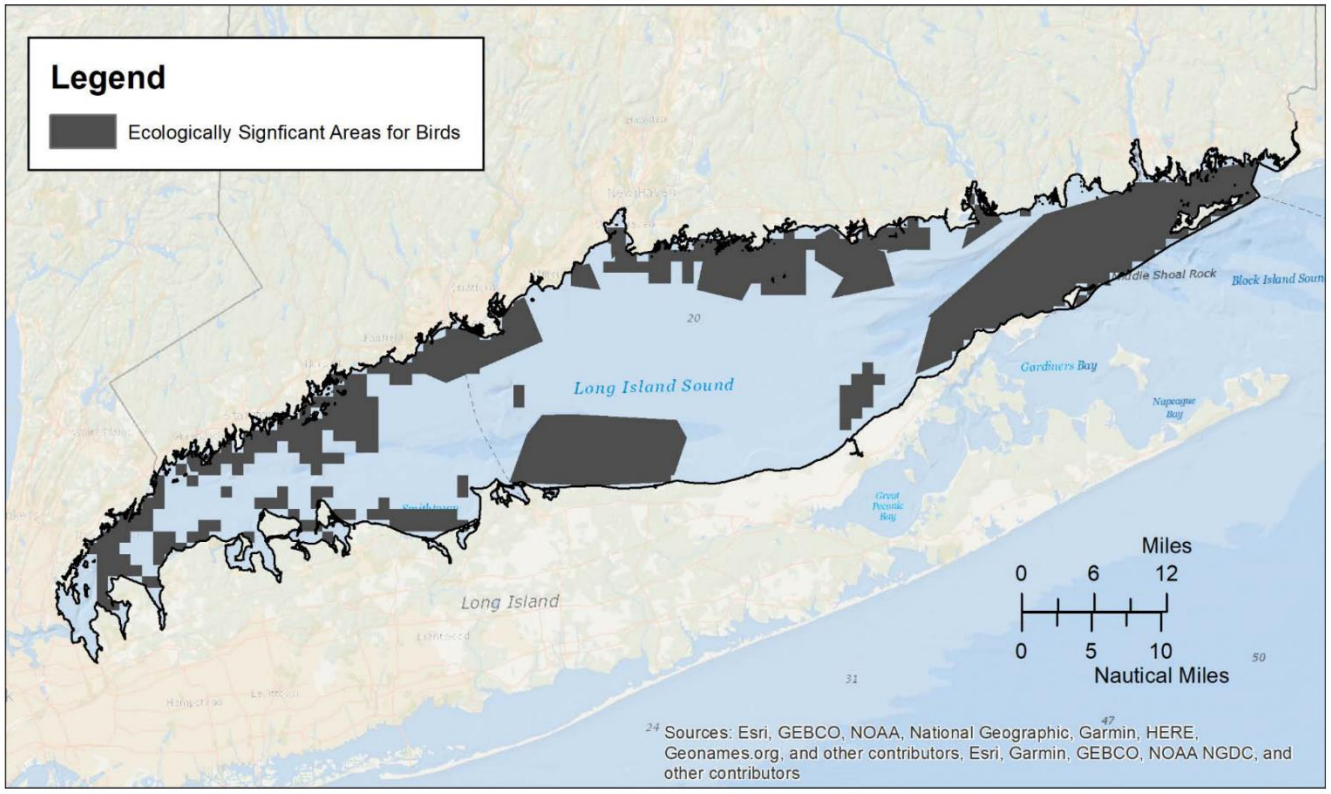


Figure 2a-31 Final ESA map for Birds.

Updates and potential future work

The data that inform this criterion could be improved by additional vetting or evaluation of the model outputs; increasing the quantity of data (both observations and numbers of environmental/habitat variables) used by the models to improve predictions; and additional or repeated participatory mapping by experts to highlight areas that may be changing with regard to bird aggregations or overall bird occurrence.

v. **Criterion 10: Fish**

Definition: Areas of high weighted fish persistence and high fish abundance and concentration.

Significance of Fish:

The fish criterion includes pelagic and demersal vertebrate fish species. Fish are key components of the Long Island Sound ecosystem and are critical to both human and animal food webs. In addition to fishing pressure, fish community composition in Long Island Sound is influenced by climate and environmental change. Since 1998, the fish community has transitioned to a single community adapted to higher temperatures, from a state where distinct winter-spring and summer-autumn communities existed prior to 1998 (Howell & Auster, 2012). There are likely other species-specific and functional-group-specific trends that are also relevant to management and decision-making that should be considered on a case-by-case basis. In an effort to characterize Ecologically Significant Areas for fish in a simplified, but not oversimplified way, the EEG considered metrics of persistence and abundance for species using water column habitats (i.e., diadromous and pelagic species), and seafloor habitats (i.e., demersal species). Both types of metrics use data derived from the CT DEEP Marine Fisheries Long Island Sound Trawl Survey (LISTS), which occurs in spring and fall of each year since 1984 (CT DEEP, 2019). The LISTS divides the Sound into about three hundred 1x2 nautical-mile grid cells and uses a stratified-random survey design. The survey design relies on the stratum assigned to each 1x2 nautical mile area and weights the number of samples per stratum by the amount of stratum-specific area available for sampling. Strata are 12 combinations of three bottom types and four depth intervals. Although LISTS data are representative of the entire Sound, there are some areas that cannot be effectively sampled by the Survey (e.g., The Race, shoals, reefs and trenches). Biomass has been recorded since 1992. All of the data for this criterion are reported using the 1x2 nautical mile grid.

Data sources and Methodologies for Fish

Persistently productive places for fish

The Long Island Sound Ecological Assessment (LISEA) identified persistently productive areas for fish using 26 years of LISTS data (1984-2009). These places have the highest number of species that have persisted there for the longest period (i.e., throughout each period of the LISTS, or 3 periods totaling 26 years at the time of the assessment) and each of these species have been detected at a frequency higher than expected, from just under 1 standard deviation to over 2 standard deviations above the mean. These persistently productive places for each species were aggregated into persistently productive places for fish functional groups: diadromous, pelagic, and demersal species (Table 2a-4). The maps and data showing persistently productive places for each functional group can be accessed via The Nature Conservancy's Conservation Gateway (The Nature Conservancy, 2017). From these maps, the following criteria were applied to identify Ecologically Significant Areas:

Diadromous species

- Grid cells of Diadromous species in the highest weighted persistence category
- Grid cells where both Pelagic and Diadromous species are in the second highest weighted persistence category overlap

Pelagic species

- Grid cells of Pelagic species in the highest weighted persistence category
- Grid cells where both Pelagic and Diadromous species are in the second highest weighted persistence category overlap

Demersal species

- Grid cells in the highest LISEA weighted persistence category for each of the Demersal species functional groups (Elasmobranchs, Gadids, Pleuronectids, Structure-oriented, Other)
- Grid cells where 3 or more of the 5 Demersal species functional groups are in the second highest LISEA weighted persistence category overlap

Table 2a-4 Species and functional groups considered in the LISEA persistence analysis.

Functional group	Species	Subgroup
Demersal	Barndoor skate Dipturus laevis	Elasmobranch
Demersal	Clearnose skate Raja eglanteria	Elasmobranch
Demersal	Little skate Leucoraja erinacea	Elasmobranch
Demersal	Roughtail stingray Dasyatis centroura	Elasmobranch
Demersal	Smooth dogfish Mustelus canis	Elasmobranch
Demersal	Spiny dogfish Squalus acanthius	Elasmobranch
Demersal	Winter skate Leucoraja ocellata	Elasmobranch
Demersal	Atlantic cod Gadus morhua	Gadids
Demersal	Fourbeard rockling Enchelyopus cimbrius	Gadids
Demersal	Haddock Melanogrammus aeglefinus	Gadids
Demersal	Pollock Pollachius virens	Gadids
Demersal	Red hake Urophycis chuss	Gadids
Demersal	Silver hake Merluccius bilinearis	Gadids
Demersal	Spotted hake Urophycis regia	Gadids
Demersal	Fourspot flounder Paralichthys oblongus	Pleuronectids
Demersal	Hogchoker Trinectes maculatus	Pleuronectids
Demersal	Smallmouth flounder Etropus microstomus	Pleuronectids
Demersal	Summer flounder Paralichthys dentatus	Pleuronectids
Demersal	Windowpane flounder Scophthalmus aquosus	Pleuronectids
Demersal	Winter flounder Pseudopleuronectes american	Pleuronectids
Demersal	Yellowtail flounder Pleuronectes ferrugineus	Pleuronectids
Demersal	Black sea bass Centropristes striata	structure oriented
Demersal	Cunner Tautogolabrus adspersus	structure oriented
Demersal	Oyster toadfish Opsanus tau	structure oriented
Demersal	Rock Gunnel Pholis gunnellus	structure oriented
Demersal	Scup Stenotomus chrysops	structure oriented
Demersal	Tautog Tautoga onitis	structure oriented

Functional group	Species	Subgroup
Demersal	American sand lance Ammodytes americanus	Other: misc.
Demersal	Atlantic silverside Menidia menidia	Other: misc.
Demersal	Atlantic croaker Micropogonias undulatus	Other: misc.
Demersal	Bigeye Priacanthus arenatus	Other: misc.
Demersal	Spot Leiostomus xanthurus	Other: misc.
Demersal	Striped searobin Prionotus evolans	Other: misc.
Demersal	Conger eel Conger oceanicus	Other: misc.
Demersal	Dwarf goatfish Upeneus parvus	Other: misc.
Demersal	Fawn cusk-eel Lepophidium profundorum	Other: misc.
Demersal	Feather blenny Hypsoblennius hentz	Other: misc.
Demersal	Goosefish/monkfish Lophius americanus	Other: misc.
Demersal	Grubby Myoxocephalus aeneus	Other: misc.
Demersal	Lined seahorse Hippocampus erectus	Other: misc.
Demersal	Longhorn sculpin Myoxocephalus octodecemspin	Other: misc.
Demersal	Lumpfish Cyclopterus lumpus	Other: misc.
Demersal	Naked goby Gobiosoma bosci	Other: misc.
Demersal	Northern kingfish Menticirrhus saxatilis	Other: misc.
Demersal	Northern Pipefish Syngnathus fuscus	Other: misc.
Demersal	Northern Puffer Sphoeroides maculatus	Other: misc.
Demersal	Northern Searobin Prionotus carolinus	Other: misc.
Demersal	Northern Sennet Sphyraena borealis	Other: misc.
Demersal	Northern Stargazer Astroscopus guttatus	Other: misc.
Demersal	Ocean Pout Macrozoarces americanus	Other: misc.
Demersal	Planehead Filefish Monacanthus hispidus	Other: misc.
Demersal	Red Cornetfish Fistularia petimba	Other: misc.
Demersal	Red Goatfish Mullus auratus	Other: misc.
Demersal	Sea Raven Hemitripterus americanus	Other: misc.
Demersal	Seasnail Liparis atlanticus	Other: misc.
Demersal	Short Bigeye Pristigenys alta	Other: misc.
Demersal	Striped Burrfish Chilomycterus schoepfi	Other: misc.

Functional group	Species	Subgroup
Demersal	Striped Cusk-Eel Ophidion marginatum	Other: misc.
Demersal	Weakfish Cynoscion regalis	Other: misc.
Diadromous	Alewife Alosa pseudoharengus	
Diadromous	American eel Anguilla rostrata	
Diadromous	American shad Alosa sapidissima	
Diadromous	Atlantic salmon Salmo salar	
Diadromous	Atlantic sturgeon Acipenser oxyrinchus	
Diadromous	Atlantic tomcod Microgadus tomcod	
Diadromous	Blueback herring Alosa aestivalis	
Diadromous	Gizzard shad Dorosoma cepedianum	
Diadromous	Hickory shad Alosa mediocris	
Diadromous	Rainbow smelt Osmerus mordax	
Diadromous	Sea lamprey Petromyzon marinus	
Diadromous	Striped bass Morone saxatilis	
Diadromous	White perch Morone americana	
Pelagic	Atlantic bonito Sarda sarda	
Pelagic	Atlantic herring Clupea harengus	
Pelagic	Atlantic mackerel Scomber scombrus	
Pelagic	Atlantic menhaden Brevoortia tyrannus	
Pelagic	Banded rudderfish Seriola zonata	
Pelagic	Bay anchovy Anchoa mitchilli	
Pelagic	Bigeye scad Selar crumenophthalmus	
Pelagic	Blue runner Caranx crysos	
Pelagic	Bluefish Peprilus triacanthus	
Pelagic	Crevalle jack Caranx hippos	
Pelagic	Gray triggerfish Balistes capriscus	
Pelagic	Lookdown Selene vomer	
Pelagic	Mackerel scad Decapterus macarellus	
Pelagic	Moonfish Selene setapinnis	
Pelagic	Rough scad Trachurus lathami	

Functional group	Species	Subgroup
Pelagic	Round herring Etrumeus teres	
Pelagic	Round scad Decapterus punctatus	
Pelagic	Sandbar shark Carcharhinus plumbeus	
Pelagic	Sharksucker Echeneis naucrates	
Pelagic	Spanish mackerel Scomberomorus maculatus	
Pelagic	Striped anchovy Anchoa hepsetus	
Pelagic	Yellow jack Caranx bartholomaei	

Areas of high fish abundance and concentration

CT DEEP Marine Fisheries provided LISTS data to the EEG to identify areas of high fish abundance and concentration. The data included the natural log of the mean abundance per grid cell for each species for spring and fall in the following date ranges: 1995-2004 and 2005-2014. Only species caught in more than 5 tows in any of the seasons in each date range were included. Species were assigned to either water column (which included diadromous and pelagic) or demersal (which included demersal and epibenthic) (Table 2a-5) functional groups and group total mean abundance was calculated for each season in each date range. The two decades of data were each used to find high fish abundance (instead of just one combined period) for several reasons. The EEG believed the most recent decade is particularly important to see, especially given the dynamics in fish distribution. Combining the two decades would have diluted that clarity and there were other statistical challenges as well. DEEP Marine Fisheries believed that 1995-2004 decade was important to use, in part so a larger portion of the broader abundance record could be captured. All parties agreed that using the first decade (before 1995) would be less relevant because of the significant shift in fish distribution that occurred in 1997. This resulted in 8 individual abundance layers. Layers were classified by quintiles and the top quintile of each layer was considered an ecologically significant area of high fish abundance and concentration.

Table 2a-5 Fish species present in greater than 5 tows in any of the seasons and date ranges for the Long Island Sound Trawl Survey between 1995 and 2014.

Water column		**Seafloor**	
Common name	Scientific name	Common name	Scientific name
Alewife	*Alosa pseudoharengus*	Atlantic sturgeon	*Acipenser oxyrinchus*
American shad	*Alosa sapidissima*	Tautog	*Tautoga onitis*
Atlantic silverside	*Menidia menidia*	Black sea bass	*Centropristis striata*
Atlantic herring	*Clupea harengus*	Clearnose skate	*Raja eglanteria*
Bay anchovy	*Anchoa mitchilli*	Atlantic cod	*Gadus morhua*
Blueback herring	*Alosa aestivalis*	Conger eel	*Conger oceanicus*
Bigeye scad	*Selar crumenophthalmus*	Cunner	*Tautogolabrus adspersus*
Bluefish	*Pomatomus saltatrix*	Fourspot flounder	*Paralichthys oblongus*
Blue runner	*Caranx crysos*	Glasseye snapper	*Priacanthus cruentatus*
Butterfish	*Peprilus triacanthus*	Goosefish	*Lophius americanus*
Crevalle jack	*Caranx hippos*	Grubby	*Myoxocephalus aeneus*
Planehead filefish	*Monacanthus hispidus*	Haddock	*Melanogrammus aeglefinus*
Hickory shad	*Alosa mediocris*	Hogchoker	*Trinectes maculatus*
Atlantic menhaden	*Brevoortia tyrannus*	Inshore lizardfish	*Synodus foetens*
Atlantic mackerel	*Scomber scombrus*	Little skate	*Leucoraja erinacea*
Moonfish	*Selene setapinnis*	Northern kingfish	*Menticirrhus saxatilis*
Northern sennet	*Sphyraena borealis*	Northern red shrimp	*Pandalus montagui*
Pollock	*Pollachius virens*	Ocean pout	*Macrozoarces americanus*

Round scad	*Decapterus punctatus*	Scup	*Stenotomus chrysops*
Rough scad	*Trachurus lathami*	Northern pipefish	*Syngnathus fuscus*
Short bigeye	*Pristigenys alta*	Fourbeard rockling	*Enchelyopus cimbrius*
Spiny dogfish	*Squalus acanthias*	Red hake	*Urophycis chuss*
Striped anchovy	*Anchoa hepsetus*	Rock gunnel	*Pholis gunnellus*
Striped bass	*Morone saxatilis*	American sand lance	*Ammodytes americanus*
Yellow jack	*Caranx bartholomaei*	Striped cusk-eel	*Ophidion marginatum*
		Longhorn sculpin	*Myoxocephalus octodecemspinosus*
		Summer flounder	*Paralichthys dentatus*
		Smooth dogfish	*Mustelus canis*
		Smallmouth flounder	*Etropus microstomus*
		Spotted hake	*Urophycis regia*
		Spot	*Leiostomus xanthurus*
		Sea raven	*Hemitripterus americanus*
		Striped searobin	*Prionotus evolans*
		Oyster toadfish	*Opsanus tau*
		Atlantic tomcod	*Microgadus tomcod*
		Winter flounder	*Pseudopleuronectes americanus*
		Silver hake	*Merluccius bilinearis*
		White perch	*Morone americana*

	Weakfish	*Cynoscion regalis*
	Windowpane flounder	*Scophthalmus aquosus*
	Winter skate	*Leucoraja ocellata*

Integration of Data and Methodologies

The datasets described above were mapped together to represent the extent of Ecologically Significant Areas for fish. In general, diadromous and pelagic fish were combined under "water column fish species" and "demersal fish species" remained its own category. Areas delineated from ten individual layers were overlaid for this ESA criterion (Table 2a-6). Because of the particular detail available in the datasets for this criterion, and the importance of seasonality and long-term trends in the fish communities of Long Island Sound, Ecologically Significant Areas for fish have been visualized using the 10 layers grouped by persistence, decade, functional group and season (Figures 2a-32 to 2a-37). Figure 38 shows the number of overlaps in each of the 10 fish components. Figure 39 shows all of the datasets dissolved together to show a single presence/absence layer of ESA for fish. Figure 39 also represents the final Ecologically Significant Area for the Fish criterion.

Table 2a-6 The ten individual data layers that contributed to the fish criterion.

Data layer description
Demersal fish species high weighted persistence (LISEA), 1984-2009
Water column fish species high weighted persistence (LISEA), 1984-2009
Top quintile of demersal species fall abundance, 1995-2004
Top quintile of demersal species spring abundance, 1995-2004
Top quintile of demersal species fall abundance, 2005-2014
Top quintile of demersal species spring abundance, 2005-2014
Top quintile of water column species fall abundance, 1995-2004
Top quintile of water column species spring abundance, 1995-2004

Top quintile of water column species fall abundance, 2005-2014
Top quintile of water column species spring abundance, 2005-2014

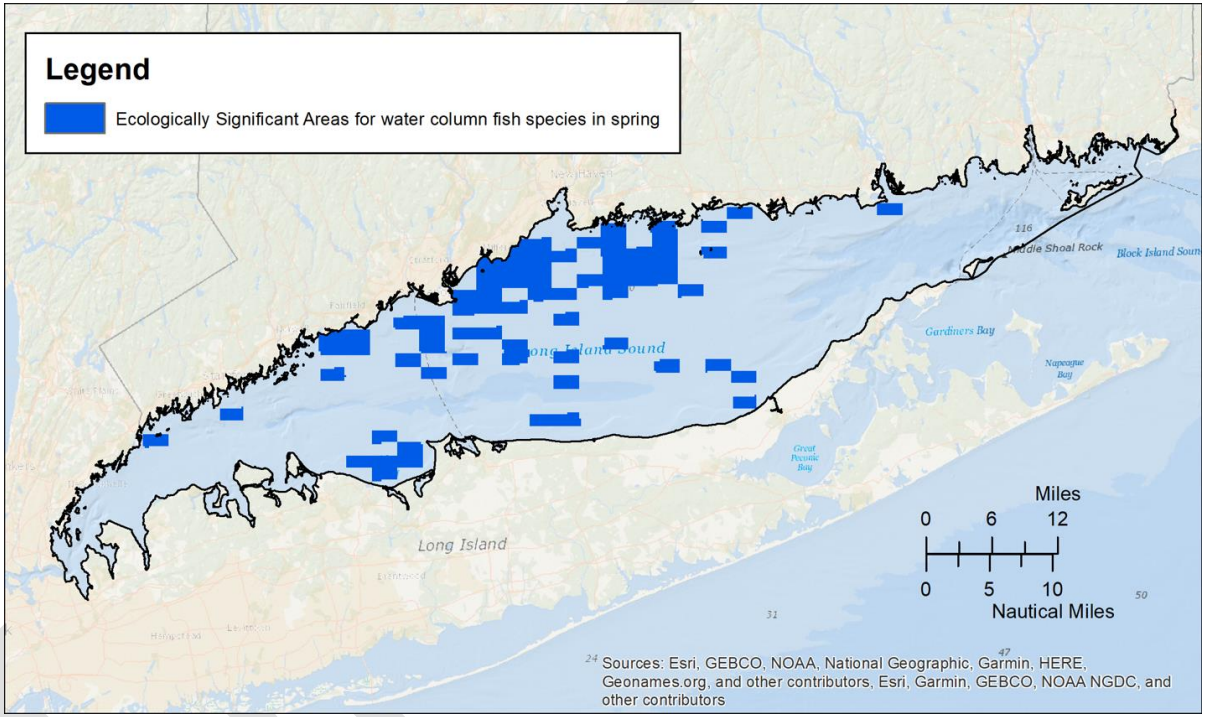


Figure 2a-32 A map showing the combination of persistently productive areas for water column species, the top quintile of abundance in spring for water column species 1995-2004, and the top quintile of abundance in spring for water column species 2005-2014.

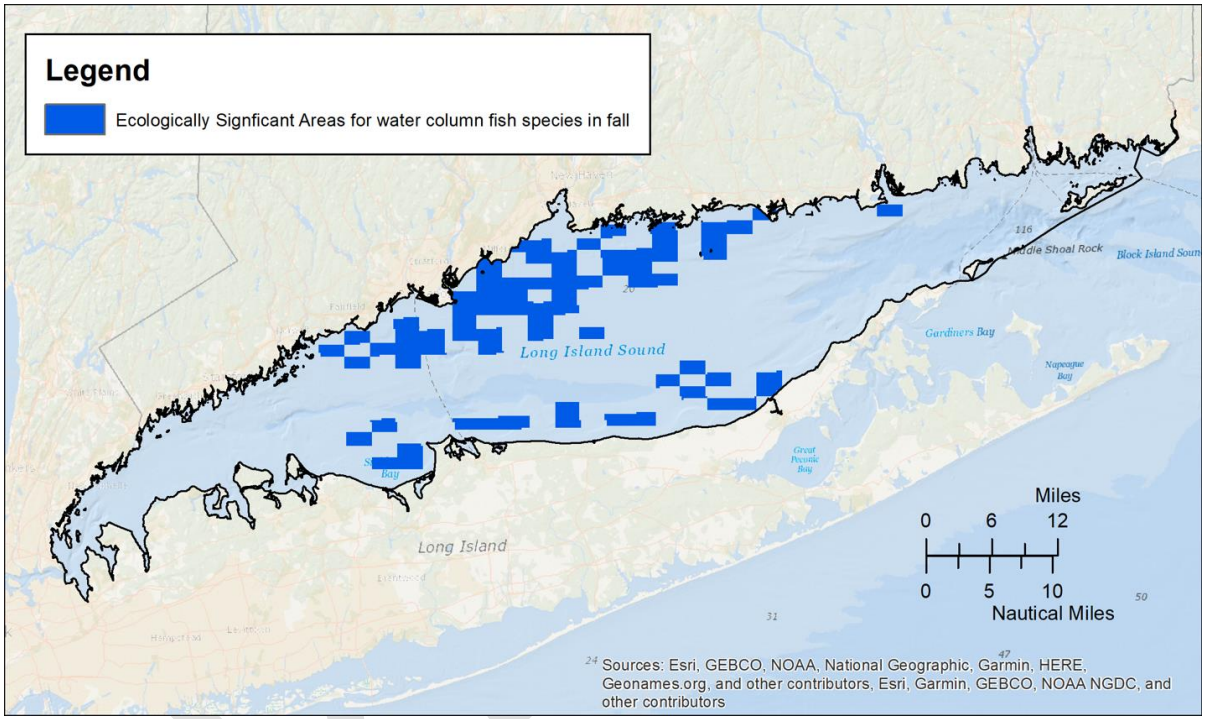


Figure 2a-33 A map showing the combination of persistently productive areas for water column species, the top quintile of abundance in fall for water column species 1995-2004, and the top quintile of abundance in fall for water column species 2005-2014.

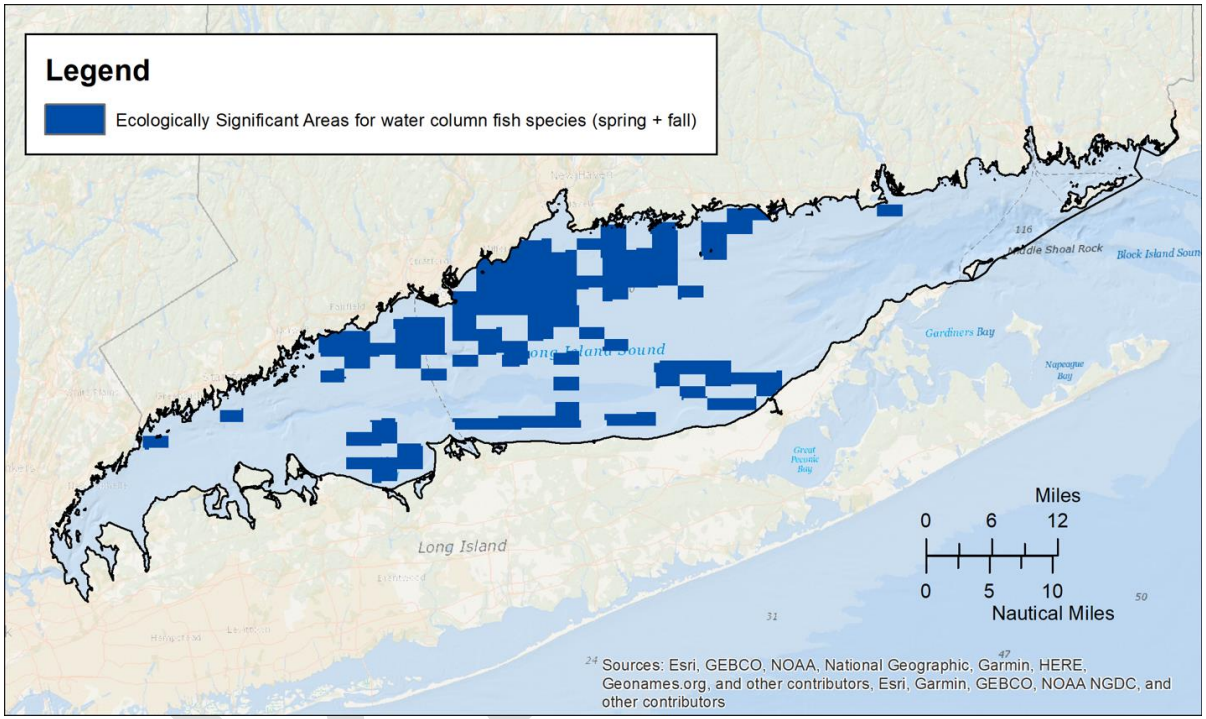


Figure 2a-34 A map showing the combination of Figures 2a 32 and 2a 33, which comprise ESAs for water column fish species in spring and fall.

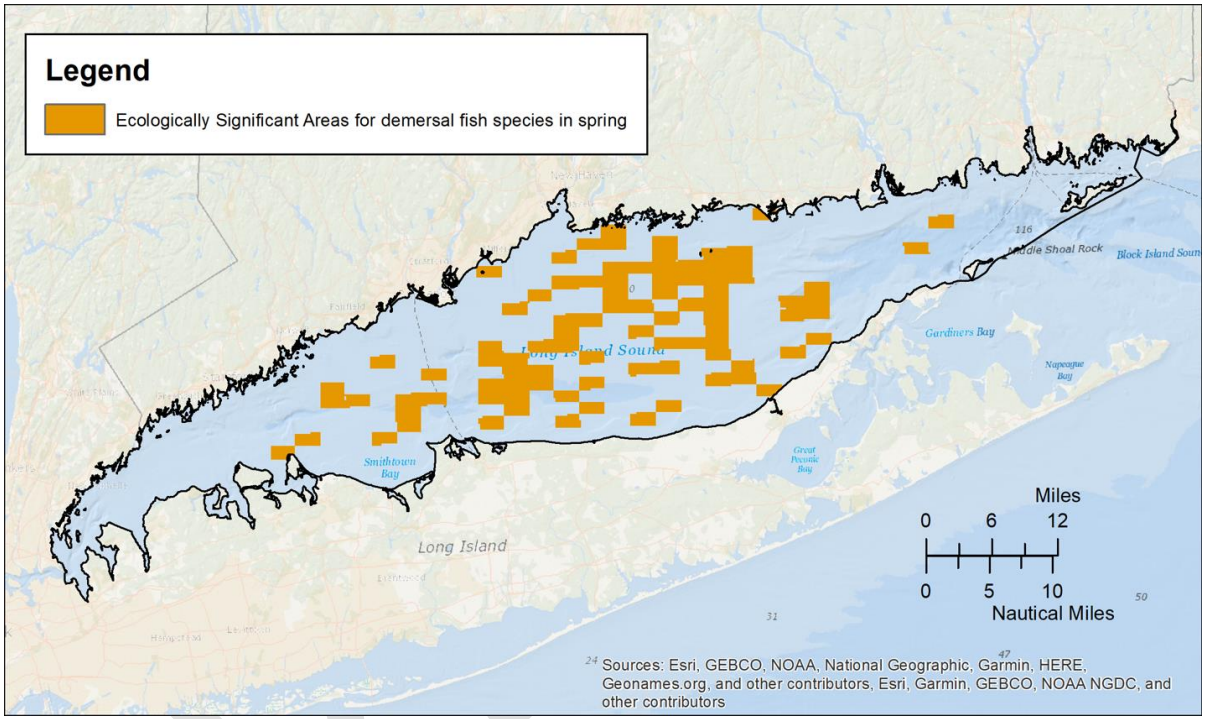


Figure 2a-35 A map showing the combination of persistently productive areas for demersal species, the top quintile of abundance in spring for demersal species 1995-2004, and the top quintile of abundance in spring for demersal species 2005-2014.

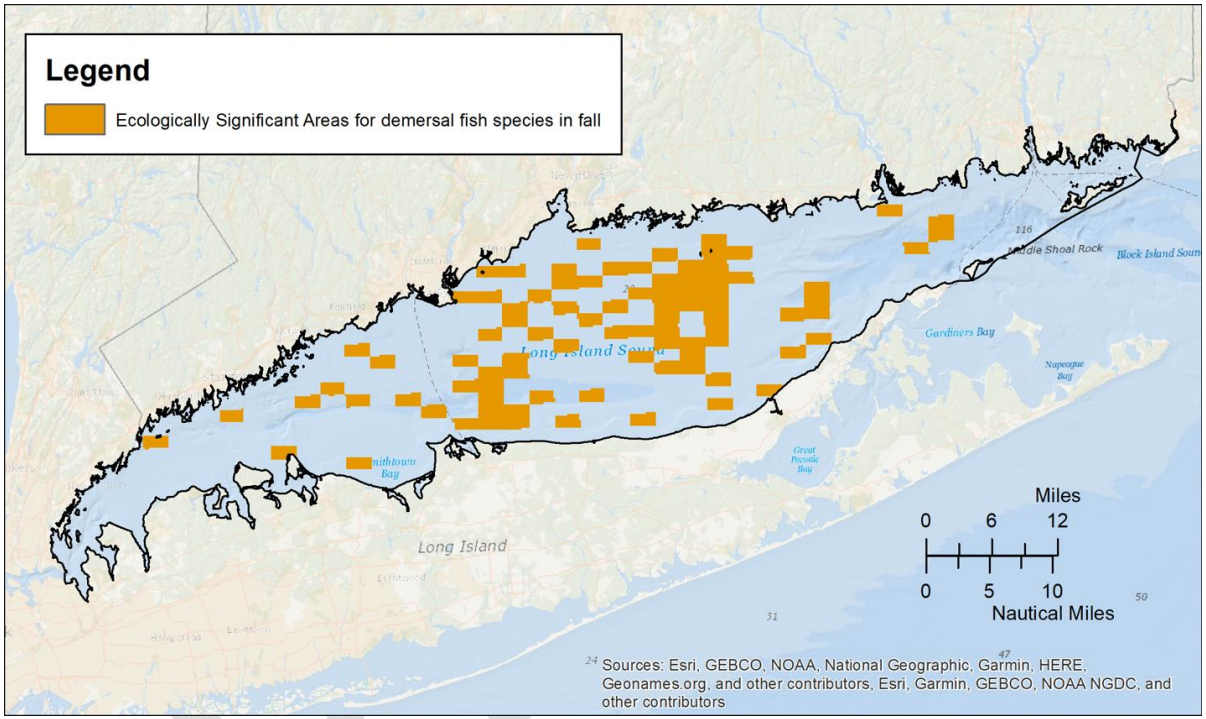


Figure 2a-36 A map showing the combination of persistently productive areas for demersal species, the top quintile of abundance in fall for demersal species 1995-2004, and the top quintile of abundance in fall for demersal species 2005-2014.

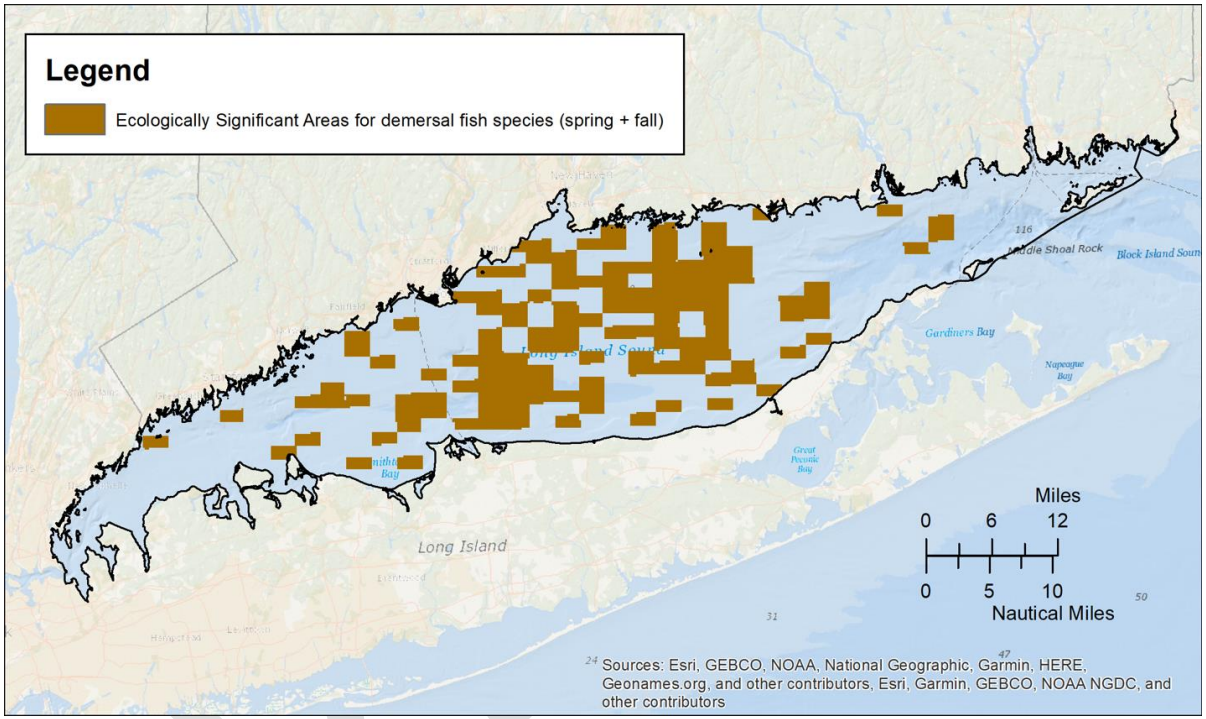


Figure 2a-37 A map showing the combination of figures 35 and 36, which comprise ESAs for demersal fish species in spring and fall.

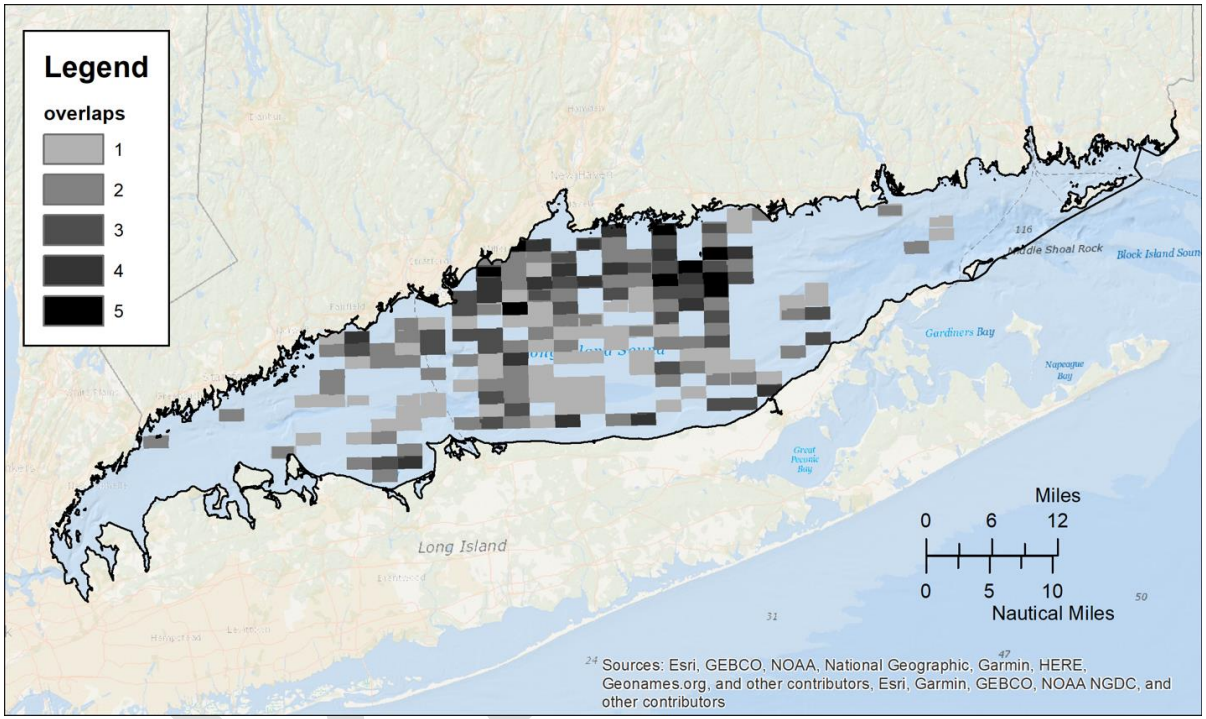


Figure 2a-38 Overlaps among each of the 10 input datasets representing ESAs for fish species.

DRAFT Ecologically Significant Area Map: Fish

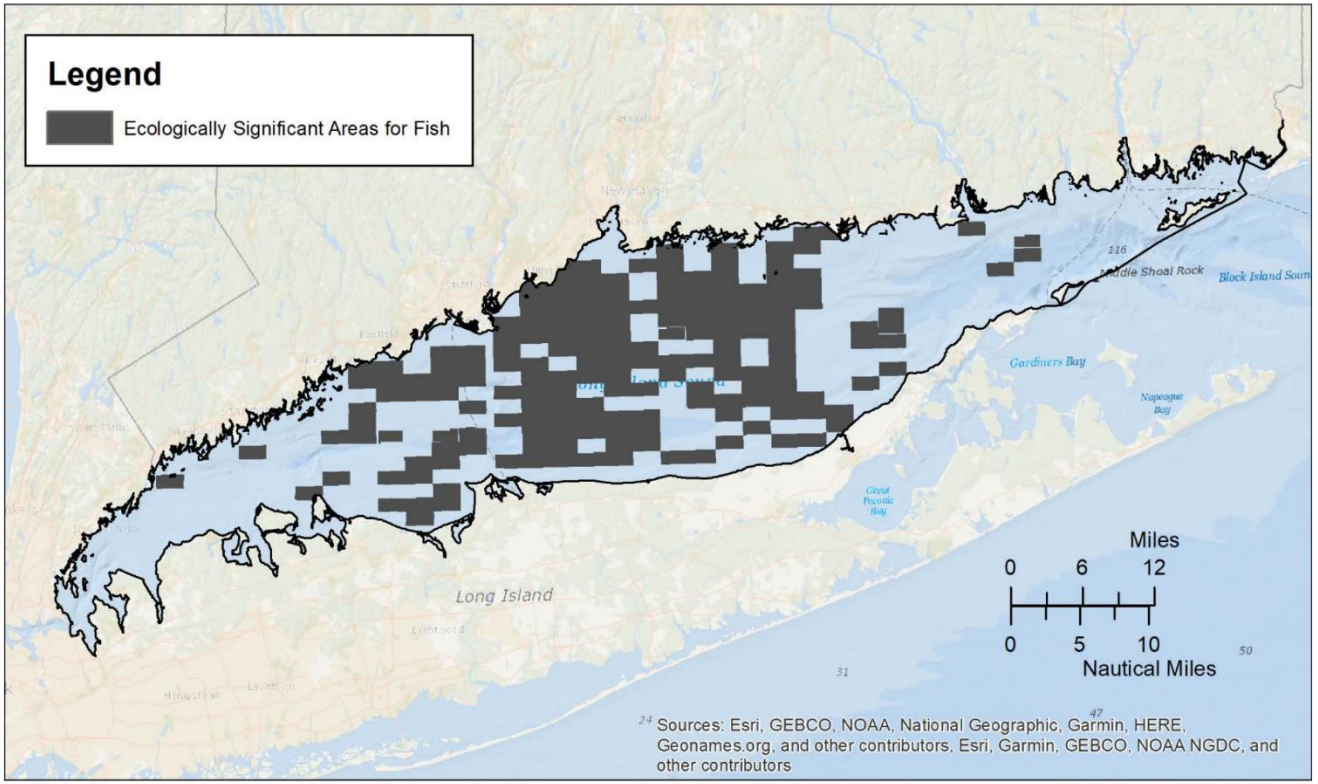


Figure 2a-39 Final ESA map of Fish

Updates and potential future work

The CT DEEP Marine Fisheries LISTS dataset is a robust, long-term dataset that provides many different opportunities for summarization. Future work could take the form of developing updated persistence products with additional data collected since the LISEA report's analysis that included data up to 2009. Similarly, the abundance products could be updated to include the most recent survey years since 2014. In both types of analyses, additional steps could be taken to highlight the differences in fish communities before and after the observed regime shift of the mid-1990s.

vi. **Criterion 11: Mobile invertebrates**

Definition: Areas of high mobile invertebrate (e.g., lobster, other crustaceans, squid) abundance and concentration.

Significance of Mobile invertebrates

Mobile invertebrates include large benthic crustaceans like lobster and crabs, as well as pelagic invertebrates such as squid. Mobile invertebrates are key components of the Long Island Sound ecosystem as scavengers and detritivores, and are critical to both human and animal food webs. In addition to fishing pressure, mobile invertebrate species in Long Island Sound are influenced by climate and environmental change. American lobster populations in particular have been severely impacted by warming waters. Horseshoe crab populations, on the other hand, have been influenced by the pharmaceutical industry and by human disturbance to nesting beaches.

Data Sources and Components of Mobile invertebrates

To identify Ecologically Significant Areas for mobile invertebrates, the EEG used the CT DEEP Marine Fisheries Long Island Sound Trawl Survey (LISTS) data and the results of existing analyses using this database, for multiple species. Mobile invertebrate species are routinely caught in the LISTS which occurs in spring and fall of each year since 1984. The LISTS divides the Sound into about three hundred 1x2 nautical-mile grid cells and uses a stratified-random survey design. The survey design relies on the stratum assigned to each 1x2 nautical mile area and weights the number of samples per stratum by the amount of stratum-specific area available for sampling. Strata are 12 combinations of three bottom types and four depth intervals. Although LISTS data are representative of the entire Sound, there are some areas that cannot be effectively sampled by the Survey (e.g., The Race, shoals, reefs and trenches). Biomass has been recorded since 1992. All of the data for this criterion are reported using the 1x2 nautical mile grid. The following analyses and datasets use LISTS data as their foundational input:

Areas of high mobile invertebrate biomass and concentration

CT DEEP Marine Fisheries provided LISTS data to the EEG to identify areas of high mobile invertebrate abundance and concentration. The data included the natural log of the mean biomass per grid cell for each species for spring and fall in the following date ranges: 1995-2004 and 2005-2014. Only species caught in more than 5 tows in any of the seasons in each date range were included (Table 2a-7). Individual species layers were summed to develop a total mean mobile invertebrate biomass layer for each season in each date range. This resulted in 4 individual biomass layers. Layers were classified by quintiles and the top quintile of each layer were combined and considered an ecologically significant area of high mobile invertebrate biomass and concentration (Figure 2a-40).

Table 2a-7 Mobile invertebrate species present in greater than 5 tows in any of the seasons and date ranges for the Long Island Sound Trawl Survey between 1995 and 2014.

Common name	**Scientific name**
Blue crab	*Callinectes sapidus*
Flat claw hermit crab	*Pagurus pollicaris*
Horseshoe crab	*Limulus polyphemus*
Lady crab	*Ovalipes ocellatus*
American lobster	*Homarus americanus*
Rock crab	*Cancer irroratus*
Spider crab	*Libinia emarginata*
Long-finned squid	*Loligo pealeii*

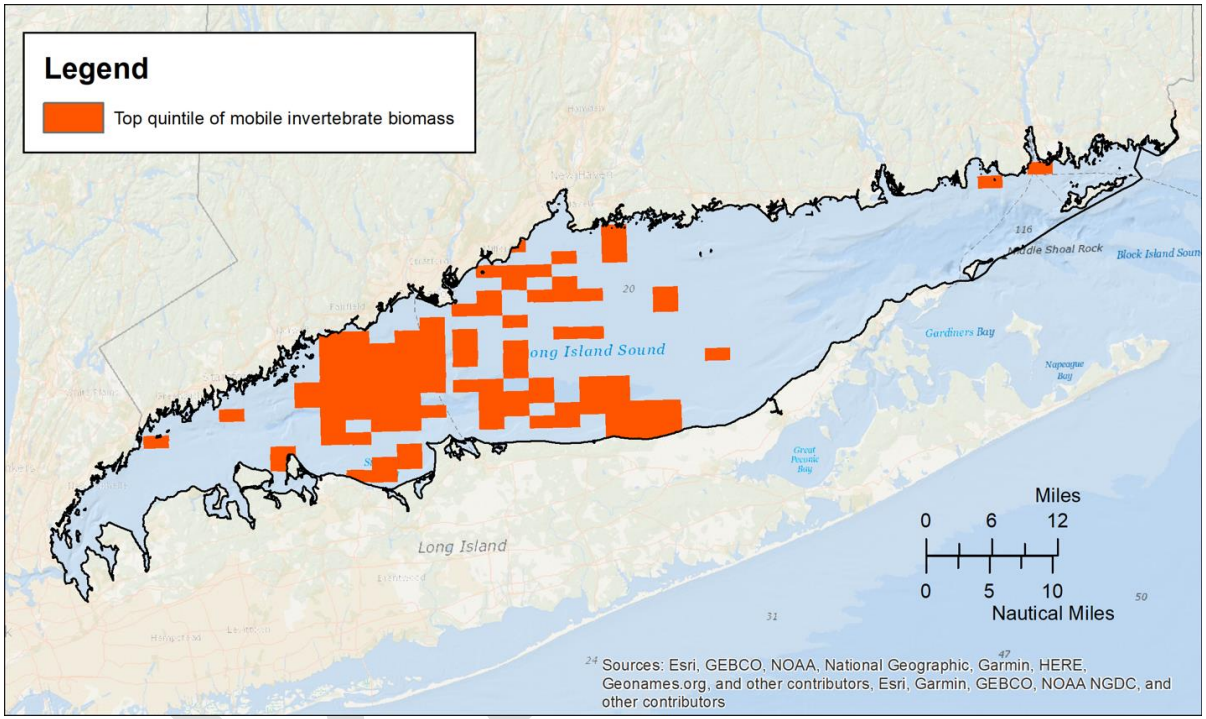


Figure 2a-40 The top quintile of invertebrate biomass from each season year range combination from the CT DEEP Marine Fisheries Long Island Sound Trawl Survey.

Horseshoe crab offshore hotspots

Provided by CT DEEP Marine Fisheries, this layer represents significant high concentrations of horseshoe crabs between 1992-2008, identified using the Hot Spot Analysis Tool in ArcGIS. These data were included in Connecticut's 2015 Wildlife Action Plan Key Habitats and Communities. Areas identified as hotspots were considered ecologically significant (Figure 2a-41).

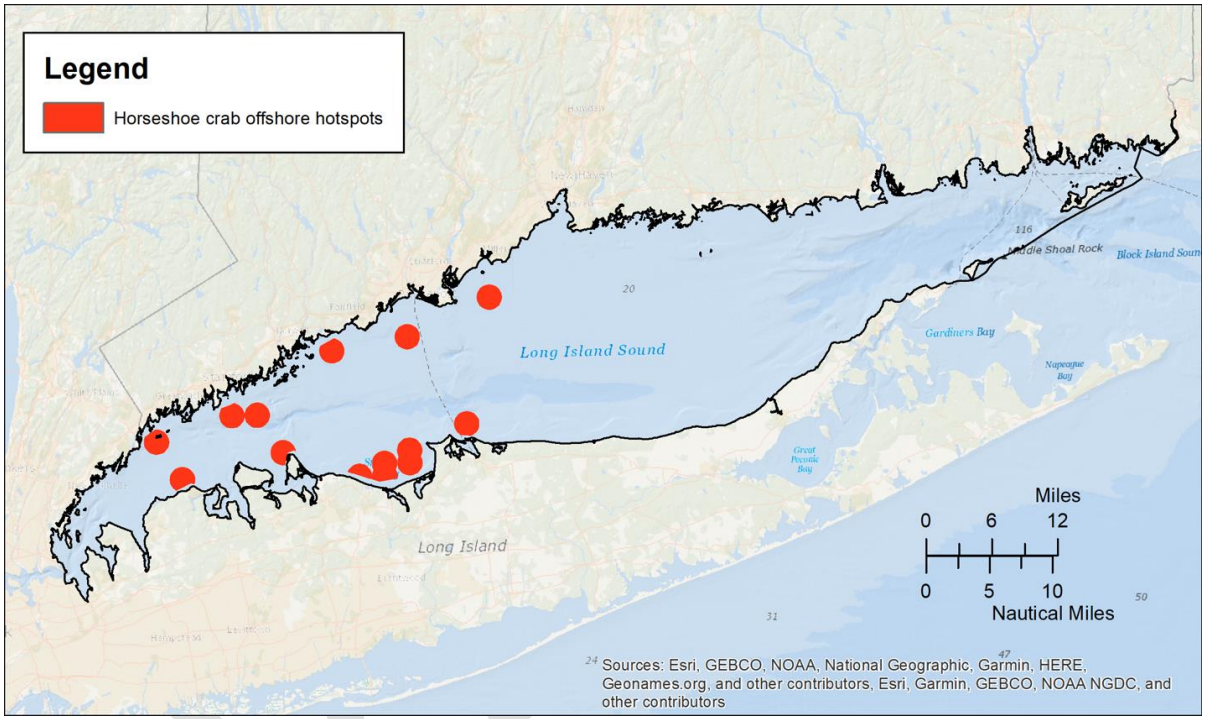


Figure 2a-41 Horseshoe crab offshore hotspots.

Horseshoe crab predicted high and medium use areas

Provided by CT DEEP Marine Fisheries, this layer represents predicted use classifications for horseshoe crabs from a resource selection function model. These data were included in Connecticut's 2015 Wildlife Action Plan Key Habitats and Communities. High and medium use areas were considered ecologically significant (Figure 2a-42).

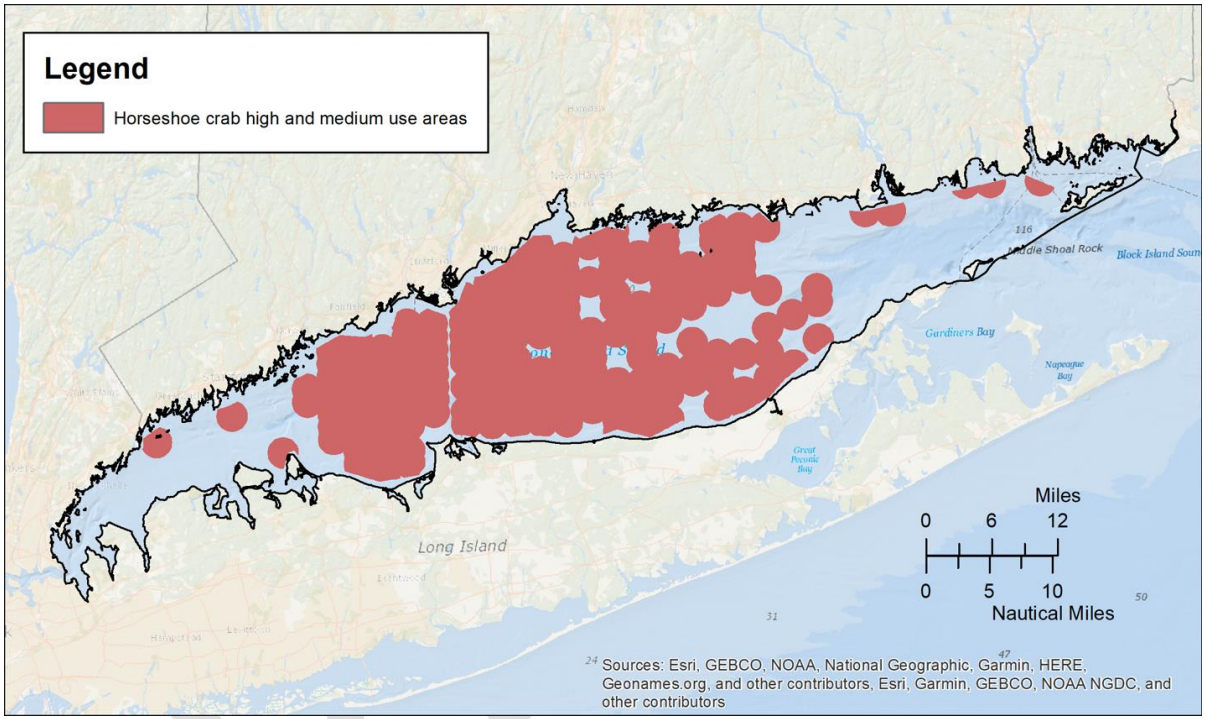


Figure 2a-42 High and medium use areas for horseshoe crabs.

Horseshoe crab predicted spawning beaches

Provided by CT DEEP Marine Fisheries, this layer represents predicted horseshoe crab spawning use classifications for Connecticut beaches. These data were included in Connecticut's 2015 Wildlife Action Plan Key Habitats and Communities. High and medium use beaches were considered ecologically significant (Figure 2a-43).

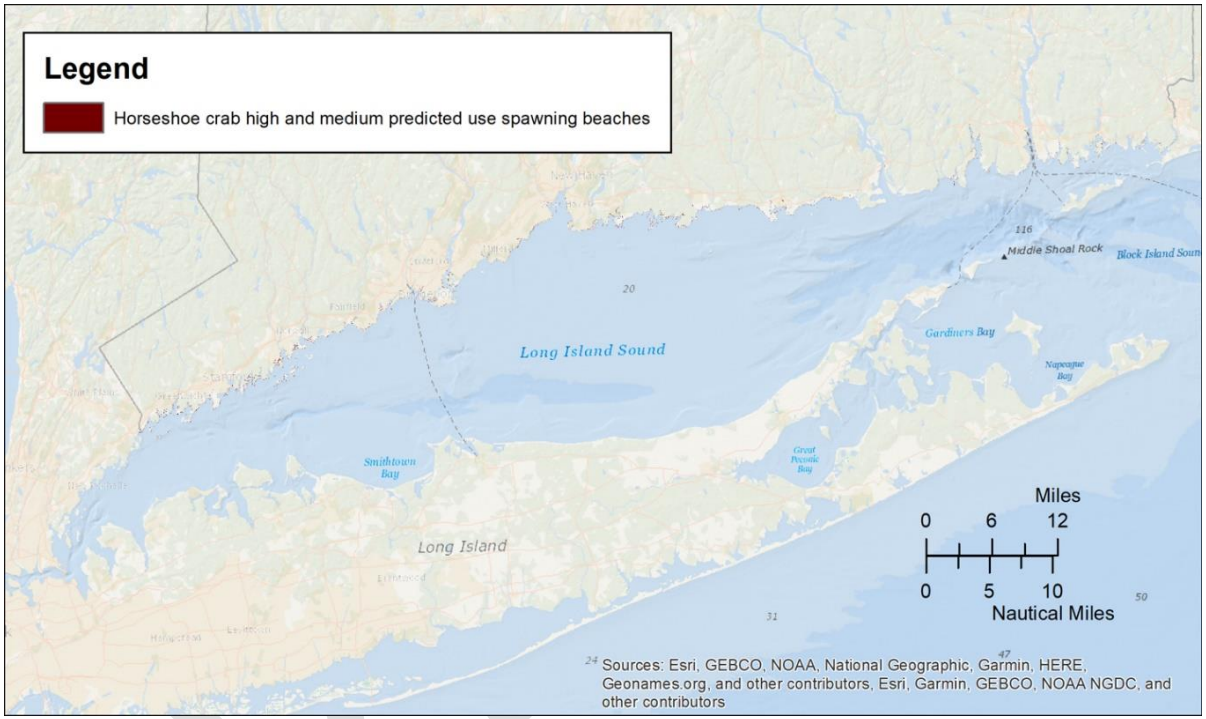


Figure 2a-43 Horseshoe crab predicted spawning beaches. Note: The Blue Plan Planning Area boundary is removed in this map to more clearly depict features.

American lobster projected thermal refuge

Provided by CT DEEP Marine Fisheries, this layer represents those LISTS grid cells where projected future temperatures remain within American lobsters' tolerance (between 12-20°C) from July to September for at least 32% of the time. This threshold was chosen because between 2002-2012 temperatures remained between 12-20°C from July to September for ~32% of the time and allowed for some American lobster survival. Development of the thermal refuge layer (Figure 2a-44) required use of a projected temperature layer that corresponded to the LISTS grid, developed by the Stevens Institute.

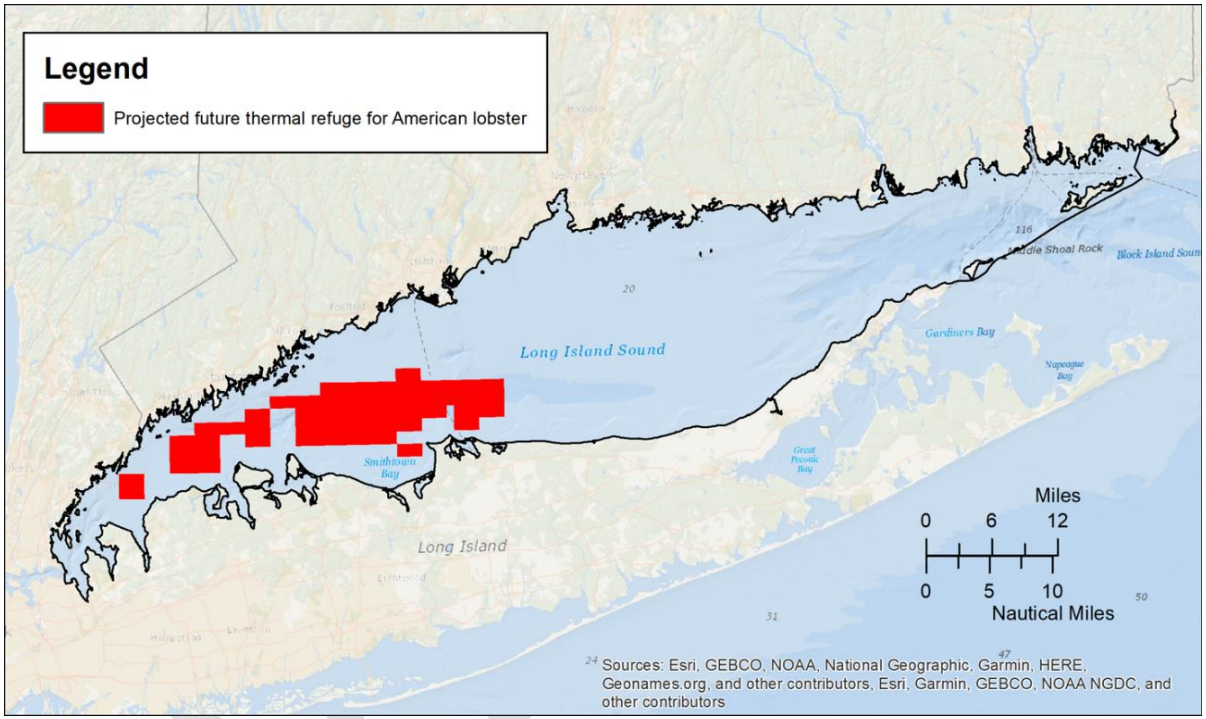


Figure 2a-44 Projected thermal refuge for American Lobster.

Integration of Data and Components

The datasets described above were mapped together to represent the extent of Ecologically Significant Areas for mobile invertebrates. Figure 2a-45 shows the number of overlaps in those datasets. Figure 2a-46 shows those datasets dissolved together to show a single presence/absence layer of ESA for mobile invertebrates.

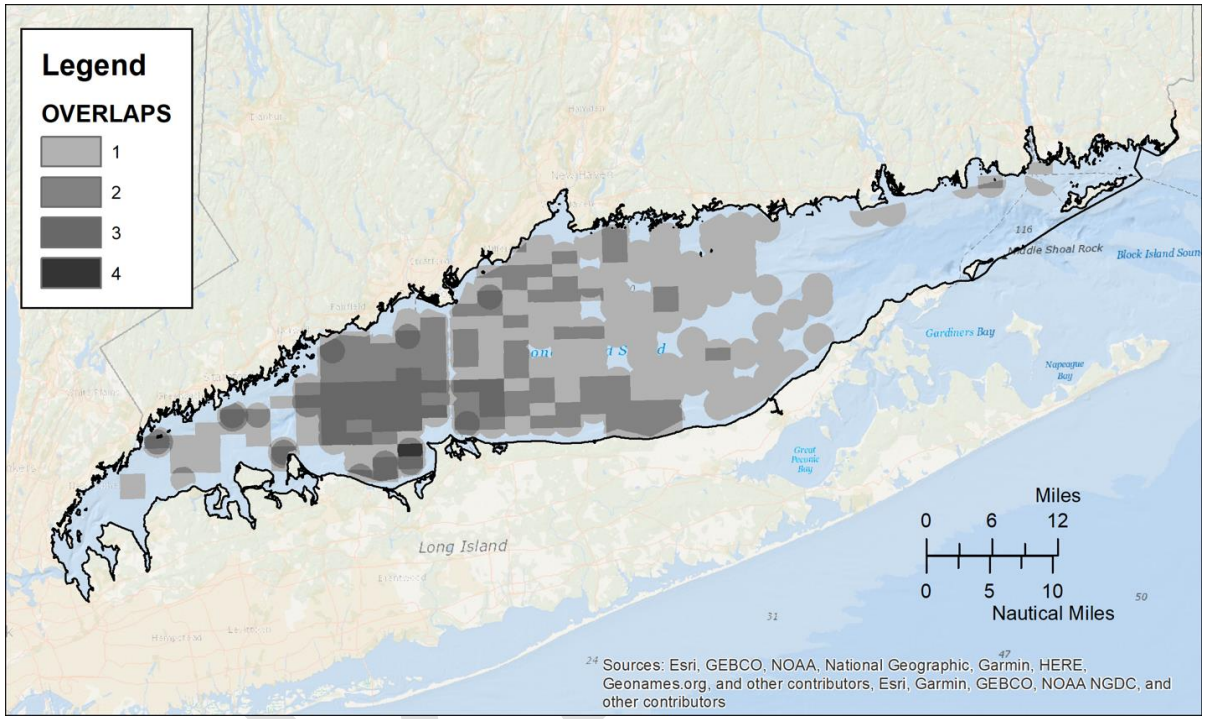


Figure 2a-45 Overlaps in datasets contributing to the mobile invertebrate ESA.

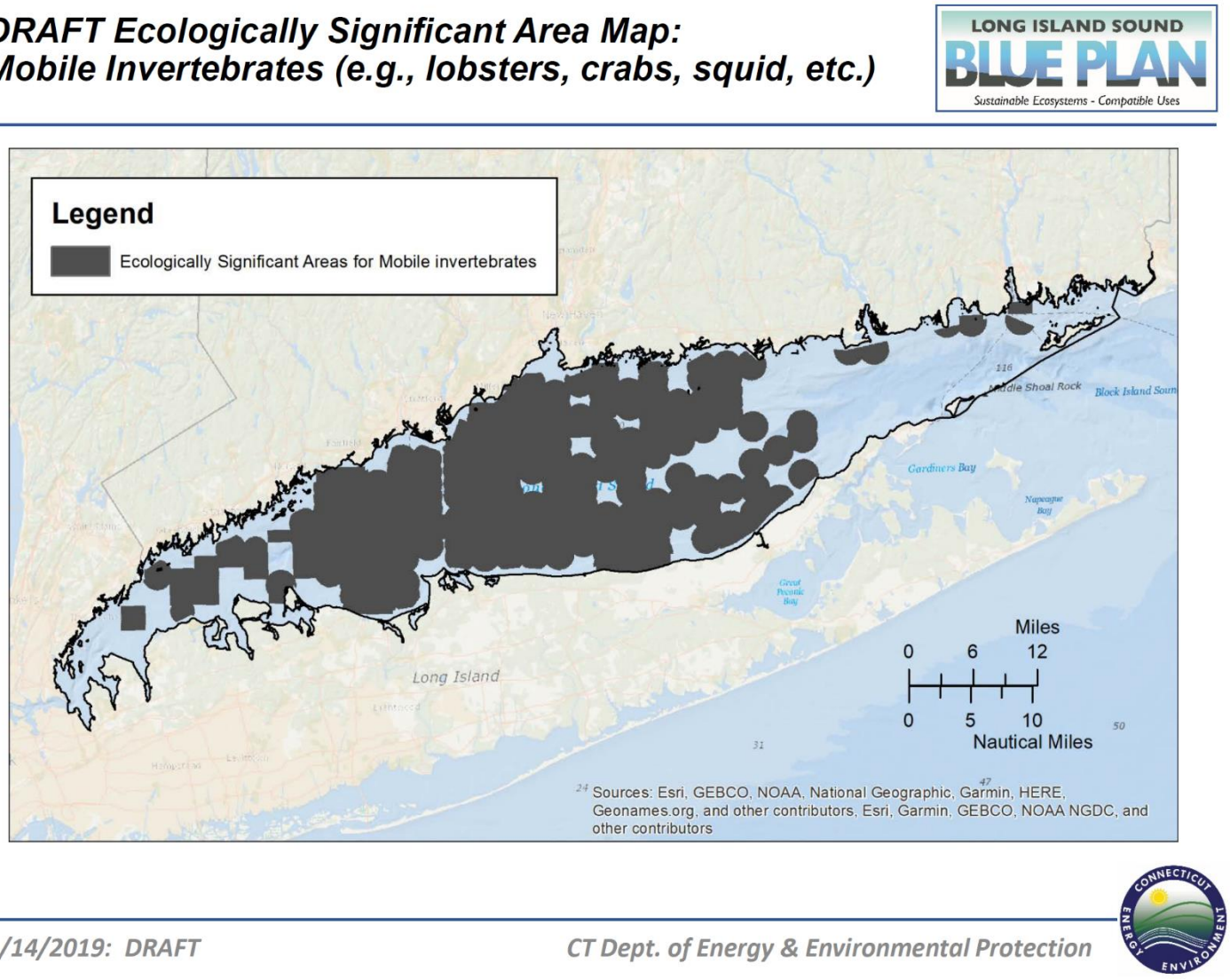


Figure 2a-46 Final ESA map of mobile invertebrates.

Updates and potential future work

The CT DEEP Marine Fisheries LISTS dataset is a robust, long-term dataset that provides many different opportunities for summarization. Future work could take the form of developing updated biomass products with additional data collected since 2014.

vii. **Criterion 12: Sessile-mollusk-dominated communities**

Definition: Areas where wild, natural sessile-mollusk-dominated communities occur.

Significance of Sessile-mollusk-dominated communities

Sessile-mollusk-dominated communities are assemblages of non-mobile gastropods (e.g., slipper shells) and bivalves (e.g., blue mussels, clams) that are not harvested by humans. These communities are anchored by the mollusks, where dead and living shell material can sometimes form reef-like features that forms habitat for encrusting species (e.g., sponges, tube worms) and mobile species (e.g., juvenile fish). Furthermore, as filter-feeders, these communities filter particles and organic matter from the water column and deposit it into the sediment, contributing to the cycling of nutrients in the Sound. Aggregations of sessile mollusks can take years or decades to establish and so are vulnerable to disturbances including physical removal, burial, or smothering.

Components and data sources for Sessile-mollusk-dominated communities

Long Island Sound Mapping and Research Collaborative (LISMaRC) Phase I and II SEABOSS observations

There have been no comprehensive surveys of sessile-mollusk-dominated communities in Long Island Sound. However, the Long Island Sound Mapping and Research Collaborative (LISMaRC), through the Long Island Sound Seafloor Mapping Initiative, have mapped the occurrence of several sessile mollusk species at discrete sampling locations near Stratford Shoals and eastern Long Island Sound. The species observations used in maps for this criterion include the common slipper shell (*Crepidula fornicata*) and blue mussels (*Mytilus edulis*). In 2012 and 2013, the percent cover of slipper shells and blue mussels was documented in the Stratford Shoals area. Survey areas with >50% cover of slipper shells and blue mussels were considered ecologically significant. In 2017, the presence and absence of slipper shells and blue mussels was documented in eastern Long Island Sound. Survey areas with slipper shells or blue mussels present were considered ecologically significant. The combined observations of slipper shells are shown in Figure 2a-47 and the combined observations of blue mussels are shown in Figure 2a-48.

These observations create an incomplete picture of where ESA for sessile-mollusk-dominated communities exist. First, while each survey area is shown on the map at its true size, sessile-mollusk-dominated communities likely only exist in a fraction of each survey area. In other words, these communities only needed to be found to occur once within the entire survey area for that survey area to be included as ecologically significant. Second, it is important to reiterate that simply because the ESA maps do not indicate presence of sessile-mollusk-dominated communities in other areas of the Sound, they do not reflect their absence - they merely indicate the lack of survey effort in those parts of the Sound. Only survey areas where sessile-mollusk-dominated communities have been observed (anywhere within the survey area) are considered ecologically significant.

Expert participatory mapping

After reviewing the draft areas selected by the EEG that were derived from the LISMaRC data, experts recommended that ESA for sessile-mollusk-dominated communities be amended to include additional areas. On January 3, 2019, Patrick Comins, Executive Director of the Connecticut Audubon Society, delineated additional areas for slipper shell aggregations and blue mussel aggregations for inclusion as ESA (Figure 2a-49).

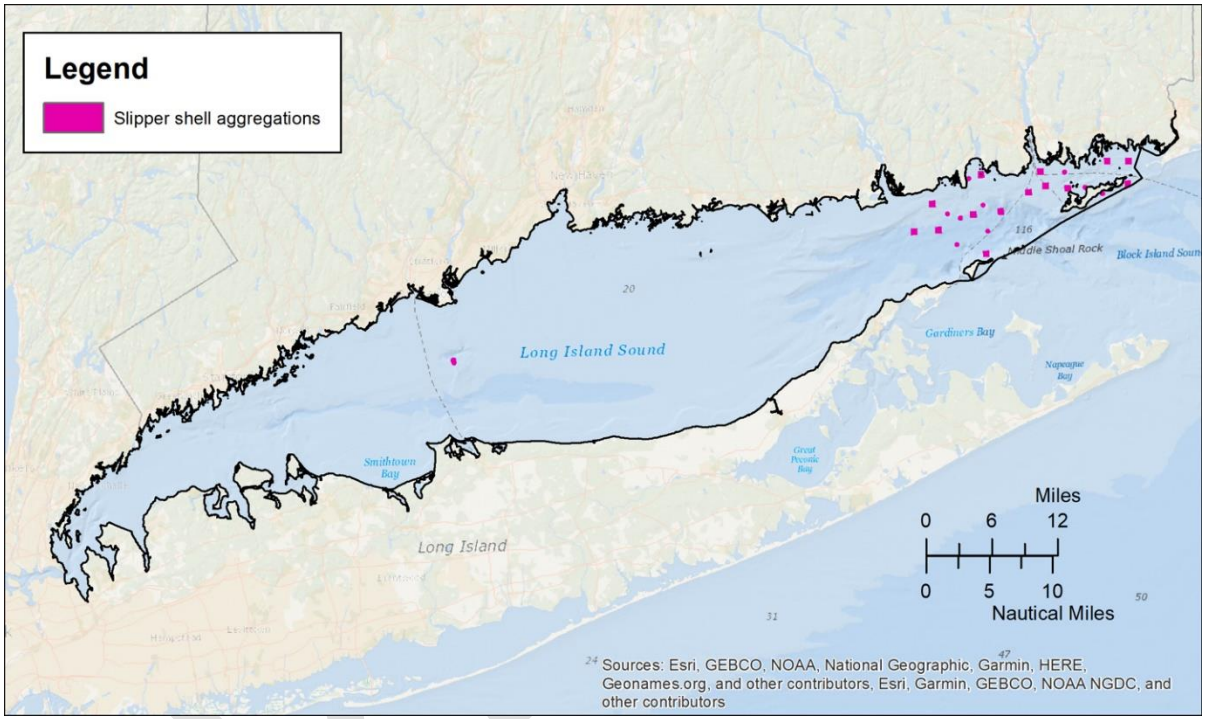


Figure 2a-47 Observations of slipper shell aggregations near Stratford Shoals and in eastern LIS.

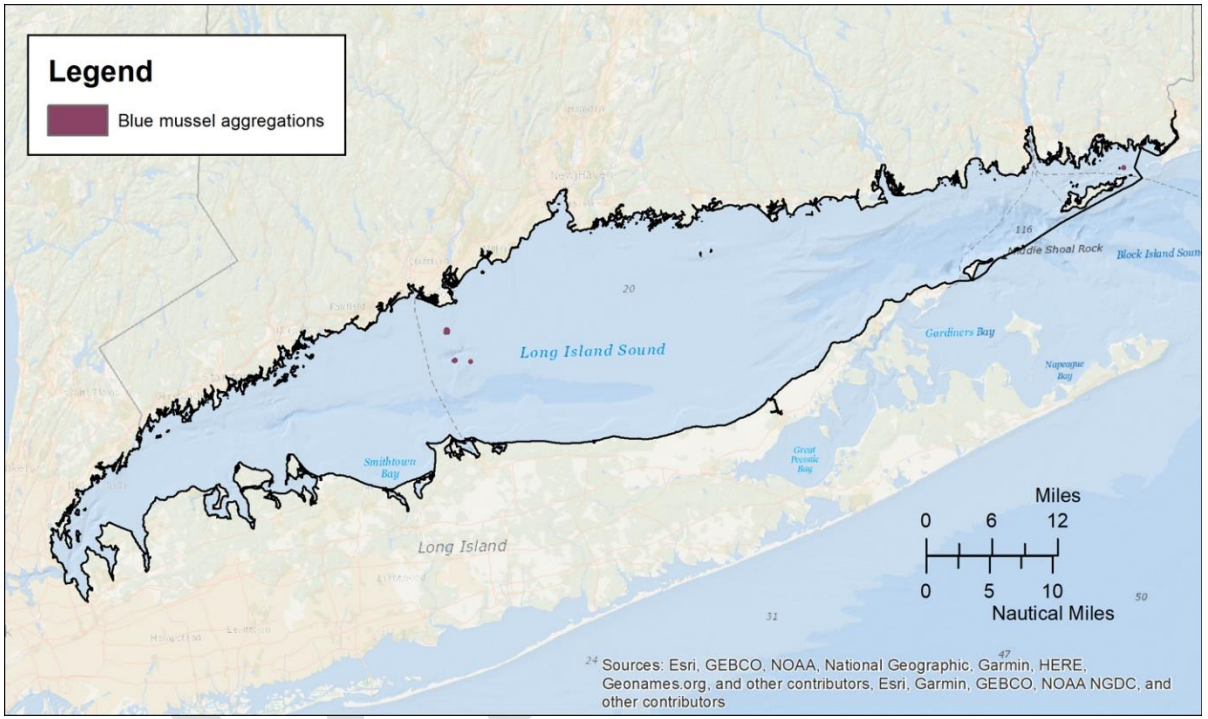


Figure 2a-48 Observations of blue mussel aggregations near Stratford Shoals and in eastern LIS.

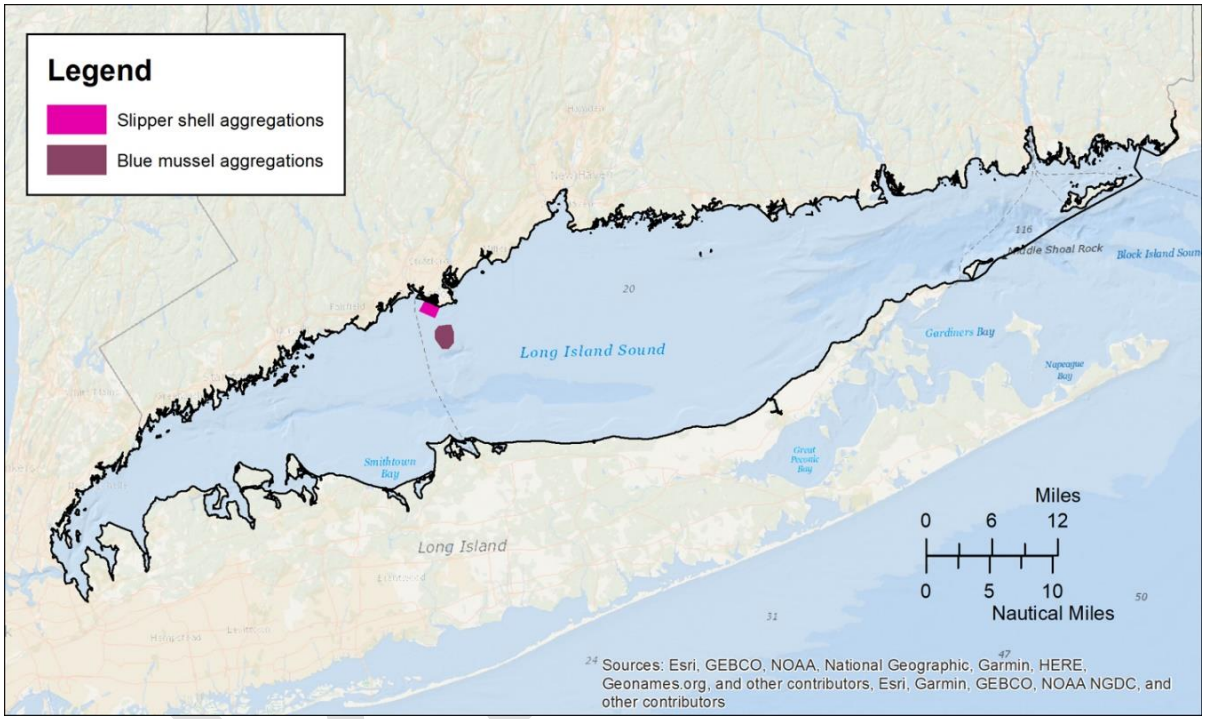


Figure 2a-49 Aggregations of slipper shells and blue mussels delineated by expert participatory mapping.

Integration of components and data sources

The datasets described above were mapped together to represent the extent of Ecologically Significant Areas for sessile-mollusk-dominated communities. Figure 2a-50 shows those datasets dissolved together to show a single presence/absence layer of ESA for sessile-mollusk-dominated communities.

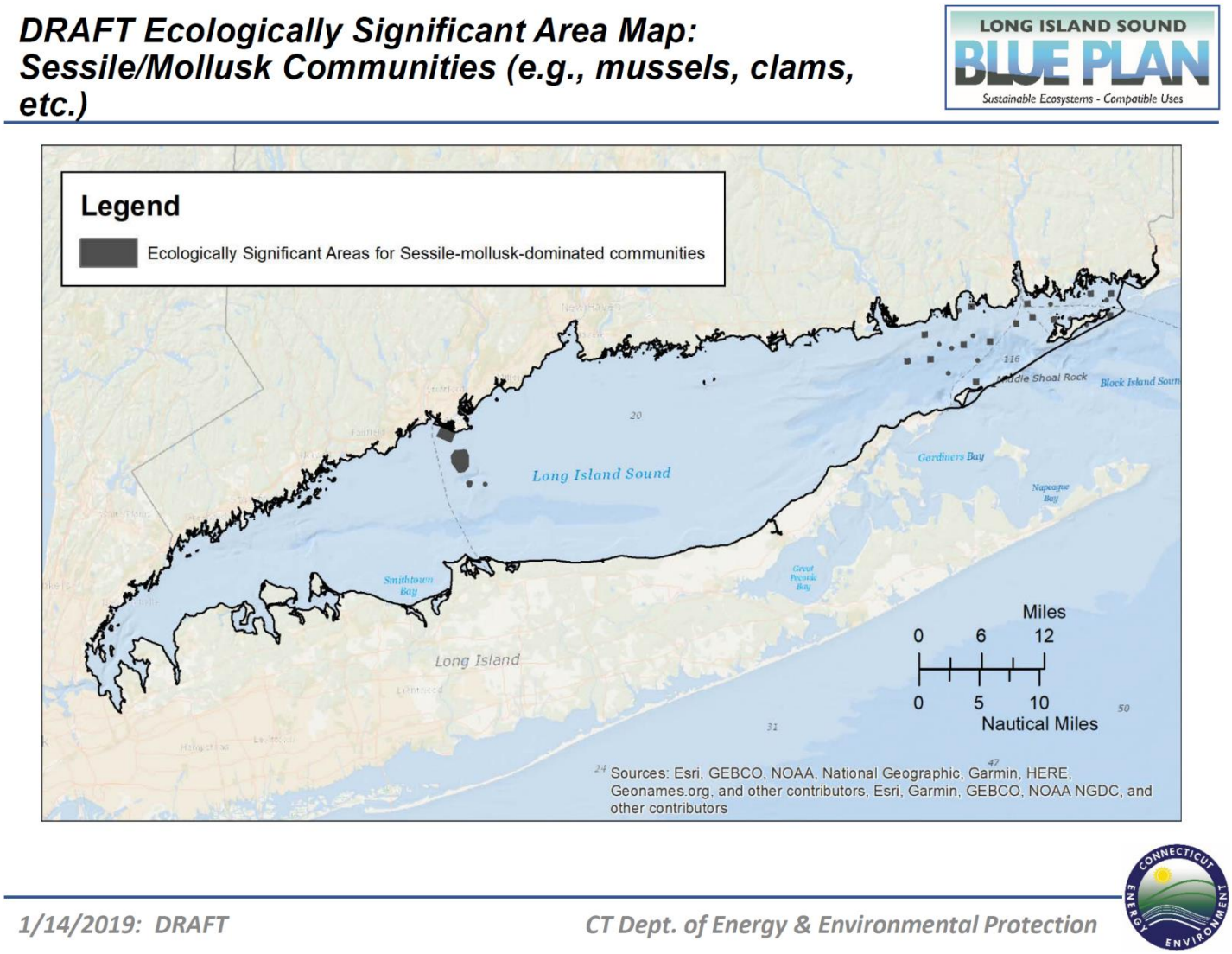


Figure 2a-50 Final ESA map of Sessile-mollusk-dominated communities.

Updates and potential future work

Additional observations of sessile-mollusk-dominated communities would improve the maps for this criterion. As with other criteria, and if enough input data are available, a habitat suitability model could be developed for sessile-mollusk-dominated communities that generates products with full-coverage of the Sound. The benefit of using a habitat suitability model is that an existing and limited set of observations could be used to predict habitat suitability across the entire Long Island Sound, rather than rely on a piece-meal sampling approach that may never sample every Long Island Sound habitat.

viii. **Criterion 13: Managed shellfish beds**

Definition: Locations of commercial and recreational shellfishing harvest areas, including shellfish restoration activities and areas closed to shellfishing.

Significance of Managed shellfish beds

In Connecticut, shellfish are defined as oysters, clams, mussels and scallops; either shucked or in the shell, fresh or frozen, whole or in part. Scallops are excluded from this definition when the final product is the shucked adductor muscle only. Lobsters, crabs, snails and finfish are not included in this definition. Managed shellfish beds is the only ESA criteria with a clear dependence on a human use or activity. Therefore, managed shellfish beds are also described in the Significant Human Use Areas analysis (see section 3.4b). However, as ecological features, managed shellfish beds provide many if not all of the same ecosystem services as unmanaged shellfish beds (see Sessile-mollusk-dominated communities), such as providing substrate and habitat for a variety of other species, water column filtration, and nutrient cycling.

Data sources for Managed shellfish beds

Several datasets from the Connecticut Bureau of Aquaculture were used to map Ecologically Significant Areas for managed shellfish beds. Since the state of New York does not map and maintain data on shellfish resources in the same way as the state of Connecticut, only Connecticut maps were used. All of the Connecticut datasets are available via the Connecticut Aquaculture Mapping Atlas (CT Aquaculture Mapping Atlas, 2018). Any area mapped as a managed shellfish bed was considered ecologically significant.

Oyster seed beds (Connecticut Natural Shellfish Beds Dataset)

Natural beds get their name from the fact that shellfish, especially oysters, naturally inhabited the area (Figure 2a-52). Natural beds have specific regulations concerning their use including licensing and harvesting methods. They are predominately oyster seed beds that cannot be mechanically harvested. A complete description and listing of regulations are available from the Bureau of Aquaculture.

Connecticut Recreational Shellfish Beds Dataset

Recreational beds are areas that are used for recreational shellfish harvest, and further delineated by shellfish growing area classifications of "Approved" and "Conditionally Approved". (Figure 2a-52) In certain areas there may be overlap between town natural beds, undesignated town beds and recreational beds. The sources for the recreational beds layer came from maps and information provided by local shellfish commissions.

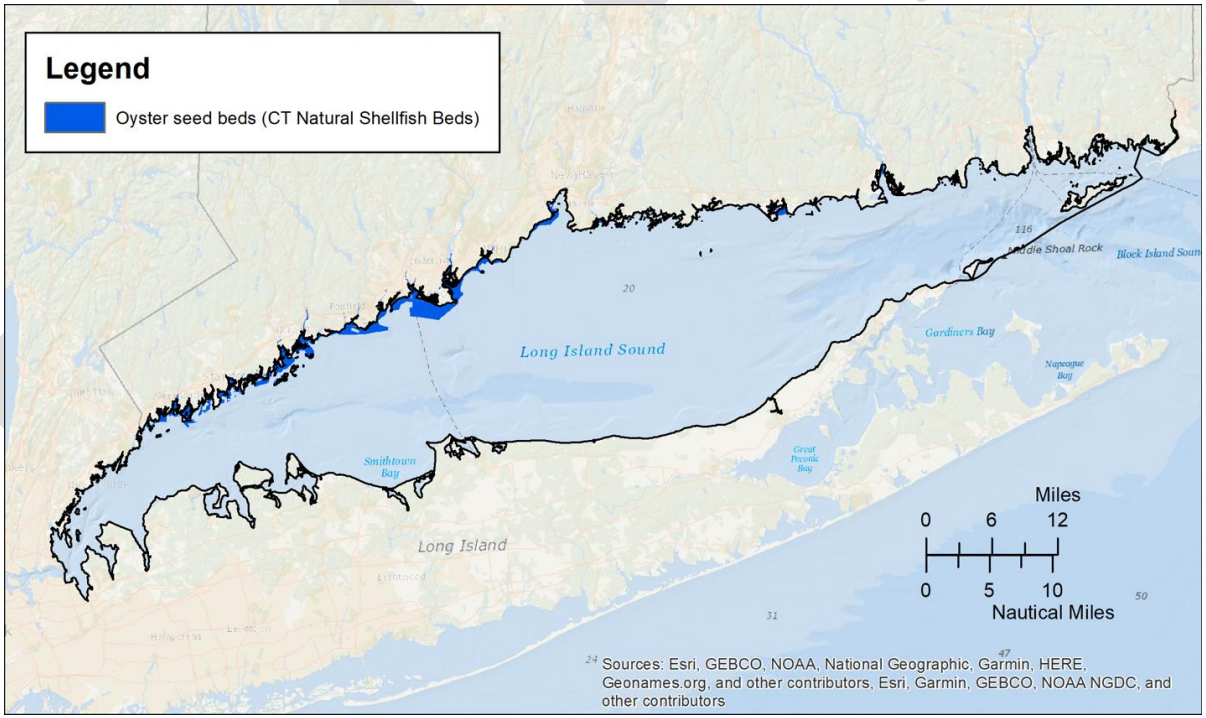


Figure 2a-51 Connecticut oyster seed beds.

Connecticut State-managed Shellfish Beds Dataset

In 1881 a line was established, referred to as the Commissioners line that divides the waters of the state into a northern and southern section. All beds south of this line are State beds and most beds north of this line are town beds. All the Beds under state jurisdiction were mapped using longitude/latitude data from Bureau of Aquaculture access database. These coordinates were taken from converted sextant angles. This data is subject to change and the Bureau of Aquaculture may have more recent information for some areas. State-managed shellfish beds are shown in Figure 2a-53.

Connecticut Town-managed Shellfish Beds Dataset

Town beds are under town jurisdiction and may be leased, licensed or otherwise managed through the local shellfish commission. Towns may require additional local permits to work in waters under local jurisdiction. The beds north of the line in Milford, West Haven, and New Haven are exceptions to this as they are under state jurisdiction. The sources of data for the town managed beds layer were quite varied. The sources included longitude/latitude data and maps from Bureau of Aquaculture, maps and longitude/latitude provided by local shellfish commissions and longitude/latitude data and maps obtained from Tallmadge Brothers. Additionally, a few towns provided maps of their beds in an electronic format such as CAD or shapefile. This data is subject to change and the Bureau of Aquaculture may have more recent information for some areas. Town-managed beds are shown in Figure 2a-54.

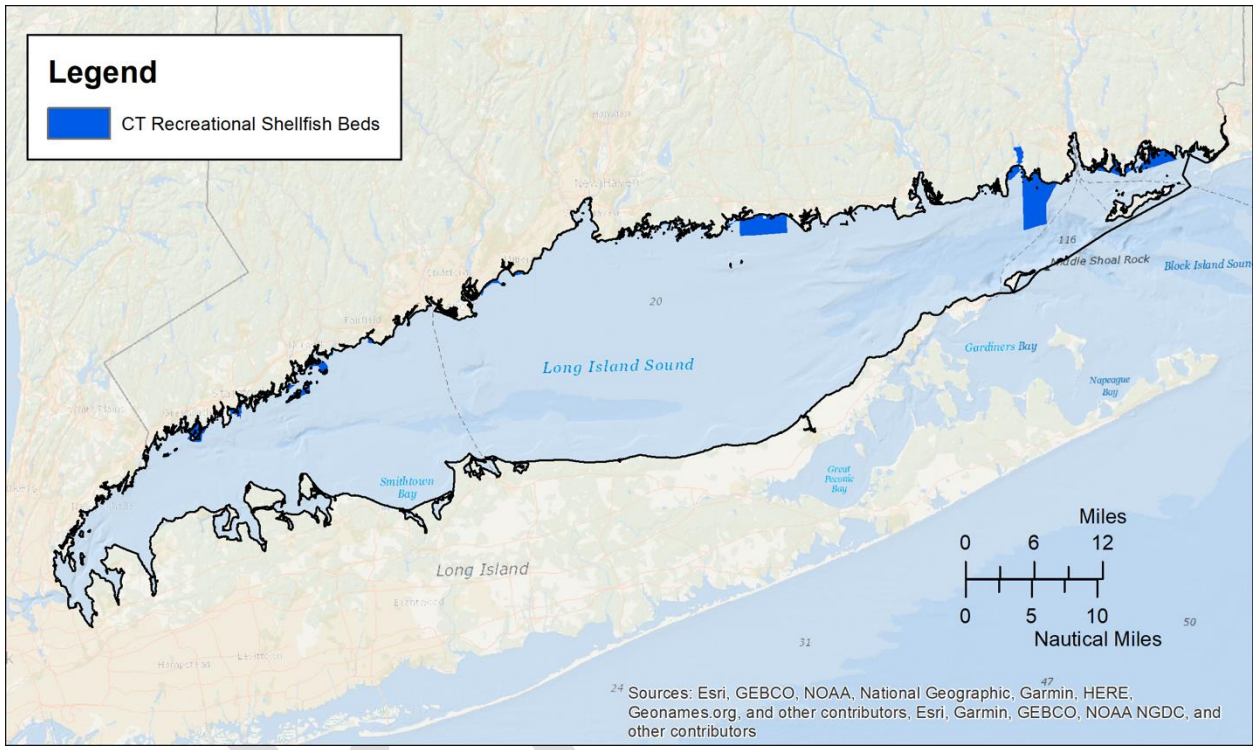


Figure 2a-52 Connecticut recreational shellfish beds.

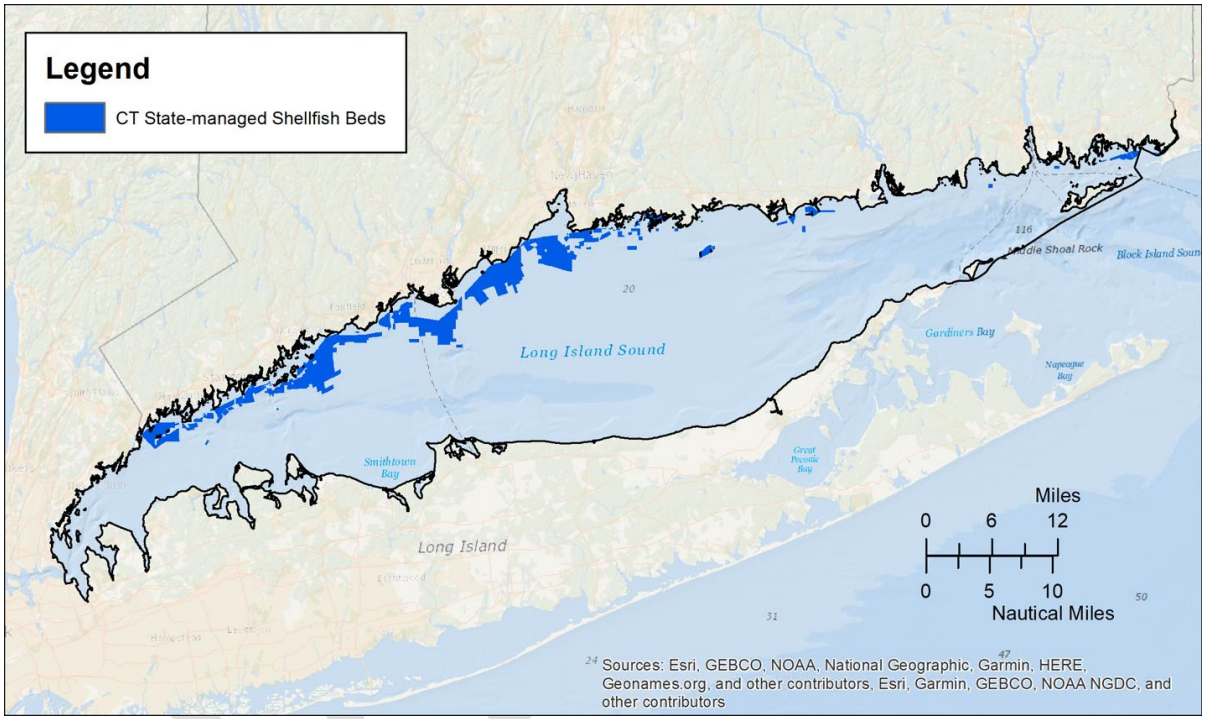


Figure 2a-53 Connecticut state-managed shellfish beds.

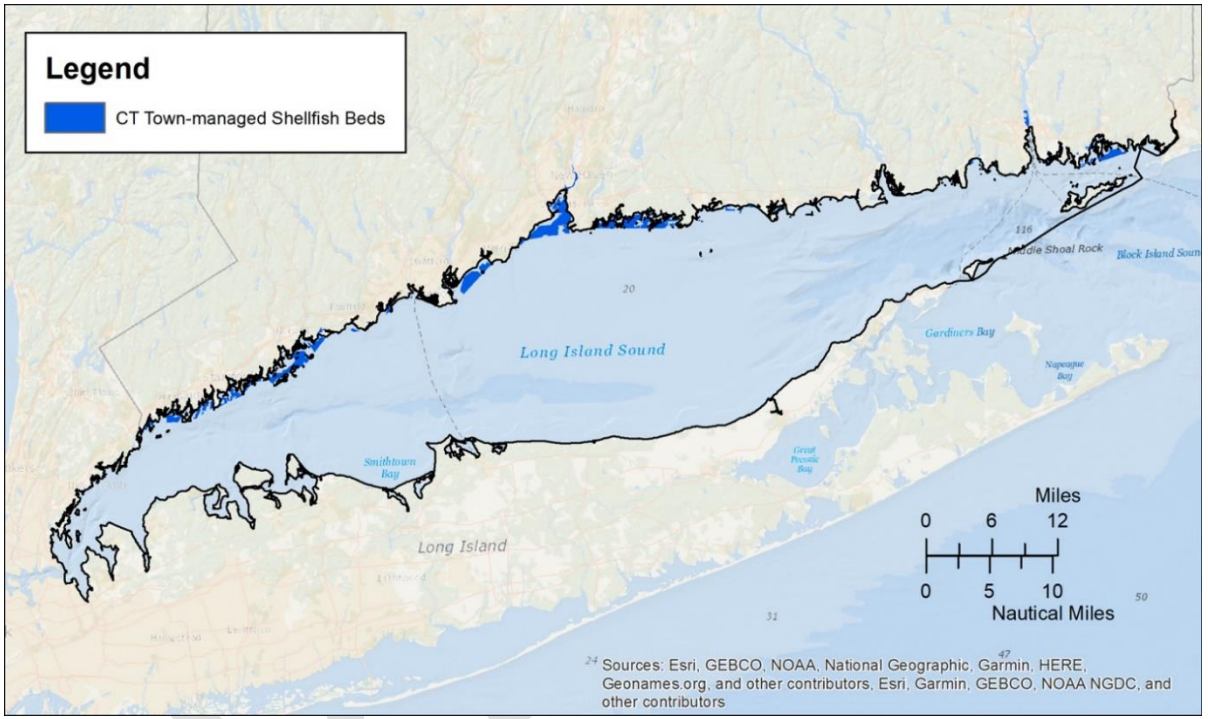
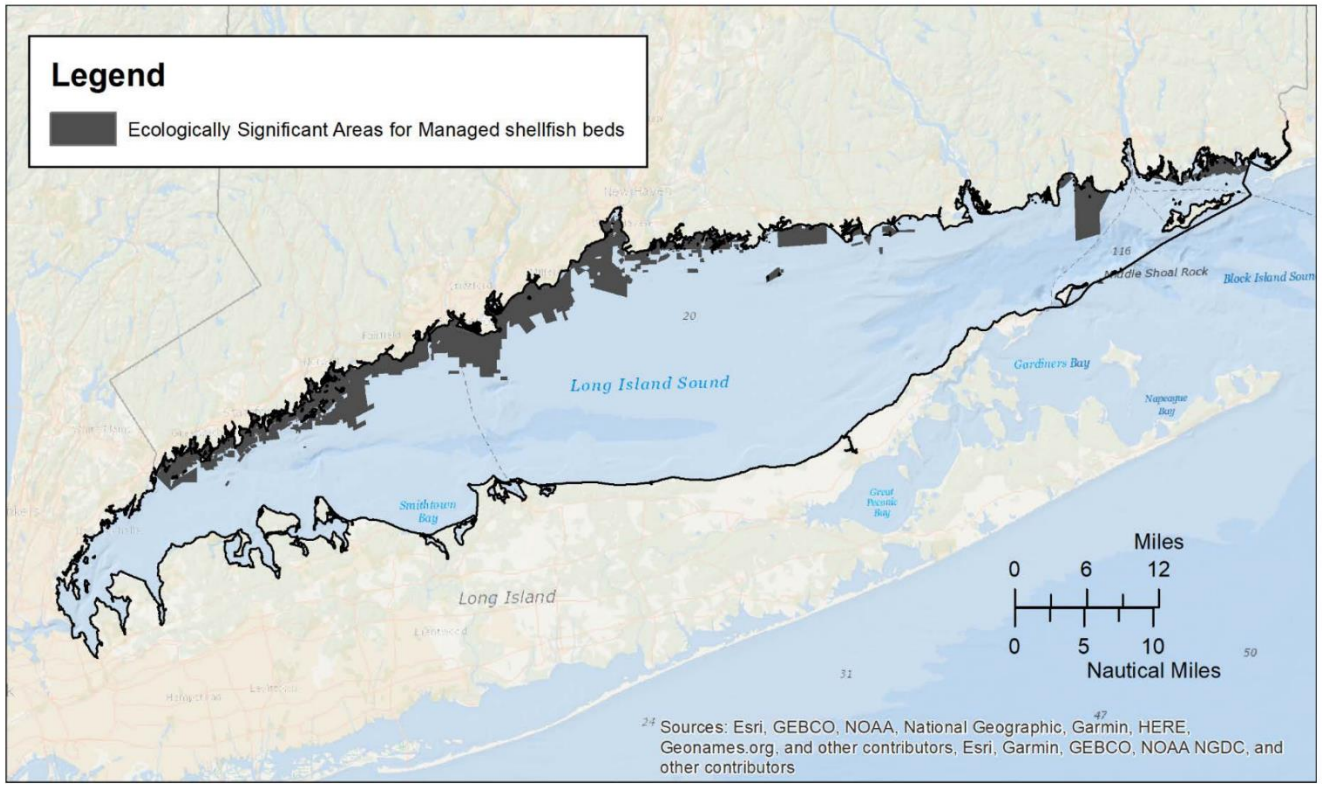


Figure 2a-54 Connecticut town-managed shellfish beds.

Integration of data sources

The datasets described above were mapped together to represent the extent of Ecologically Significant Areas for managed shellfish beds. Figure 2a-55 shows all datasets dissolved together to show a single presence/absence layer of ESA for managed shellfish beds.

DRAFT Ecologically Significant Area Map: Managed Shellfish Beds



1/14/2019: DRAFT

CT Dept. of Energy & Environmental Protection

Figure 2a-55 Final ESA map of Managed shellfish beds.

Updates and potential future work
This criterion should be updated when the Connecticut Bureau of Aquaculture publishes updated maps.

ix. **Criterion 14: Soft-bottom benthic communities**
Definition: Areas of soft-bottom seafloor communities where natural productivity, biological persistence, diversity, and/or abundance of marine flora and fauna are high, as well as areas of soft-bottom seafloor communities known to support important life history or important ecological functions of mobile species (e.g., migratory stopovers and corridors, feeding areas, and nursery grounds).

Significance of Soft-bottom benthic communities
Soft-bottom benthic communities are the biological assemblages that are associated with sandy and muddy seafloor types. Because soft-bottom habitats comprise so much (perhaps the majority) of the seafloor habitats of Long Island Sound, understanding the composition of the benthic communities and the types of ecosystem services they provide, is critical.

Data sources and conceptual challenges
Several data sources relevant to soft-bottom benthic communities were identified in the Blue Plan Inventory. However, none of them were comprehensive in their spatial coverage, nor were they compatible temporally or thematically such that a comprehensive map could be developed. Furthermore, the EEG discussed what would constitute an ecologically significant area for soft-bottom benthic communities, considering their ubiquity in the environment (e.g., are vulnerable soft-bottom benthic communities ecologically significant, and/or are resilient soft-bottom benthic communities ecologically significant?).

These data and conceptual limitations could not be resolved by the EEG in the time available for draft ESA maps to be completed. The EEG continues to explore ways to leverage the available data and represent ESA for soft-bottom benthic communities spatially.

6. Synthesis
The complete set of ESA results presented above describes 14 individual ESA criteria and corresponding ESA layers or maps (with the exception of criteria 14). While each individual layer is useful on its own, it can also be informative to visualize the multiple criteria together, to better understand the distribution of ESA and where they might overlap, if at all. Again, it is

important to remember that the current suite of maps represents the best available knowledge about the location of ESA, and just because a map doesn't show ESA for a particular criterion, it does not mean that ESA does not exist there. Therefore, composite maps for ESA should be viewed as "The minimum number of ESA".

The EEG did not apply a ranking or prioritization scheme to the individual layers. Therefore, the map legends are simple to interpret: a value of 5 corresponds to a minimum of 5 ESA present in a location and a minimum of 5 siting and performance standard to consider.

Three synthesis maps were developed: one for each Criteria Pillar and a third for all ESA criteria together (Figures 2a-56, 2a-57, 2a-58).

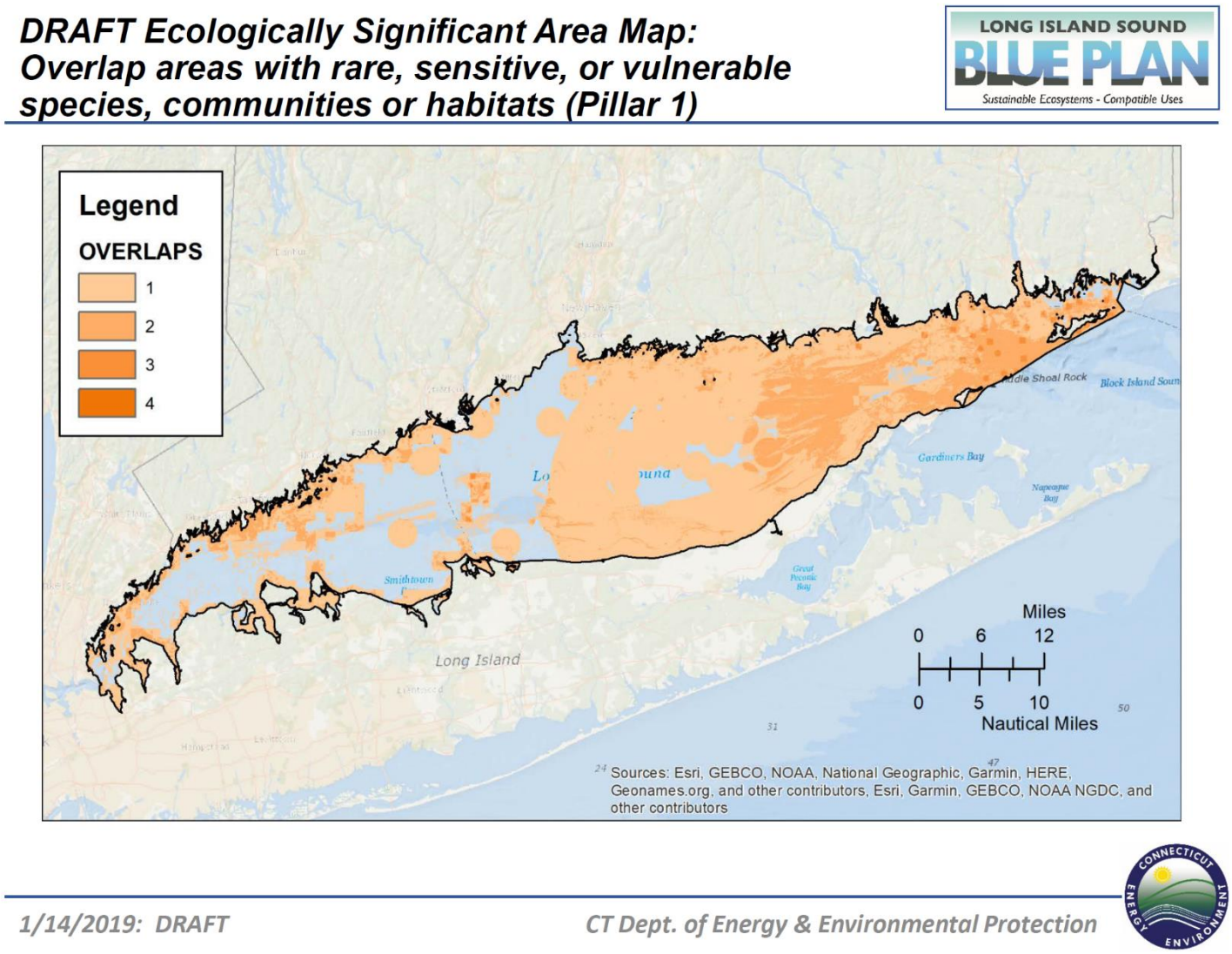


Figure 2a-56 Overlaps among the five criteria that contribute to ESAs with rare, sensitive, or vulnerable species, communities or habitats.

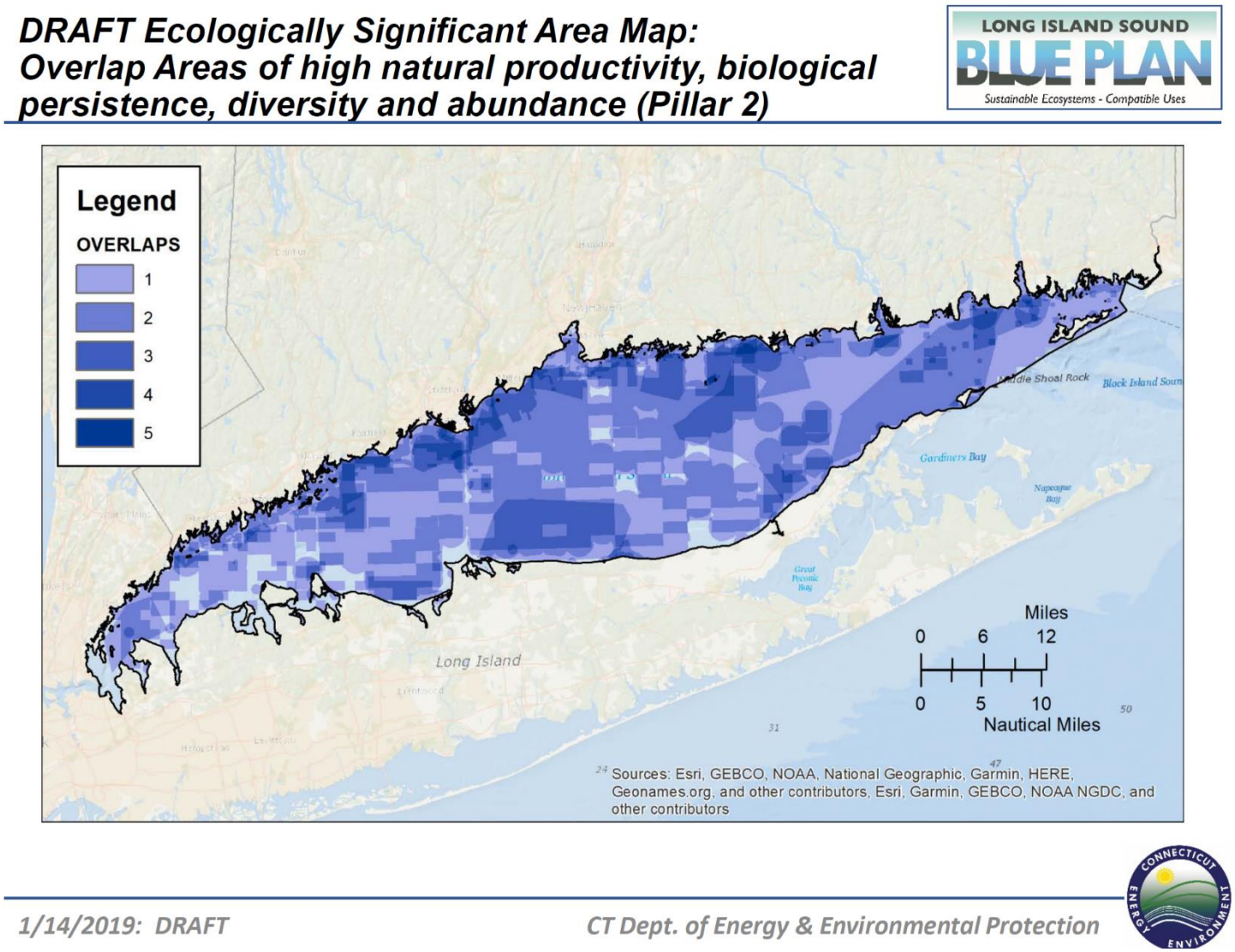


Figure 2a-57 Overlaps among the 9 criteria that contribute to the ESAs of high natural productivity, biological persistence, diversity, and abundance.

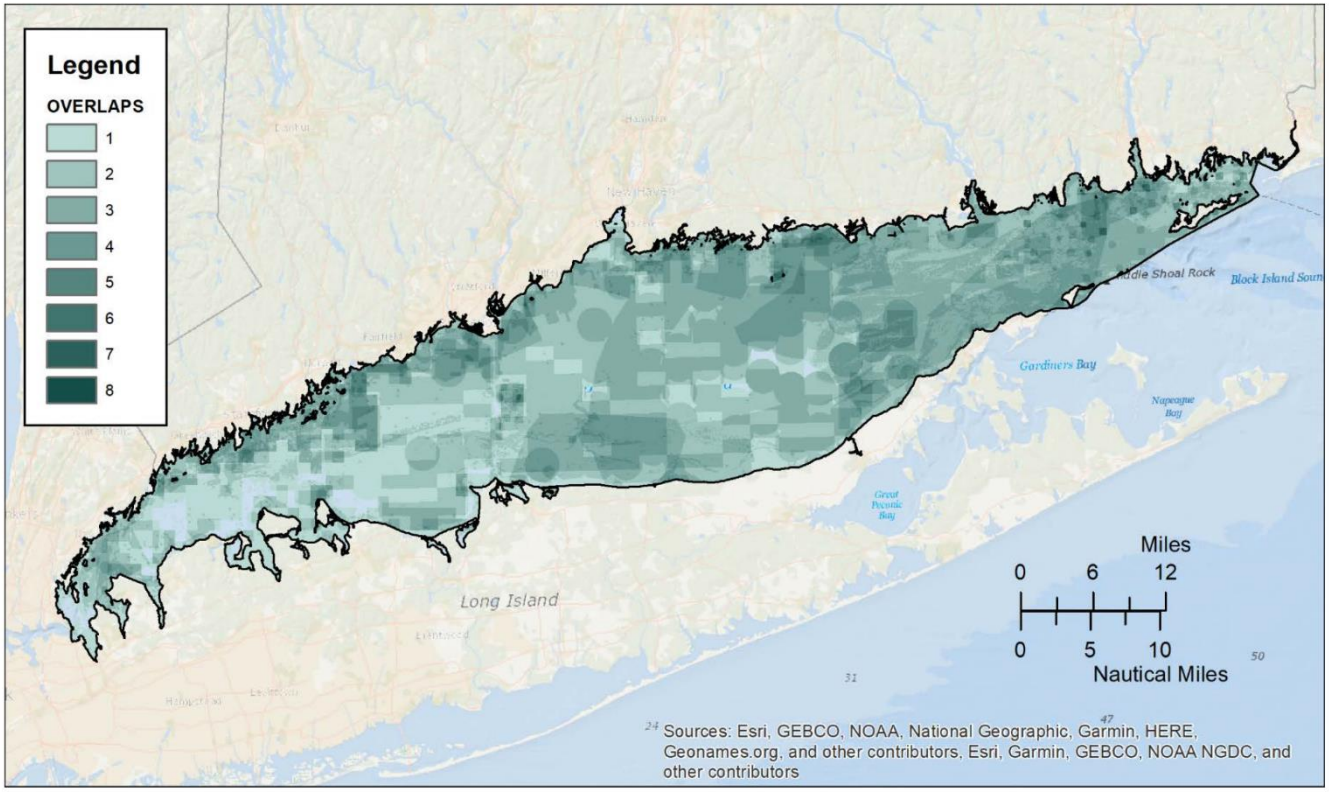


Figure 2a-58 Overlaps among all 14 criteria that represent the full set of ESAs in LIS

7. ESA Layer Construction Tables:

Criteria Pillar 1: Areas with Rare, Sensitive, or Vulnerable Species, Communities, or Habitats
Criterion 1: Hard bottom and complex seafloor

Table 2a-8 Data construction table for Hard Bottom and Complex Seafloor.

	Areas of Hard Bottom and Complex Seafloor
ESA Criterion Description	Areas of hard bottom are characterized by exposed bedrock or concentrations of boulder, cobble, pebble, gravel, or other similar hard substrate distinguished from surrounding sediments and provide a substrate for sensitive sessile suspension-feeding communities and associated biodiversity. Complex seafloor is a morphologically rugged seafloor characterized by high variability in neighboring bathymetry around a central point. Biogenic reefs and man-made structures, such as artificial reefs, wrecks, or other functionally equivalent structures, may provide additional suitable substrate for the development of hard bottom biological communities. Areas of hard bottom and complex seafloor are areas characterized singly or by any combination of hard seafloor, complex seafloor, artificial reefs, biogenic reefs, or wrecks and obstructions.
Data Source	Hard bottom: The Nature Conservancy's Long Island Sound Ecological Assessment (LISEA; 2015) known occurrences of hard bottom from usSEABED, USGS East Coast Sediment Texture Database, and NOAA Nautical Chart ENC data. Points are described as "bedrock", "boulders", "rock" or "rocky"; the USGS Long Island Sound Surficial Sediment map; Long Island Sound Mapping and Research Collaborative Phase II SEABOSS hard bottom observations described as gravel and coarser (unpublished data courtesy of C. Conroy christian.conroy@uconn.edu) Complex seafloor: TopoBathy – LIS 8m composite Terrain Ruggedness Index (TRI). Wrecks and obstructions: NOAA's Automated Wreck and Obstruction Information System (AWOIS). AWOIS is a catalog of reported wrecks and obstructions that are considered navigational hazards in coastal U.S. waters. These data are not a comprehensive inventory of wrecks. Data were downloaded from the Northeast Ocean Data Portal.
Data Extent	The Long Island Sound Blue Plan planning area.
Data Adjustment and Pre-processing	Hard bottom: Data were clipped to the Long Island Sound Blue Plan planning area. Complex seafloor: Data were clipped to the Long Island Sound Blue Plan planning area. Wrecks and obstructions: Data were clipped to the Long Island Sound Blue Plan planning area.

Data Analysis	Hard bottom: LISEA hard bottom points were buffered with a 160-meter radius. The buffer distance was chosen so that individuals points were visible at the ~1:800,000 scale. Areas classified as "gravel, bedrock" were extracted from the USGS sediment map. The gravel/bedrock zones and buffered hardbottom points were merged and gridded to an 8-meter grid (same resolution as the TRI dataset). Complex seafloor: Complex seafloor was calculated using bathymetry data by applying the TRI algorithm developed by Riley (1999) to measure the variability in seafloor relief. The resulting unitless output ranges from 0 to 100 and has a resolution of 8-meters. Wrecks and obstructions: Wrecks and obstructions points were buffered with a 160-meter radius. The buffer distance was chosen so that individuals points were visible at the ~1:800,000 scale. The buffered wrecks/obstructions points were then gridded to an 8-meter grid (same resolution as the TRI dataset).
Data Classification	Hard bottom: LISEA hard bottom data were classified using the Wentworth (1922) grain-size scale that defines hard bottom ("bedrock or concentrations of boulder, cobble, or other similar hard bottom") as sediment with a grain size of 64 mm or larger. LISMaRC hard bottom data included any points classified as "gravel", or "cobble", or "rock". Areas classified as "gravel, bedrock" were extracted from the USGS sediment map. Complex seafloor: Complex seafloor was classified from descriptive statistics calculated on the TRI dataset. Seafloor complexity values were divided into fifths (quintiles), and areas in the top quintile were classified as complex. This threshold was chosen based on a comparison between the USGS classification of gravel and bedrock areas and the complex dataset, and a comparison between the observed locations of cold water corals and the complex dataset. Complexity values in the top quintile were coincident with some gravel and bedrock areas (although much of the complex seafloor in LIS is not gravel and bedrock). In addition, every positive cold water coral observation overlapped with complexity values in the top quintile. Wrecks and obstructions: N/A
Selection of ESA	All 8x8-meter grid cells classified as 1) hard bottom, or 2) complex seafloor, or 3) wrecks and obstructions were selected for inclusion as Ecologically Significant Areas.

Criterion 2: Areas of submerged aquatic vegetation

Table 2a-9 Data construction table for areas of submerged aquatic vegetation.

	Areas of submerged aquatic vegetation
ESA Criterion Description	Areas where submerged aquatic vegetation, e.g., eelgrass (Zostera marina), etc., are present or have been found to be present.
Data Source	Tier 1 2017 mapping of *Zostera marina* in Long Island Sound and change analysis, Bradley and Paton 2018. http://longislandsoundstudy.net/wp-content/uploads/2018/08/LIS_2017_report2_wAppendix.pdf Tiner et al. 2013, 2012 Eelgrass Survey for Eastern Long Island Sound, Connecticut and New York. USFWS National Wetlands Inventory Program Tiner et al. 2010, 2009 Eelgrass Survey for Eastern Long Island Sound, Connecticut and New York. USFWS National Wetlands Inventory Program Tiner 2006, Delineations of 2006 eelgrass beds, eastern Connecticut to Rhode Island border, USFWS National Wetlands Inventory Program Tiner 2002, Interpretation and identification of Eelgrass beds located in the Long Island Sound Eastern Connecticut shoreline, Fishers Island NYS and the Northshore of Long Island NYS, USFWS National Wetlands Inventory Program
Data Extent	Coastal eastern Long Island Sound, approximately from Westerly RI to Guilford CT on the north shore of LIS to the North Fork of Long Island.
Data Adjustment and Pre-processing	None.
Data Analysis	Features from all 5 datasets containing eelgrass were converted to an 8-meter grid.
Data Classification	None.
Selection of ESA	All 8x8-meter grid cells containing eelgrass from any of the 5 surveys were selected as Ecologically Significant Areas.

Criterion 3: E, T, SC species

Table 2a-10 Data construction table for E, T, and SC species.

	Endangered, threatened, species of concern, and candidate species listed under state or federal Endangered Species Act, and their habitats
ESA Criterion Description	The species listed by federal or state statutes (e.g., the US Endangered Species Act, the CT Endangered Species Act, the NY Endangered Species Act) as endangered, threatened, species of concern, and candidates for listing, and their associated habitats, recognizing that detailed spatial data depicting the distribution and abundance for these marine species in Long Island Sound are potentially unavailable.
Data Source	Federal: Federal Endangered Species Act designated Critical Habitat (NOAA GARFO) Connecticut: Connecticut Natural Diversity Database (CT DEEP); Connecticut Estuarine Critical Habitats (CT DEEP); Roseate tern predicted occurrence (May – September), Steen and Elphick 2018; Atlantic Sturgeon high use areas, migratory corridors, gear restriction areas (CT DEEP) New York: New York Rare Animals and Rare Plants (NY DEC); New York Significant Natural Communities (NY DEC); New York Significant Coastal Fish and Wildlife Habitats (NY DEC/DOS)
Data Extent	● Critical Habitat for New York Bight Distinct Population Segment of Atlantic Sturgeon: Connecticut River, Housatonic River, Hudson River, and Delaware River ● Connecticut Natural Diversity Database (CT DEEP) – state of CT ● Connecticut Estuarine Critical Habitats (CT DEEP) – state of CT ● Roseate tern predicted occurrence (May – September), Steen and Elphick 2018 – Long Island Sound ● Atlantic sturgeon and shortnose sturgeon high and medium use areas, migratory corridors, gear restriction areas (CT DEEP) – Long Island Sound ● New York Rare Animals and Rare Plants (NY DEC) – state of NY ● New York Significant Natural Communities (NY DEC) – state of NY ● New York Significant Coastal Fish and Wildlife Habitats (NY DEC/DOS) – state of NY

Data Adjustment and Pre-processing	<u>Critical Habitat for New York Bight Distinct Population Segment of Atlantic Sturgeon</u> River lengths (polylines) were buffered with an 800 m buffer <u>All layers</u> All layers were clipped to the Long Island Sound Blue Plan planning area.
Data Analysis	All features were converted to an 8-meter grid.
Data Classification	None.
Selection of ESA	All 8x8-meter grid cells containing features were selected as Ecologically Significant Areas.

Criterion 4: Cold water corals

Table 2a-11 Data construction table for cold water corals.

	Areas of cold water corals
ESA Criterion Description	Areas where cold-water corals have been observed or where habitat suitability or other scientific models predict they occur.
Data Source	Long Island Sound Mapping and Research Collaborative Phase I and Phase II seafloor mapping; geospatial data provided by Conroy and Auster, University of Connecticut. Formal citation for Phase I data: Long Island Sound Cable Fund Steering Committee, eds. (2015). "Seafloor Mapping of Long Island Sound – Final Report: Phase 1 Pilot Project." (Unpublished project report). U. S. Environmental Protection Agency Long Island Sound Study, Stamford, CT
Data Extent	Multiple discrete sampling locations (polygons) near Stratford Shoal and eastern Long Island Sound
Data Adjustment and Pre-processing	Sampling locations (polygons) where *Astrangia poculata* (a species of cold water coral) was found to be present were extracted from the full dataset.
Data Analysis	All features were converted to an 8-meter grid.

Data Classification	None.
Selection of ESA	All 8x8-meter grid cells containing features where *Astrangia poculata* were found to be present were selected as Ecologically Significant Areas.

Criterion 5: Coastal wetlands

Table 2a-12 Data construction table for coastal wetlands.

	Coastal wetlands
ESA Criterion Description	According to Connecticut General Statute (CGS) 22a-29: "Those areas which border on or lie beneath tidal waters, such as, but not limited to banks, bogs, salt marshes, swamps, meadows, flats, or other low lands subject to tidal action, including those areas now or formerly connected to tidal waters, and whose surface is at or below an elevation of one foot above local extreme high water; and upon which may grow or be capable of growing some, but not necessarily all, of [a list of specific plant species found in CGS section 22a-29(2)].
Data Source	Tidal and nontidal wetlands of Connecticut and New York from the National Wetlands Inventory (NWI) 2010, provided by the Long Island Sound Study.
Data Extent	Coastal Connecticut and Long Island.
Data Adjustment and Pre-processing	None.
Data Analysis	All features were converted to an 8-meter grid.
Data Classification	None.
Selection of ESA	All 8x8-meter grid cells containing tidal and nontidal wetlands were selected as Ecologically Significant Areas.

Criteria Pillar 2: Areas of High Natural Productivity, etc.
Criterion 6: Cetaceans

Table 2a-13 Data construction table for cetaceans.

	Cetaceans
ESA Criterion Description	Areas where cetaceans occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support cetaceans (e.g. particular feeding areas, nursery grounds).
Data Source	Predicted cetacean density Modeled average density of cetacean species (predicted animals per 100 square kilometers) by the Duke University Marine Geospatial Ecology Lab and Marine-life Data and Analysis Team. Roberts J.J., B.D. Best, L. Mannocci, E. Fujioka, P.N. Halpin, D.L. Palka, L.P. Garrison, K.D. Mullin, T.V.N. Cole, C.B. Khan, W.M. McLellan, D.A. Pabst, and G.G. Lockhart. 2016. Habitat-based cetacean density models for the U.S. Atlantic and Gulf of Mexico. Scientific Reports 6: 22615. doi: 10.1038/srep22615. Roberts J.J., L. Mannocci, and P.N. Halpin. 2017. Final Project Report: Marine Species Density Data Gap Assessments and Update for the AFTT Study Area, 2016-2017 (Opt. Year 1). Document version 1.4. Report prepared for Naval Facilities Engineering Command, Atlantic by the Duke University Marine Geospatial Ecology Lab, Durham, NC. Curtice C., J. Cleary, E. Shumchenia, and P.N. Halpin. 2018. Marine-life Data and Analysis Team (MDAT) Technical Report on the Methods and Development of Marine-life Data to Support Regional Ocean Planning and Management. Prepared on behalf of the Marine-life Data and Analysis Team (MDAT). Accessed at: http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report.pdf. Marine-life Data Analysis Team (MDAT; Patrick Halpin, Earvin Balderama, Jesse Cleary, Corrie Curtice, Michael Fogarty, Brian Kinlan, Charles Perretti, Jason Roberts, Emily Shumchenia, Arliss Winship). Marine life summary data products for Northeast ocean planning. Version 2.0. Northeast Ocean Data. http://northeastoceandata.org. Accessed 09/04/2018. Expert participatory mapping January 3, 2019 - Patrick Comins, Executive Director, Connecticut Audubon Society.
Data Extent	US Atlantic Coast.

Data Adjustment and Pre-processing	Predicted cetacean density Data products for species or guilds with model results in Long Island Sound were extracted from the MDAT data download package. The following 11 models predicted cetacean abundance in Long Island Sound: Cuvier's beaked whale, Fin whale, Humpback whale, Harbor porpoise, Mesoplodont beaked whales, Minke whale, North Atlantic right whale, Pilot whale, Sei whale, and Sperm whale, Unidentified beaked whales. For the seven species with monthly predictions (Fin whale, Humpback whale, Harbor porpoise, Minke whale, North Atlantic right whale, Sei whale, Sperm whale) the 12 monthly layers were averaged to develop an annual mean predicted abundance layer. The remaining four species products already represented annual predictions. Each of the 11 annual layers were clipped to the Long Island Sound Blue Plan planning area. Expert participatory mapping None.
Data Analysis	Predicted cetacean density All 11 annual mean layers were summed to create a layer that represented the average annual total predicted abundance of 11 cetacean species in Long Island Sound, with 10km grid size. Contours for the 10km gridded total predicted abundance layer were generated using the contour tool in the Spatial Analyst toolbox in ArcGIS 10.5. Contours were generated at an abundance increment of 1.0. Expert participatory mapping None.
Data Classification	Predicted cetacean density The contours representing 5 or more predicted animals were merged and converted to a polygon feature. The polygon feature representing the average annual predicted abundance of 5 or more animals was converted to an 8-meter grid. Expert participatory mapping None.
Selection of ESA	Predicted cetacean density All 8x8-meter grid cells representing the average annual predicted abundance of 5 or more animals were selected as Ecologically Significant Areas. Expert participatory mapping All 8x8-meter grid cells representing an area off New Rochelle, NY where humpback whales have been recently observed, as identified by Patrick Comins, were selected as Ecologically Significant Areas.

Criterion 7: Pinnipeds

Table 2a-14 Data construction table for pinnipeds.

	Pinnipeds
ESA Criterion Description	Areas where pinnipeds occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support pinnipeds (e.g. particular haul-out locations, feeding areas).
Data Source	Seal concentration areas (Environmental Sensitivity Index data plus expert input) representing 2015-2017 conditions
Data Extent	Long Island Sound planning area
Data Adjustment and Pre-processing	None.
Data Analysis	Polygon features representing seal concentration areas were converted to an 8-meter grid.
Data Classification	None.
Selection of ESA	All 8x8-meter grid cells representing seal concentration areas were selected as Ecologically Significant Areas.

Criterion 8: Sea turtles and other reptiles

Table 2a-15 Data construction table for Sea turtles and other reptiles.

	Sea turtles and other reptiles
ESA Criterion Description	Areas where sea turtles and other reptiles occur in higher concentrations and/or particular significant areas as noted in the general description (above) that support sea turtles and other reptiles (e.g. particular feeding areas, nesting grounds, hibernation areas).

Data Source	Strandings and in-water observations of sea turtles, Riverhead Foundation Strandings and in-water observations of sea turtles, Mystic Aquarium Point locations of 2018 coastal Connecticut sea turtle mortality events at Silver Sands State Park, Long Beach, and Sheffield Island. Diamondback terrapin probability of occurrence, Conservation Wildlife Foundation of New Jersey (Egger, Davenport, Leu, Maslo).
Data Extent	Long Island Sound and NY bight
Data Adjustment and Pre-processing	Strandings data from both Riverhead Foundation and Mystic Aquarium were filtered to retain only live strandings or in-water observations of live animals. All point locations of live strandings, in-water observations, and 2018 coastal Connecticut mortality events were buffered with an 800-meter radius. The buffers were clipped to the Long Island Sound Blue Plan planning area. The diamondback terrapin probability of occurrence model outputs were clipped to the Long Island Sound Blue Plan planning area.
Data Analysis	800-meter buffers representing sea turtle live strandings, in-water observations, 2018 coastal Connecticut mortality events, and diamondback terrapin occurrence were converted to an 8-meter grid.
Data Classification	Sea turtle live strandings, in-water observations, and 2018 coastal Connecticut mortality events - none. Diamondback terrapin probability of occurrence - A threshold of 0.3188 was generated by the modeling program (Maxent) and is considered a relatively conservative threshold that has been used as an indicator for suitable habitat in other studies.
Selection of ESA	All 8x8-meter grid cells representing sea turtle live strandings, in-water observations, and 2018 coastal Connecticut mortality events were selected as Ecologically Significant Areas. All 8x8-meter grid cells representing diamondback terrapin probability of occurrence greater than 0.3188 were selected as Ecologically Significant Areas.

Criterion 9: Birds

Table 2a-16 Data construction table for birds.

	Birds
ESA Criterion Description	Areas where birds are abundant or diverse including feeding areas; areas of high bird productivity including nesting areas.
Data Source	eBird models in Long Island Sound (eBird data since 2010), Steen and Elphick 2018 Summer bird species: Common tern, Double-crested cormorant, Great black-backed gull, Herring gull, Laughing gull, Ring-billed gull, Roseate tern Winter bird species: American black duck, Black scoter, Bonaparte's gull, Brant, Bufflehead, Common eider, Common goldeneye, Common loon, Double-crested cormorant, Great black-backed gull, Great cormorant, Greater scaup, Herring gull, Horned grebe, Laughing gull, Lesser scaup, Long-tailed duck, Northern gannet, Red breasted merganser, Red throated loon, Ring-billed gull, Surf scoter, White-winged scoter <u>Expert participatory mapping</u> January 3, 2019 - Patrick Comins, Executive Director, Connecticut Audubon Society.
Data Extent	Long Island Sound
Data Adjustment and Pre-processing	None.
Data Analysis	Presence/absence layers for all 7 summer species were overlaid and summed to create a single summer species richness layer. Presence/absence layers for all 23 winter species were overlaid and summed to create a single winter species richness layer. Summer and winter richness layers were converted to an 8-meter grid. <u>Expert participatory mapping</u> Areas delineated were converted to an 8-meter grid.
Data Classification	The summer and winter richness layers were each classified by quintiles.
Selection of ESA	All 8x8-meter grid cells in the top quintiles of summer and winter richness were selected as Ecologically Significant Areas.

	The top quintiles of summer and winter richness were overlaid to create a single layer that represented Ecologically Significant Areas for birds. Expert participatory mapping All 8x8-meter grid cells that were delineated were selected as Ecologically Significant Areas.

Criterion 10: Fish

Table 2a-17 Data construction table for fish.

	Fish
ESA Criterion Description	Areas of high weighted fish persistence and high fish abundance and concentration.
Data Source	CT DEEP LISTS data: Mean spring and fall individual species abundance, 1995-2004 and 2005-2014, CT DEEP Long Island Sound Trawl Survey (LISTS), for species caught in more than 5 tows (full species list in this appendix). LISEA data: Demersal, diadromous, and pelagic weighted persistence layers from the Long Island Sound Ecological Assessment (LISEA) Demersal species (59 spp.) includes the following subgroups: Elasmobranchs (7 spp.), Gadids (7 spp.), Pleuronectids (7 spp.), Structure-oriented (6 spp.), Other (32 spp.) Diadromous species (13 spp.) Pelagic species (23 spp.) (see Anderson and Frohling 2005 for a full listing of species.)
Data Extent	Long Island Sound
Data Adjustment and Pre-processing	CT DEEP LISTS data: CT DEEP LISTS data were grouped by demersal or pelagic (or "water column") functional groups (full species list in this appendix). There were some species in LISEA that were not caught in >5 tows in the LISTS data. LISEA data: None.

Data Analysis	CT DEEP LISTS data: All CT DEEP LISTS individual species abundance layers were converted to an 8-meter grid. For each season (spring; fall) and time period (1995-2004; 2005-2014) demersal and water column species were overlaid and summed to create total mean abundance layers for each functional group. This resulted in 8 individual layers. LISEA data: All LISEA weighted persistence layers were converted to an 8-meter grid.
Data Classification	CT DEEP LISTS data: Each of the 8 individual layers (demersal and water column; spring and fall; 1995-2014 and 2005-2014) were each classified into quintiles. LISEA data: The LISEA weighted persistence layers were already classified so that "high" weighted persistence corresponded to species that had been detected at levels 1 or 2 standard deviations above the mean for the time series in all 3 of the examined time periods within a 26-year span (1984-2009).
Selection of ESA	The following layers were each selected to represent a component of Ecologically Significant Areas for fish. Layers representing #1-6 below were overlaid to create a single layer representing Ecologically Significant Areas for fish. CT DEEP LISTS data: 1. All 8x8-meter grid cells in the top quintile of fall demersal species abundance 1995-2004 were selected as Ecologically Significant Areas. 2. All 8x8-meter grid cells in the top quintile of spring demersal species abundance 1995-2004 were selected as Ecologically Significant Areas. 3. All 8x8-meter grid cells in the top quintile of fall demersal species abundance 2005-2014 were selected as Ecologically Significant Areas. 4. All 8x8-meter grid cells in the top quintile of spring demersal species abundance 2005-2014 were selected as Ecologically Significant Areas. 5. All 8x8-meter grid cells in the top quintile of fall water column species abundance 1995-2004 were selected as Ecologically Significant Areas. 6. All 8x8-meter grid cells in the top quintile of spring water column species abundance 1995-2004 were selected as Ecologically Significant Areas. 7. All 8x8-meter grid cells in the top quintile of fall water column species abundance 2005-2014 were selected as Ecologically Significant Areas. 8. All 8x8-meter grid cells in the top quintile of spring water column species abundance 2005-2014 were selected as Ecologically Significant Areas. LISEA data:

	9. All 8x8-meter grid cells in the highest LISEA weighted persistence category for each Pelagic and Diadromous species were selected as Ecologically Significant Areas. 10. All 8x8-meter grid cells where both Pelagic and Diadromous species in the second highest LISEA weighted persistence category overlap were selected as Ecologically Significant Areas. 11. All 8x8-meter grid cells in the highest LISEA weighted persistence category for each Demersal species functional group (Elasmobranchs, Gadids, Pleuronectids, Structure-oriented, Other) were selected as Ecologically Significant Areas. 12. All 8x8-meter grid cells where 3 or more of the 5 Demersal species functional groups in the second highest LISEA weighted persistence category overlap were selected as Ecologically Significant Areas.

Criterion 11: Mobile invertebrates

Table 2a-18 Data construction table for mobile invertebrates.

	Mobile invertebrates
ESA Criterion Description	Areas of high mobile invertebrate (e.g., lobster, other crustaceans, squid) abundance and concentration
Data Source	CT DEEP LISTS data: Mean spring and fall individual species biomass, 1995-2004 and 2005-2014, CT DEEP Long Island Sound Trawl Survey (LISTS), for the following species: blue crab, flat claw hermit crab, horseshoe crab, lady crab, American lobster, rock crab, spider crab, and longfin squid. CT DEEP Horseshoe crab data: Offshore hotspots Presence in open water CT spawning beaches American lobster thermal refuge: American lobster habitat based on IPCC intermediate projection of bottom water temperatures (12-20°C) under a doubling of CO_2 over 20 years by the Stevens Institute of Technology
Data Extent	Long Island Sound

Data Adjustment and Pre-processing	<u>CT DEEP LISTS data:</u> None. <u>CT DEEP Horseshoe crab data:</u> None. <u>American lobster thermal refuge:</u> Data from the Stevens Institute were presented as the predicted number of days per month (2002-2012, and future) at various water temperature thresholds. The predicted number of future days with bottom temperatures between 12-20°C during July and September for the period representing conditions under a doubling of CO_2 with respect to 2012 levels was extracted for further analysis. Bottom water temperatures between 12-20°C are considered optimal for American lobster reproduction and survival.
Data Analysis	<u>CT DEEP LISTS data:</u> The CT DEEP LISTS individual species biomass layers were converted to an 8-meter grid. Individual species biomass layers were overlaid and summed to create total mean biomass layers for mobile invertebrates in each season (spring and fall) and time period (1995-2004 and 2005-2014), resulting in 4 total layers. <u>CT DEEP Horseshoe crab data:</u> The CT DEEP Horseshoe crab data layers were each converted to an 8-meter grid. <u>American lobster thermal refuge:</u> The average proportion of days with bottom temperatures between 12-20°C from July to September from 2002-2012 for all Long Island Sound Trawl Survey grid cells was calculated to be 31%. The predicted proportion (%) of future days with bottom temperatures between 12-20°C from July-September was calculated for each Long Island Sound Trawl Survey grid cell. This layer was converted to an 8-meter grid.
Data Classification	<u>CT DEEP LISTS data:</u> Each total mean invertebrate biomass layer was classified into quintiles. <u>CT DEEP Horseshoe crab data:</u> Offshore hotspots – no classification Presence in open water – already classified into “High” (above median) and “Medium” (below median) CT spawning beaches – already classified into “High use” and “Medium use” <u>American lobster thermal refuge:</u> None.

Selection of ESA	The following layers were each selected to represent a component of Ecologically Significant Areas for mobile invertebrates. Layers representing # below were overlaid to create a single layer representing Ecologically Significant Areas for mobile invertebrates. <u>CT DEEP LISTS data:</u> 1. All 8x8-meter grid cells representing the top quintile of invertebrate abundance in spring 1995-2004 were selected as Ecologically Significant Areas. 2. All 8x8-meter grid cells representing the top quintile of invertebrate abundance in fall 1995-2004 were selected as Ecologically Significant Areas. 3. All 8x8-meter grid cells representing the top quintile of invertebrate abundance in spring 2005-2014 were selected as Ecologically Significant Areas. 4. All 8x8-meter grid cells representing the top quintile of invertebrate abundance in fall 2005-2014 were selected as Ecologically Significant Areas. <u>CT DEEP Horseshoe crab data:</u> 5. All 8x8-meter grid cells representing horseshoe crab offshore hotspots were selected as Ecologically Significant Areas. 6. All 8x8-meter grid cells representing High and Medium horseshoe crab presence in open water were selected as Ecologically Significant Areas. 7. All 8x8-meter grid cells representing horseshoe crab "High use" and "Medium use" CT spawning beaches were selected as Ecologically Significant Areas. <u>American lobster thermal refuge:</u> 8. All 8x8-meter grid cells higher than the 2002-2012 average proportion (i.e., > 31%) of days with bottom temperatures between 12-20°C during July-September were selected as Ecologically Significant Areas.

Criterion 12: Sessile-mollusk-dominated communities

Table 2a-19 Data construction table for sessile-mollusk-dominated communities.

	Sessile-mollusk-dominated communities
ESA Criterion Description	Areas where wild, natural sessile-mollusk-dominated communities occur.
Data Source	2012 and 2013 sessile mollusk percent cover from: Long Island Sound Mapping and Research Collaborative Phase I seafloor mapping; geospatial data provided by Conroy and Auster, University of Connecticut. Formal citation for Phase I data: Long Island Sound Cable Fund Steering

	Committee, eds. (2015). "Seafloor Mapping of Long Island Sound – Final Report: Phase 1 Pilot Project." (Unpublished project report). U. S. Environmental Protection Agency Long Island Sound Study, Stamford, CT 2017 sessile mollusk presence, from: Long Island Sound Mapping and Research Collaborative Phase II seafloor mapping; unpublished geospatial data provided by Conroy and Auster, University of Connecticut.
Data Extent	Multiple discrete sampling locations (points) near Stratford Shoals (Phase I sampling) and multiple discrete sampling locations (polygons) in eastern LIS (Phase II sampling)
Data Adjustment and Pre-processing	2012 and 2013 sessile mollusk percent cover near Stratford Shoals Sampling locations (points) where *Crepidula fornicata* (a species of gastropod mollusk) or Mytilus edulis (a species of bivalve mollusk) were found to have >= 50% cover in 2012 or 2013 were extracted from the full dataset. The extracted points were buffered with a 375-meter radius to match the footprint and scale of the Phase II sampling data. 2017 sessile mollusk presence in eastern LIS Sampling locations (polygons) where *Crepidula* or *Mytilus* were found to be present.
Data Analysis	2012 and 2013 sessile mollusk percent cover near Stratford Shoals 375-meter buffers were converted to an 8-meter grid. 2017 sessile mollusk presence in eastern LIS Polygons were converted to an 8-meter grid.
Data Classification	2012 and 2013 sessile mollusk percent cover near Stratford Shoals The grid cells were classified by whether values were less than, equal to, or greater than 50 (percent cover). 2017 sessile mollusk presence in eastern LIS All grid cells where *Crepidula* or *Mytilus* were found to be present were retained.
Selection of ESA	2012 and 2013 sessile mollusk percent cover near Stratford Shoals All 8x8-meter grid cells representing values >= 50% cover of *Crepidula fornicata* or *Mytilus edulis* were selected as Ecologically Significant Areas. 2017 sessile mollusk presence in eastern LIS All 8x8-meter grid cells where *Crepidula fornicata* or *Mytilus edulis* were found to be present were selected as Ecologically Significant Areas.

Criterion 13: Managed shellfish beds

Table 2a-20 Data construction table for managed shellfish beds.

	Managed shellfish beds
ESA Sub-criterion Description	Locations of commercial and recreational shellfishing harvest areas, including shellfish restoration activities and areas closed to shellfishing.
Data Source	Oyster seed beds (Connecticut Natural Shellfish Beds Dataset), Connecticut Recreational Shellfish Beds Dataset, Connecticut State-managed Shellfish Beds Dataset, Connecticut Town-managed Shellfish Beds Dataset, from the Connecticut Department of Agriculture Bureau of Aquaculture and Connecticut Department of Energy and Environmental Protection
Data Extent	Connecticut state waters of Long Island Sound
Data Adjustment and Pre-processing	None.
Data Analysis	All features were converted to an 8-meter grid.
Data Classification	None.
Selection of ESA	All 8x8-meter grid cells characterized as natural shellfish beds, recreational shellfish beds, state-managed shellfish beds, and town-managed shellfish beds were selected as Ecologically Significant Areas. All layers were overlaid to develop a single layer that represents commercial and recreational shellfish harvest Ecologically Significant Areas.

Criterion 14: Soft-bottom benthic communities

Table 2a-21 Data construction for soft-bottom benthic communities.

	Soft-bottom benthic communities
ESA Criterion Description	Areas of soft-bottom seafloor communities where natural productivity, biological persistence, diversity, and/or abundance of marine flora and fauna are high, as well as areas of soft-bottom seafloor communities known to support important life history or important ecological functions of mobile species (e.g., migratory stopovers and corridors, feeding areas, and nursery grounds).
Data Source	
Data Extent	
Data Adjustment and Pre-processing	
Data Analysis	
Data Classification	
Selection of ESA	

Appendix 3. Significant Human Use Areas: Supplemental Information and Maps

Appendix Figures

Appendix Tables

1. Introduction

As described in the Blue Plan text, the development of the SHUA areas followed as a corollary to the statutorily mandated Ecologically Significant Areas due to the nature of Long Island Sound itself – the richness in ecological resources and services is matched by the importance and relevance of a variety of ways the sound is used to benefit the economy, support recreation, and foster culture and knowledge.

The SHUA effort was coordinated by the Blue Plan Development Team (PDT), made up of staff representation from:

- CT Dept. of Energy & Environmental Protection (DEEP)
- The Nature Conservancy (TNC)
- CT Sea Grant (SG)

During the development the PDT sought and received a variety of input from the Blue Plan Advisory Committee and various stakeholder groups who provided feedback on the map products as well as additional sources of data to include.

The PDT set the following primary goals for the SHUA effort:

- Goal 1: To include a mix of data that accurately depicts significant human uses in Long Island Sound;
- Goal 2: To render it in formats easy to understand and interpret;

2. Goal 1: To include a mix of data that accurately depicts significant human uses in Long Island Sound

Using the previously completed Resource and Use Inventory and the concurrent efforts of the Policy Development Team as initial sources of data and a framework to work within, the PDT began by identifying potential sources of human-use data and generally aggregating these into thematic bins. These included both in-water activities that directly related to the Blue Plan policy and planning areas (e.g., boating densities, fishing areas, and large Sound-wide infrastructure such as cables and

pipelines) as well as shore-based activities and resources (e.g., public open space, archaeological sites, or locations of water-dependent working waterfronts.) The inclusion of upland areas may at first seem counter-intuitive to an effort designed to address marine spatial planning; however, the implications of activities in the water-based policy area may have significant effect on shore-centric areas, such as the potential to land a cable on/or near a cultural resource.

During the spring and summer of 2018, the PDT developed a suite of nearly 80 different potential data layers that could reasonably be used to describe various aspects of human uses for four criteria groups developed by the Policy Team. The table below identifies the criteria and sub-criteria the Policy team used (Table 3a-1).

Table 3a-1 SHUA Criteria and descriptions.

Criteria	Description
Areas with features of historical, cultural, educational, or research significance	
Areas associated with lighthouses and other historic areas	Lighthouses, waterfront historic districts, or in-water structures of historical significance, excluding wrecks, and areas of Long Island Sound immediately adjacent to such resources.
Shipwrecks	Wrecks of historical or cultural significance.
Visual and Scenic Resources	Views of Long Island Sound's scenic resources from publicly accessible coastal land.
Submerged and Coastal Archaeological Areas	Submerged or coastal locations of archaeological sensitivity and/or significance.
Areas of Tribal Significance	Submerged or coastal locations recognized by Tribes as having historical or cultural significance.

Discrete Areas for Research, Education, and Monitoring	Areas actively and consistently used for research activities, including but not limited to long term monitoring sites, and Sound-dependent experiential educational programming.
Criteria	Description
Areas of substantial recreational and/or "quality of life" value	
Sailing or Rowing Races	Areas consistently used by organized clubs and associations. Including but not limited to racing and training areas, and long-distance sailing race routes.
Marine Events	Recurring marine events including those described in 33 CFR 100.100 Table.
High Activity Recreational Boating Areas	Approximate areas where the density of recreational boating is substantially higher than the overall mean for LIS.
Mooring Fields and Anchorage Areas	Formally designated or traditional mooring fields and anchorages, as designated or managed by NOAA, municipal Harbor Management, or other organizations.
Marinas, Yacht Clubs, and Boat Launches	Locations of marinas, yacht clubs, and boat launches that are within the Blue Plan planning area.
Waterfowl Hunting	Areas in Long Island Sound important for waterfowl hunting, including sea duck habitat.
Dive Sites	Locations in Long Island Sound important for SCUBA activities.
Coastal Public Use Areas	Areas important for public access and use of Long Island Sound for recreational activities including but not limited to swimming, paddling, and wildlife watching.

Criteria	Description
Areas important for navigation, transportation, infrastructure, and economic activity	
Working Waterfronts, Ports, and Marine Commercial Areas	Commercial facilities that are water dependent, or service water dependent uses on Long Island Sound, including but not limited to onshore and offshore terminals and port facilities.
Designated Navigational Channels, Fairways, and Basins	Designated and maintained navigational channels as they appear on the NOAA-published charts and USACE management plans. Also includes authorized privately maintained navigational channels, fairways, and basins, excluding facilities for individual residential use.
Designated Anchorage Areas	Anchorage areas as they appear on the NOAA charts, and are generally used by commercial vessels.
Security Zones and other Designated Areas	Security zones and other operational zones, as designated by the Coast Guard or other appropriate authority.
Areas of Lightering Activity	Areas designated by the Coast Guard for ship-to-ship transfer (lightering), and other areas regularly used for such transfers.
Vessel Traffic Areas	Areas of high traffic use by vessels with AIS transponders including but not limited to ferries and commercial ships. High traffic use is defined by areas that exceed the mean value of transit counts.
Dredged Material Disposal Areas (Active and Historic)	Material disposal sites as they appear on the NOAA charts, in the LIS DMMP, or designated by EPA. Includes areas currently and historically used. Also includes confined aquatic disposal (CAD) cells.

Cables, Pipelines, and Cable/Pipeline Areas	Submerged cable and pipeline infrastructure areas, including but not limited to those indicated on NOAA navigational charts.
Coastal Energy Generating and Transmission Facilities	Coastal energy generating and transmission facilities and associated infrastructure, including areas of Long Island Sound adjacent thereto.
Criteria	Description
Areas important to Fishing and Aquaculture	
Recreational Fishing	Areas significant for recreational fishing, as identified by DEEP Fisheries and the recreational fishing community of Long Island Sound.
Commercial Fishing	Areas of substantial value to the commercial fishing community in Long Island Sound.
Charter and Party Boat Fishing	Areas of substantial value to the charter and party boat industry in Long Island Sound.
Recreational Shellfish Areas	Town and/or state managed recreational shellfishing areas.
Commercial Aquaculture Locations	Shellfish leases, seaweed leases, gear areas, designated natural beds, and any other type of authorized aquaculture venture in CT and NY as applicable.

Below is generalized list of the initial set of map products that were assigned to each major criteria category (Table 3a-2 to Table 3a-5)

Table 3a-2 Initial data layers under consideration for areas of Historical, Cultural, and Archaeological significance.

Name	Source
Christmas Bird Count Circles	Audubon
Research, Monitoring, Educational Institutions	various
Shellfish Sampling Stations	CT Dept Of Agriculture/Bureau of Aquaculture
LIS Trawl Survey Towpaths	CT Dept of Energy & Environmental Protection
LIS WQ Cruise Sampling Stations	CT Dept of Energy & Environmental Protection
Potential Holocene shoreline - 11000BP	CT Office of State Archaeology
Potential Holocene shoreline - 8000BP	CT Office of State Archaeology
Potential Holocene underwater sites	CT Office of State Archaeology
CT Local Historic Districts - LIS	CT State Historic Preservation Office
CT Local Historic Districts - Upland	CT State Historic Preservation Office
CT National Register Historic Districts - LIS	CT State Historic Preservation Office
CT National Register Historic Districts - Upland	CT State Historic Preservation Office
CT State Register Historic Districts - Upland	CT State Historic Preservation Office
CT Historic Feature Points - LIS	CT State Historic Preservation Office
CT Historic Feature Points - Upland	CT State Historic Preservation Office
CT Non-AWOIS Wrecks	CT Office of State Archaeology
CT Archaeological sites - LIS	CT Office of State Archaeology
CT Archaeological sites - Upland	CT Office of State Archaeology
CT Underwater Archaeological Survey Areas	CT Office of State Archaeology

Name	Source
CT State Property	CT Dept of Energy & Environmental Protection
LIS Cable Fund Mapping Priority Areas	CT Dept of Energy & Environmental Protection
AWOIS Obstructions	National Oceanic and Atmospheric Administration - Automated Wreck Info
AWOIS Wrecks	National Oceanic and Atmospheric Administration - Automated Wreck Info
ENC Obstructions (Harbor scale)	National Oceanic and Atmospheric Administration - Elec. Nautical Charts
ENC Wrecks (Harbor scale)	National Oceanic and Atmospheric Administration - Elec. Nautical Charts
Artificial Reefs	Northeast Ocean Data Portal
NY State Parks	NY Dept of Environmental Conservation
NY Shellfish Sampling Stations	NY Dept of Environmental Conservation
NY National Register District - upland	NY State Historic Preservation Office
LIS Coastal Observation sites	University of Connecticut
NUWC Test Range	Northeast Ocean Data Portal

Table 3a-3 Initial data layers under consideration for areas of Recreational and Quality of Life significance.

Name	Source
Christmas Bird Count Circles	Audubon
Areas Open for Hunting	CT Dept of Energy & Environmental Protection
Coastal Access Sites	CT Dept of Energy & Environmental Protection
Migratory Waterfowl Concentration Areas	CT Dept of Energy & Environmental Protection
Dive Locations	Northeast Ocean Data Portal

Name	Source
Marinas, Yacht Clubs, etc.	CT Dept of Energy & Environmental Protection / LIS Cruising Guide
Marine Events	digitized by Blue Plan staff/volunteers
Mooring Fields	digitized by Blue Plan staff/volunteers
Sailing Areas	digitized by Blue Plan staff/volunteers
Sailing Routes	digitized by Blue Plan staff/volunteers
Transient Anchorages	digitized by Blue Plan staff/volunteers
Yacht Clubs	CT Dept of Energy & Environmental Protection / LIS Cruising Guide
Underwater Recreation Sites	Mid-Atlantic Regional Coastal Association Portal
Boat Launches	Northeast Ocean Data Portal
Distance Sailing Races	Northeast Ocean Data Portal
Shore based Ocean Uses	Northeast Ocean Data Portal
Wildlife/Sightseeing Ocean Uses	Northeast Ocean Data Portal
Kayaking Ocean Uses	Northeast Ocean Data Portal
SCUBA Areas	Northeast Ocean Data Portal
Recreational Boating Activities	Northeast Ocean Data Portal
Recreational Boating Routes	Northeast Ocean Data Portal
Recreational Boating Densities	Northeast Ocean Data Portal
Water Trails	Northeast Ocean Data Portal
AWOIS Wrecks	National Oceanic and Atmospheric Administration - Elec. Nautical Charts
ENC Anchorages	National Oceanic and Atmospheric Administration - Elec. Nautical Charts
ENC Wrecks (Harbor scale)	National Oceanic and Atmospheric Administration - Elec. Nautical Charts
Vessel Density - Pleasure Craft/Sailing	Northeast Ocean Data Portal

Table 3a-4 Initial data layers under consideration for areas of Navigational, Transportation, and Commerce significance.

Name	Source
Working Waterfronts	digitized by Blue Plan staff/volunteers
2013 AIS Cargo vessel density	Northeast Ocean Data Portal
2013 AIS Tanker vessel density	Northeast Ocean Data Portal
Cable And Pipeline Areas	Northeast Ocean Data Portal
Ocean Disposal Sites	Northeast Ocean Data Portal
Submarine Cables	Northeast Ocean Data Portal
ENC Anchorages	National Oceanic and Atmospheric Administration - Elec. Nautical Charts
ENC Fairways and Navigation Channels	National Oceanic and Atmospheric Administration - Elec. Nautical Charts
ENC Lightering Zones	National Oceanic and Atmospheric Administration - Elec. Nautical Charts
ENC Restricted Areas	National Oceanic and Atmospheric Administration - Elec. Nautical Charts
Coastal Energy Facilities	National Oceanic and Atmospheric Administration - Marine Cadastre
Danger Zones & Restricted Areas	National Oceanic and Atmospheric Administration - Marine Cadastre
NUWC Test Range	Northeast Ocean Data Portal

Table 3a-5 Initial data layers under consideration for areas of fishing and aquaculture significance.

Name	Source
CT Aquaculture Gear Area	CT Dept Of Agriculture/Bureau of Aquaculture
CT Aquaculture Operations	CT Dept Of Agriculture/Bureau of Aquaculture

Name	Source
CT Recreational Shellfish Beds	CT Dept Of Agriculture/Bureau of Aquaculture
CT Seaweed Licenses	CT Dept Of Agriculture/Bureau of Aquaculture
CT Shellfish Beds-State	CT Dept Of Agriculture/Bureau of Aquaculture
CT Shellfish Beds-Town	CT Dept Of Agriculture/Bureau of Aquaculture
CT Shellfish Bed Classification	CT Dept Of Agriculture/Bureau of Aquaculture
CT Shellfish Sampling Stations	CT Dept Of Agriculture/Bureau of Aquaculture
CT Recreational Fishing Areas	CT Dept of Energy & Environmental Protection
AWOIS Obstructions	National Oceanic and Atmospheric Administration - Automated Wreck Info
AWOIS Wrecks	National Oceanic and Atmospheric Administration - Automated Wreck Info
ENC Obstructions (Harbor)	National Oceanic and Atmospheric Administration - Elec. Nautical Charts
ENC Wrecks (Harbor)	National Oceanic and Atmospheric Administration - Elec. Nautical Charts
VTR Commercial Fishing Landings - Gillnet	NY Geographic Information Gateway
VTR Commercial Fishing Landings - Otter Trawl	NY Geographic Information Gateway
VTR Commercial Fishing Landings - Pots	NY Geographic Information Gateway
VTR Commercial Fishing Landings - Seine	NY Geographic Information Gateway
NY Aquaculture Sites (TMAU)	NY Dept of Environmental Conservation
NY Shellfish Sampling Stations	NY Dept of Environmental Conservation

Once the initial identification and organization of human use map products was complete, the PDT, relying on both the Resource and Use Inventory and professional experience, performed a series of basic processing steps and checks on the data for accuracy and completeness.

Data were generally clipped to or selected to intersect either the LIS Blue Plan Planning Area (for in water data) or the extent of the boundaries for coastal towns in Connecticut and New York that were immediately adjacent to the Planning Area (for upland data.)

Data that spanned both upland and in-water areas (e.g., several historic register and Archeological site layers contained locations that were both on land and in the Sound.) were separated into "upland" and "LIS" versions.

The PDT identified several gaps that required the investment of time and effort to address. Areas of notable gaps were:

- Activities in New York waters within the sector of aquaculture, where there was significant corresponding data for Connecticut;
- Activities in New York waters within the sector of recreational fishing, where there was significant corresponding data for Connecticut;
- Sound-wide areas dedicated to sailing races;
- Sound-wide Dive areas/locations;
- Sound-wide areas important to commercial fishing interests;
- Connecticut and New York upland areas of public open space beyond examples of state parks and other state-owned property;
- Connecticut and New York working waterfronts.

To fill these gaps the PDT:

- Reached out to colleagues in New York to seek out additional data on shellfishing and aquaculture. In this case, information did not readily exist, as New York does not manage the shellfish industry in the same way as Connecticut. While the New York Department of Environmental Conservation (DEC) was able to provide information on the dollar value of shellfish harvest, spatial information for where effort is concentrated was not available. As a result, it appears that Connecticut waters are dominated by aquaculture, while New York waters see only a few tiny operations: in reality, shellfish harvest is a prominent business in both states. Addressing this discrepancy is a key point to note and should be a key area of emphasis in the ongoing Plan update process.
- Developed a series of participatory mapping exercises with stakeholders from the recreational fishing, diving, and sailing sectors to help augment voids in their respective mapping data. Through a series of outreach meetings and webinars, the existing data layers were displayed in web-enabled online maps. Users could then add or edit areas based

on their expertise and knowledge. The edits occurred both communally (e.g., at meetings or other events) or by individual access to the online maps. The results provided by the members of their respective user communities were integrated into or included with the existing data to more completely represent these uses.

- Contacted the commercial fishing sector. Although they were generally unwilling to provide detailed information on areas or locations significant for their interests in LIS due the proprietary nature of the industry, they did however provide comments and suggestions concerning how best to present the limited data available for the industry. By their recommendations, data from the four types of fishing gear categories (otter trawls, pots, seine, and gillnet) were combined and their landing totals (in pounds) summed to create a singular layer that reflects commercial fishing landings in general rather than by gear type.
- Sought out additional sources of Open Space property data available from DEEP but not included in the Resource and Use Inventory to provide a more complete picture of public open space. These included the CT Protected Open Space Mapping (POSM) data, and a set of CT Municipal Open Space properties that pre-dated POSM. From the POSM inventory, locations flagged as Federal property and Municipal properties whose names contained keywords such as "park", "town green", "field" or similar were extracted and added. From the Municipal Open Space inventory, properties flagged as "municipal – open to the public without fee" were extracted and added.
- Worked with volunteers and other DEEP staff to use digital aerial photography, planning reports, and professional experience and knowledge to digitize the locations of working waterfronts.

After the initial compilation of data, QA/QC, and gap filling where possible/practical, the PDT reviewed and analyzed the resulting list of initial layers to assess the overall levels of completeness and representativeness.

Due to the intervening time between when the Resource and Inventory was completed and the SHUA development process was fully underway, several datasets provided by source organizations were updated. As a result, the initial versions for commercial boating densities were replaced with more currently available versions.

Some datasets that were part of the initial collections were eliminated; for example, a historic buildings dataset provided by the CT State Historic Preservation Office (CTSHPO) was excluded in favor of a historic district dataset (also provided by CTSHPO) that included over 90% of the buildings. Conversations from CTSHPO confirmed that using both was redundant and the districts data provided a sufficient level of representation.

In other cases, data representing similar topical areas from different sources were modified. Some were combined, as in the case of shipwrecks. The location of shipwrecks originally spanned three sets of national and state-based information; these were refined and combined into one singular shipwreck map product. Others had records removed where they were better reflected by other sources. For example, certain Coastal Access Sites were removed from that layer as they were already captured in other layers such as Boat Launches or Public Open Space. And many data layers contained records that extended beyond the Blue Plan Planning area and were removed.

The final list (Table 3a-6) of human use map products used in the SHUA process includes:

Table 3a-6 Final list of human use data layers to be used in the SHUA process.

Historic, Cultural, & Educational Interests:	**Recreational / Quality of Life Interests:**	**Navigation, Transportation, Military, Infrastructure, & Commerce Interests:**	**Fishing/Shellfishing Interests:**
LIS Lighthouses	LIS Sailing Routes	CT & NY Coastal Energy Facilities	CT Recreational Shellfish Beds
CT and NY Historic Districts	LIS Sailing Areas	CT & NY Working Waterfronts	LIS Recreational Fishing Areas
LIS Wrecks	LIS Mooring Fields	LIS Anchorages	LIS Commercial Fishing
CT & NY Open Space & Public Lands	LIS Anchorages	LIS Fairways & Navigation Channels	CT Aquaculture Operations
CT Archaeological Sites - upland	LIS Recreational Boating Density	CT & NY Commercial Dredging Areas	CT Seaweed Licenses
CT Archaeological Sites - LIS	CT & NY Marinas, Yacht Clubs	LIS Restricted Areas	NY Aquaculture Sites
LIS Coastal Observing System sites	CT & NY Boat Launches	LIS Lightering Zones	CT Aquaculture Gear Areas
LIS Water Quality Sampling	Waterfowl Concentration Areas	LIS Vessel Transit Count Density	CT Natural Shellfish Beds
LIS Potential Holocene underwater sites	Waterfowl Hunting Areas	LIS Ocean Disposal Sites	CT Shellfish Beds-Towns
		LIS Underwater Cables	CT Shellfish Beds-State
		LIS Cable & Pipeline Areas	

Several datasets (such as those representing boating densities and commercial fishing landings) provided coverage of all or nearly all of LIS and also provided data that could support parsing it into areas where the focus or intensity of use could be further explored. The PDT felt that these layers could be analyzed to glean where more substantial areas may occur and thus better reflect "significant" use areas as opposed to all of LIS being tabbed significant. After experimentation and informed by similar efforts of the Ecologically Significant Areas approach, the PDT applied the following thresholds (Table 3a-7):

Table 3a-7 Thresholds applied to various SHUA criteria.

LIS Recreational Boating Density	Retain only areas defined by the top 2 out of 5 equal quantity classes.
LIS Vessel Transit Count Density	Retain only areas where the AIS count values were above mean value of 85.
LIS Restricted Areas	Retain only areas flagged as safety / security zones in Code of Federal Regulations, plus Plum Island.
LIS Commercial Fishing	Retain only areas defined by the top 2 out of 5 equal quantity classes.

Caveats:

As with any effort that involves the aggregation and manipulation of data from a variety of sources to create new products, its important to keep in mind some of key warnings.

- There were no on-site/field based groundtruthing employed. QA/QC where applied, came mainly from sector-based stakeholder review, the results of the Resource and Inventory assessments, and best professional knowledge judgment of the PDT.
- Participatory Mapping results relied exclusively on the expertise of sector-based stakeholders and should be considered valid. However, exact boundaries and locations should be considered approximations.
- When used for Blue Plan purposes, original source material was often clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.
- Human use information was generally more readily available for Connecticut. Data provided by various New York state agencies, and representatives from certain stakeholder holder groups with knowledge of human use activities in New York waters are reflected here, but due to limited resources, the Blue Plan was unable to fully tap into these resources beyond these and what was originally identified as part of the Resource and Use Inventory. Therefore, there is additional data that is likely to exist within other administrative entities within New York (e.g., county, town, and village governments) that should be pursued as part of the update process.

3. Goal 2: To render SHUA data in formats easy to understand and interpret;

Having finalized the data layers to represent SHUAs, the PDT focused on three distinct ways to present and share the individual layers, a synthesis of groups of layers, and a combination of both.

Hardcopy Maps:
Each SHUA layer was rendered in a standardized layout to show it along with the Blue Plan Planning area, Blue Plan Policy area, and the extent of the boundaries of coastal towns adjacent to the Planning area. These layouts were converted into PDFs and aggregated by SHUA Criteria and subcriteria to provide an easily accessible way to see the data.

Hot Spot Clustering Analysis:
When trying to view multiple SHUA layers at once (e.g., to try and visualize all Fishing and Shellfishing data at once, overlaps between layers can obscure features and become confusing. To address this, the PDT applied a clustering analysis for each of the four criteria groups, (plus a group of all human uses) based on the count (frequency) of human use data layers occurring in a given area. This would synthesize the numerous individual layers and present them as clusters – areas where concentrations of uses can be statistically defined by the levels of frequency counts. This was done using a spatial statistics process (optimized Getis-Ord Gi* Hot-Spot Analysis) within Geographic Information System (GIS) software (Esri, 2018). In summary, the method involved:

1) Breaking the LIS Blue Plan Planning Area into grids – one for each of the four criteria groups, plus a fifth group of all human uses. Based several options and best professional judgment to balance individual units that covered both the Sound and the immediate near-shore areas, a 1km x 1km grid size was used.
2) For each of the four criteria group grids:
    a) Overlay the grid onto the map products from each data group.
    b) Add column fields to the grid layer – each field reflects each map product.
    c) For each map product in the criteria group, log the grid cells it intersects by entering a '1' in the selected records for the appropriate map products field.
    d) Derive a cumulative frequency value for each grid cell (row) by adding the number of '1s' from each map product (field).

3) Apply the Getis-Ord Gi* spatial statistics process to create statistically determined clusters based on like-frequency counts. This results in maps that show, for each criteria group:
   a) Areas where lots of high frequency grid cells are concentrated (hot spots)
   b) Areas where lots of low frequency grid cells are concentrated (cool spots)
   c) Areas that are neutral
4) Combine the grids from step 2 into a fifth representing the total of all human uses. Calculate frequencies for each grid cell for all map product fields.
5) Repeat step 3 to determine clustering for all human uses.

In addition to the original four criteria groups of uses, the same clustering process was repeated by re-organizing the map products into new groups that reflect existing uses that may be susceptible to impacts by future activities occurring either on the bottom substrate, in the water column, or at/above the surface of Long Island Sound.

As above the clustering maps were also output using standardized layouts into easily accessible PDFs.

Web Viewer:
Although PDF maps are nearly universally accessible, they are limited in what they can show and do. Being able to interact with individual data layers or combinations of layers based on specific reasons provides a far more useful approach. To address this issue, the PDT will be partnering with the University of Connecticut's Center for Landuse Education and Research (CLEAR) to develop an online web-based viewer to enable stakeholders to view and work with the Significant Human Use Area data (as well as the corresponding Ecologically Significant Areas.) The viewer is under development and is expected to be ready to support the draft version of the Blue Plan due March 1, 2019. Core functionality will include:

- Ability to pan/zoom around a map with supplemental layers (e.g., aerial photos, road networks, town boundaries, water bodies, etc.)
- Ability to selectively turn on and off various Blue Plan data layers;
- Ability to perform an identification to return information about Blue Plan data layers;
- Create basic map layouts and share them via hardcopy and electronically.

4. <u>Significant Human Use Maps and Data Construction Tables</u>

In the following pages are the SHUA maps organized by criteria, and their corresponding data construction tables. These tables illustrate the data sources, extent, adjustment and processing,

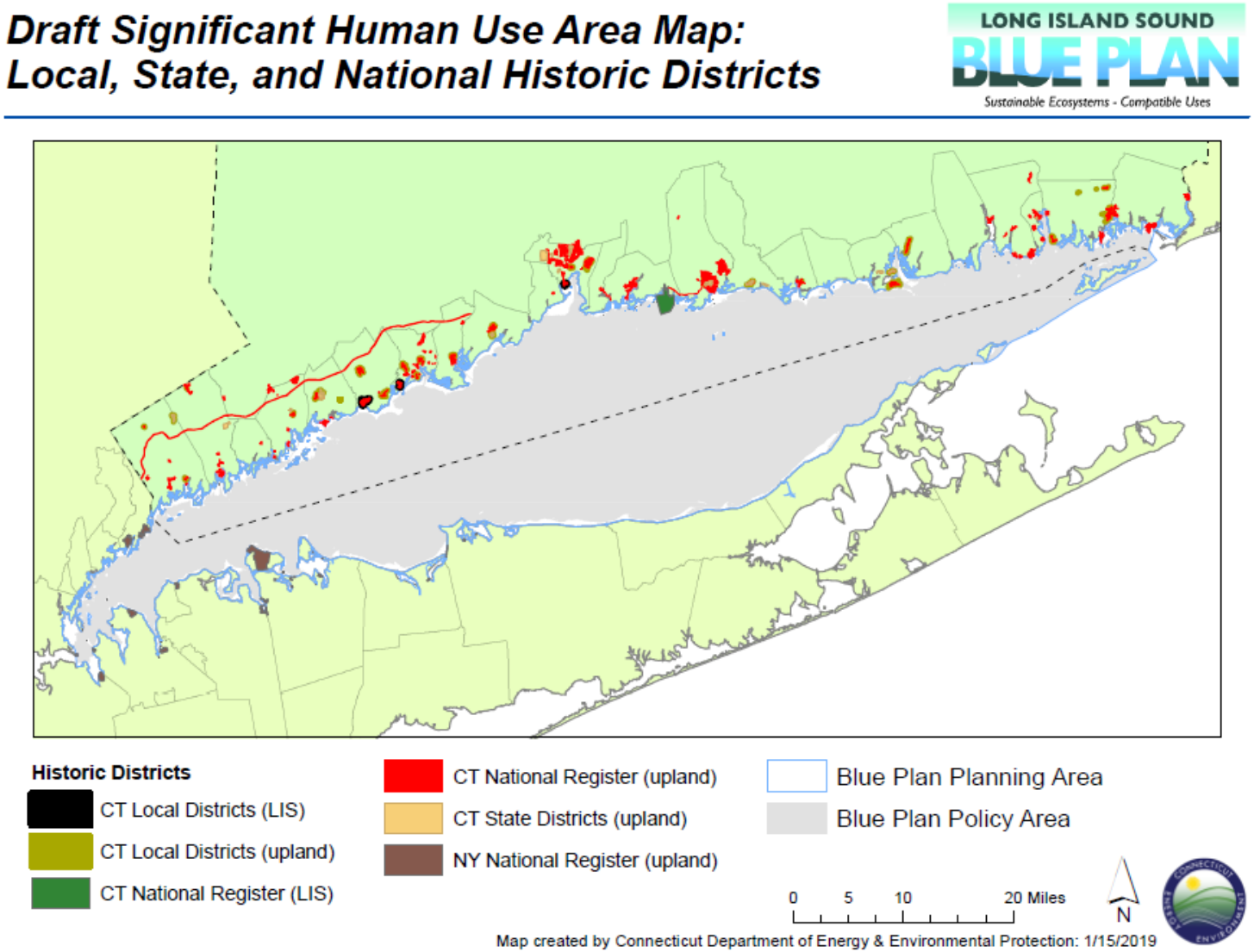


Figure 3a-1 Final SHUA map for local, state, and national historic districts under the Areas associated with lighthouses and other historic areas criteria.

Local, State, and National Historic Districts

Table 3a-8 Data construction table for local, state, and national historic districts.

SHUA Criteria	Areas with features of historical, cultural, educational, or research significance
SHUA Sub-criterion	Areas associated with lighthouses and other historic areas
SHUA Sub-criterion Description	Waterfront historic districts, or in-water structures of historical significance (excluding wrecks), and areas of Long Island Sound immediately adjacent to such resources.
Data Source(s)	GIS Data layers from: • Local Historic Districts (CT State Historic Preservation Office) • National Register Districts (CT State Historic Preservation Office) • State Register Districts (CT State Historic Preservation Office) GIS Data layer from: • National Register Districts (NY State Historic Preservation Office)
Data Extent	The Connecticut and New York coastal town boundaries adjacent to the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66.
Data Adjustment and Pre-processing	All GIS data were first clipped to the data extent. Any districts defining areas in the waters of Long Island Sound were extracted into new layers so that upland and offshore districts can be identified. All layers were appended into a master layer, retaining the attribute schemes from their original sources. An additional attribute field "BP_Source" was added and populated to identify the source layer of the individual records. Where possible, common field information (name, lat/long, location descriptions, etc.) were compiled into a single field for ease of use. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment, but the "BP_Source" attribute can be used to classify them based on their original data sources.

Date Created	October, 2018
Basic Data Description	A synthesis of several sources of historic districts at the local, state, and national levels for coastal areas of Long Island Sound. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

Draft Significant Human Use Area Map: Lighthouses

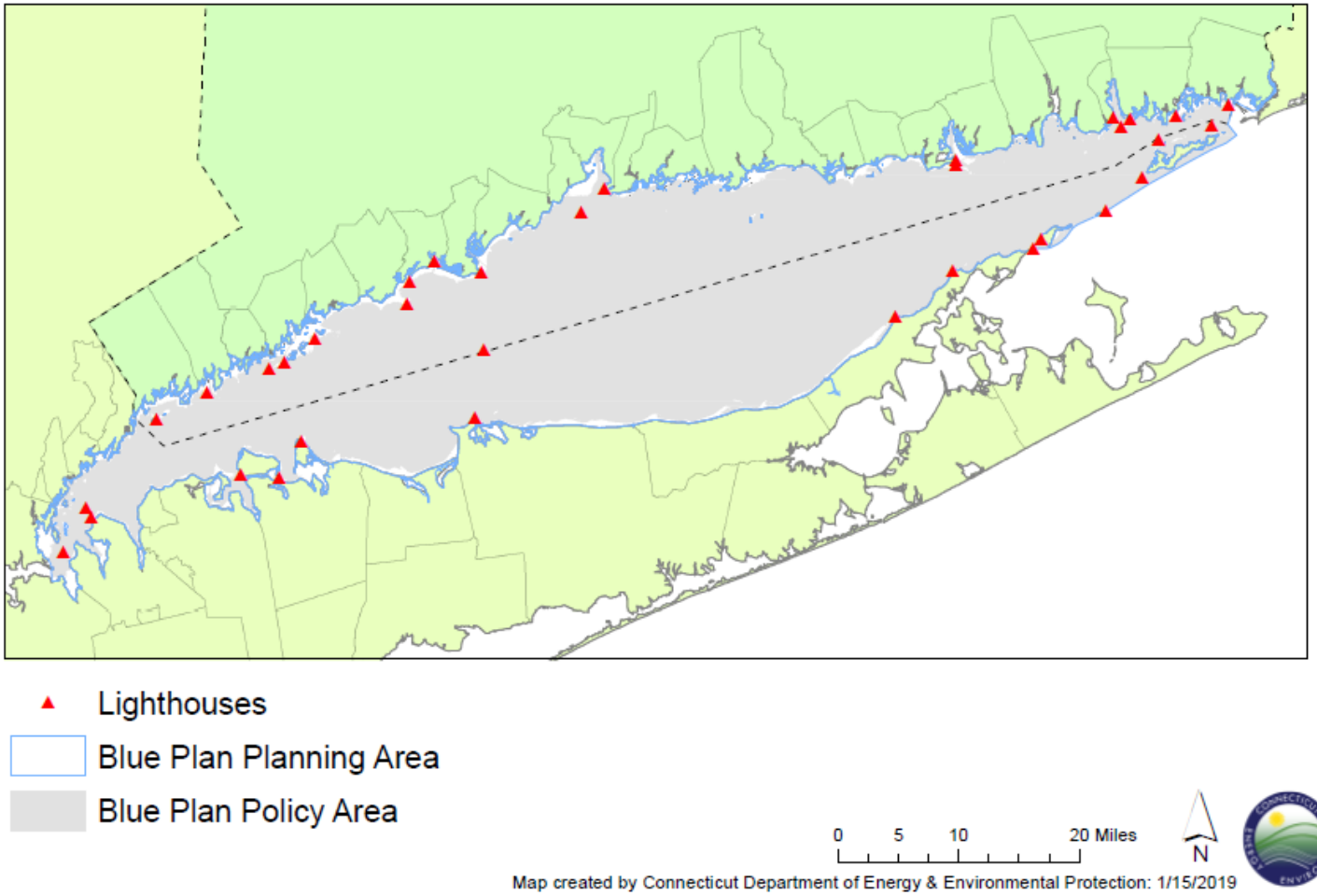


Figure 3a-2 Final SHUA map for LIS lighthouses under the Areas associated with lighthouses and other historic areas criteria.

Long Island Sound Lighthouses

Table 3a-9 Data construction table for LIS Lighthouses.

SHUA Criteria	Areas with features of historical, cultural, educational, or research significance
SHUA Sub-criterion	Areas associated with lighthouses and other historic areas
SHUA Sub-criterion Description	Lighthouses and areas of Long Island Sound immediately adjacent thereto.
Data Source(s)	GIS data layer: • National Register of Historic Places (CT State Historic Preservation Office) Websites: • http://www.birdsandbeacons.com/Lighthouses/LI_Lighthouses.htm • http://lighthousefriends.com (Connecticut and New York)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	National Registry GIS data were clipped to the data extent. Existing lighthouses were then selected and exported into a separate layer retaining the same attribute scheme. Using the inventories from the websites, other LIS lighthouses were hand digitized into the new layer approximating their locations using photo imagery and NOAA Nautical Charts as

	references. Lighthouse names were entered into the "Name" field and the website URL was entered in the "Source" field. Data layer stored in UTM Zone 18N, NAD83. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes.
Date Created	October, 2018
Basic Data Description	Provides the location of lighthouses in Long Island Sound and the coastal waters of CT and NY. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

Draft Significant Human Use Area Map: Wrecks

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

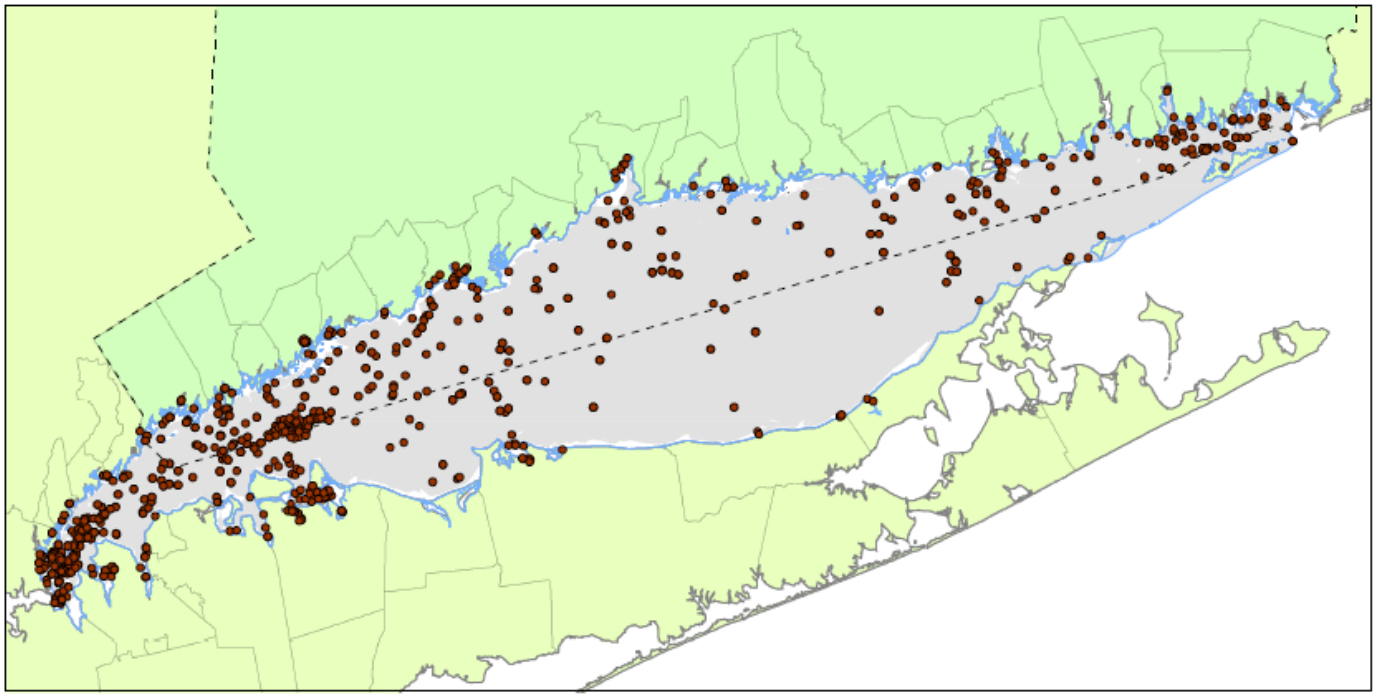


Figure 3a-3 Final SHUA map for shipwrecks.

Long Island Sound Shipwrecks

Table 3a-10 Data construction table for Shipwrecks.

SHUA Criteria	Areas with features of historical, cultural, educational, or research significance
SHUA Sub-criterion	Shipwrecks
SHUA Sub-criterion Description	Wrecks of historical or cultural significance.
Data Source(s)	GIS data layers: • Historic Feature Points (CT State Historic Preservation Office) • Wrecks (CT State Historic Preservation Office) • Wrecks and Obstructions (NOAA Electronic Nautical Chart (ENC) –Approach scale) • Wrecks and Obstructions (NOAA Electronic Nautical Chart (ENC) –Harbour scale) • Wrecks and Obstructions (NOAA Automated Wreck and Obstruction Information System (AWOIS))
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Source data were clipped to the Long Island Sound Blue Plan planning area. For sources that differentiated wrecks from obstructions, obstructions were excluded. NOAA data (ENC and AWOIS) and CT State Historic Preservation Office data (Historic Features) were kept in their entirety. CT State Historic Preservation Office data (wrecks) contained information from NOAA ENC and AWOIS sources – these were removed based on attribute and spatial analysis to eliminate duplicate records. Individual data layers were appended together to form a new composite data layer. The field "BP_Source" was

	added and populated to identify the source layer for each record. Where possible, common field information (name, lat/long, location descriptions, etc.) were compiled into a single field for ease of use. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment, but the "BP_Source" attribute can be used to classify them based on their original data sources.
Date Created	October, 2018
Basic Data Description	A synthesis of several sources of wreck information for Long Island Sound. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

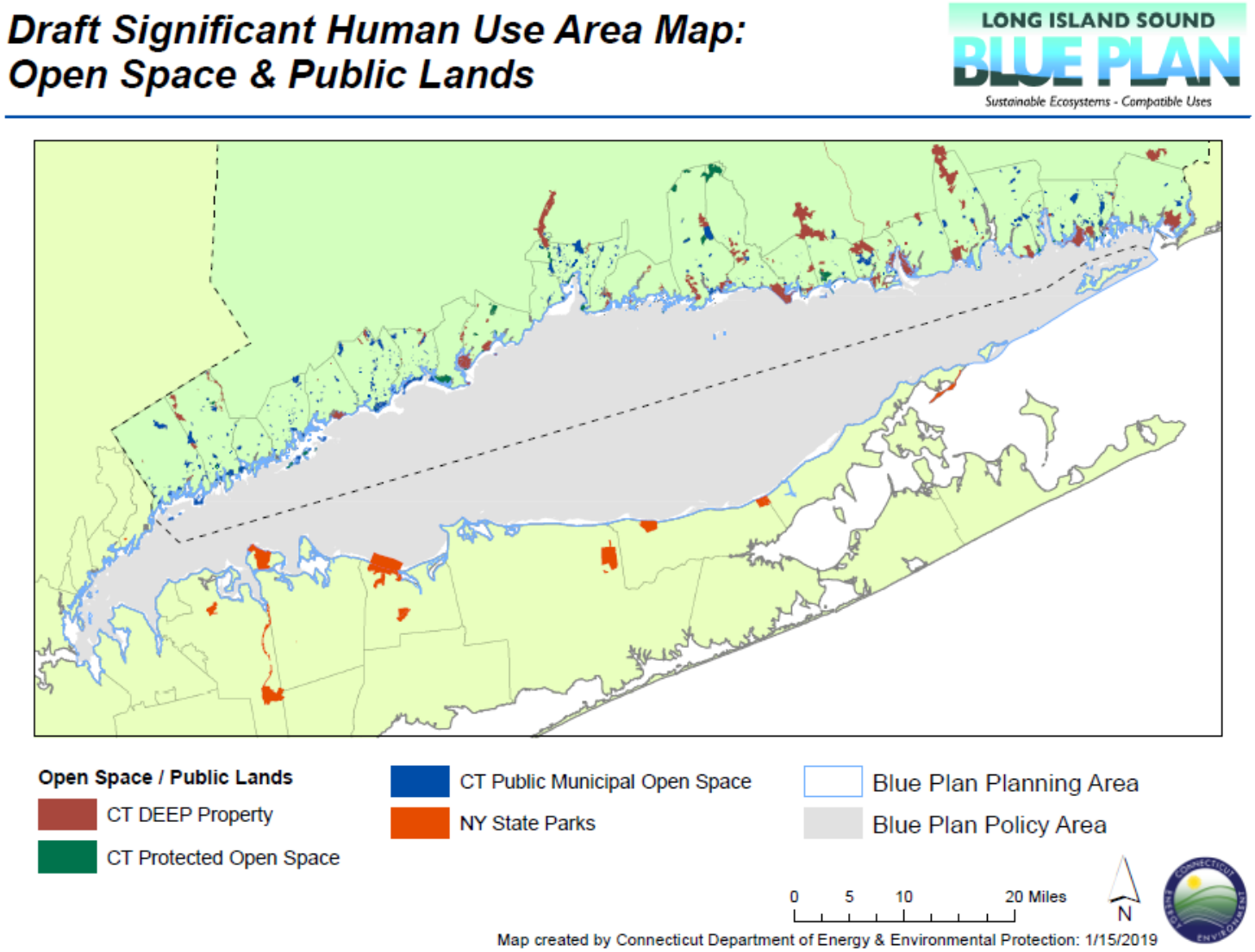


Figure 3a-4 Final SHUA map for open space and public lands, under the Visual and scenic resource criteria.

Connecticut and New York Parklands and Open Space

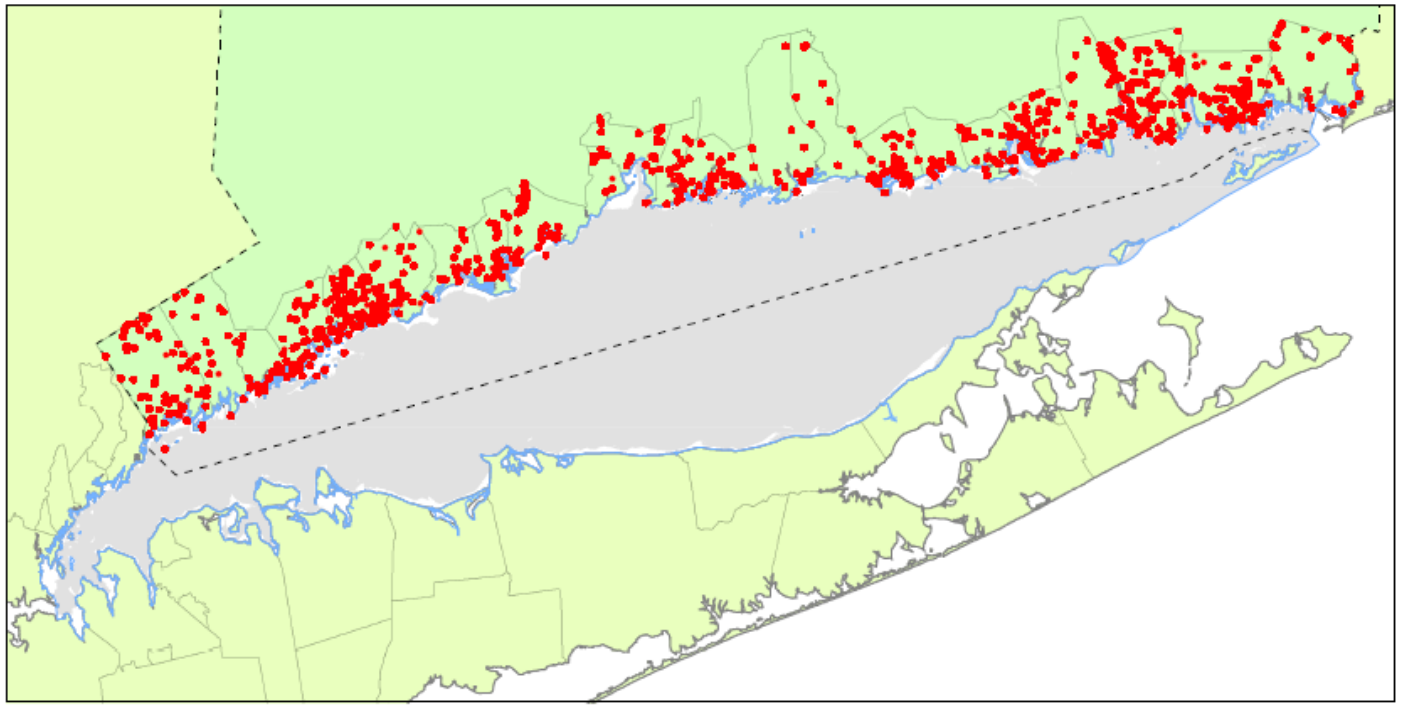
Table 3a-11 Data construction table for Parklands and Open Space.

SHUA Criteria	Areas with features of historical, cultural, educational, or research significance
SHUA Sub-criterion	Long Island Sound Visual and Scenic Resources
SHUA Sub-criterion Description	Views of Long Island Sound's scenic resources from publicly accessible coastal land.
Data Source(s)	GIS data layers: • CT Protected Open Space Mapping (CTPOSM) Inventories (CT Dept. of Energy & Environmental Protection) • CT DEEP Property (CT Dept. of Energy & Environmental Protection) • CT Municipal Open Space (CT Dept. of Energy & Environmental Protection) • NY State Parks (NYS Office of Parks, Recreation and Historic Preservation)
Data Extent	The Connecticut and New York coastal town boundaries adjacent to the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66.

Data Adjustment and Pre-processing	All data were first clipped to the data extent. CTPOSM data were first filtered to identify Open Space Types of Municipal, Municipal with Buildings, or Federal. All Federal properties were retained. Municipal properties were further filtered to retain only those parcels where an entry in the "Offic_Name" field indicated or seemed to indicate it could support public access, natural area preservation/conservation, or general recreation. This could include, but not be limited to parks, recreation areas, town greens, preserves, beaches, open space, etc. No formal or definitive cross-referencing or validations were performed to conclusively verify these. CT DEEP Municipal Open Space data were filtered to focus on parcels classified within the "DESCRIPT" field as "municipal, open to the public without fee." There were further filtered to remove parcels such as cemeteries, churches, or other similar areas that based on best professional judgment, may not best support the intent of providing a location to view the scenery and vistas of Long Island Sound. No formal or definitive cross-referencing or validations were performed to conclusively verify these. New York State Parklands were included in their entirety within the Data extent. No filtering or removals were performed. CTDEEP Property were included in their entirety within the Data extent. No filtering or removals were performed. The final property layers were appended into a master layer, retaining the attribute schemes from their original sources. An additional attribute field "BP_Source" was added and populated to identify the source layer of the individual records. Where possible, common field information (name, lat/long, location descriptions, etc.) were compiled into a single field for ease of use. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment, but the "BP_Source" attribute can be used to classify them based on their original data sources.
Date Created	October, 2018
Basic Data Description	A synthesis of several sources of open space and publicly accessible properties that can serve as vantage points for visual vistas of Long Island Sound. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

Draft Significant Human Use Area Map: Archaeological Sites (upland)

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses



Archaeological sites (upland)
Blue Plan Planning Area
Blue Plan Policy Area

0 5 10 20 Miles

N

Map created by Connecticut Department of Energy & Environmental Protection: 1/15/2019

Figure 3a-5 Final SHUA map for archaeological sites (upland), under the submerged and coastal archaeological areas criteria.

Connecticut Archaeologically Sensitive Areas (coastal)

Table 3a-12 Data construction table for Archeological areas (upland).

SHUA Criteria	Areas with features of historical, cultural, educational, or research significance
SHUA Sub-criterion	Submerged and coastal archaeological areas
SHUA Sub-criterion Description	Submerged or Coastal locations of archaeological sensitivity and/or significance.
Data Source(s)	GIS Datalayer: • OSA Site Inventory (CT Office of State Archaeology)
Data Extent	The Connecticut coastal town boundaries adjacent to the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66.
Data Adjustment and Pre-processing	GIS data were provided for the entire state and were clipped to the Data Extent. Resulting sites were buffered by 100ft per the recommendation of the CT State Historic Preservation Office. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment. NOTE: Information provided in the attribute field “SITENO” should be used in referencing any site with CT State Historic Preservation Office.
Date Created	October 2018
Basic Data Description	Inventory of upland (i.e. land-based) sites from the CT Office of State Archaeology (OSA). For more information on a given site, provide the "Site Number" value to OSA or the CT State Historic Preservation Office (CT SHPO).When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

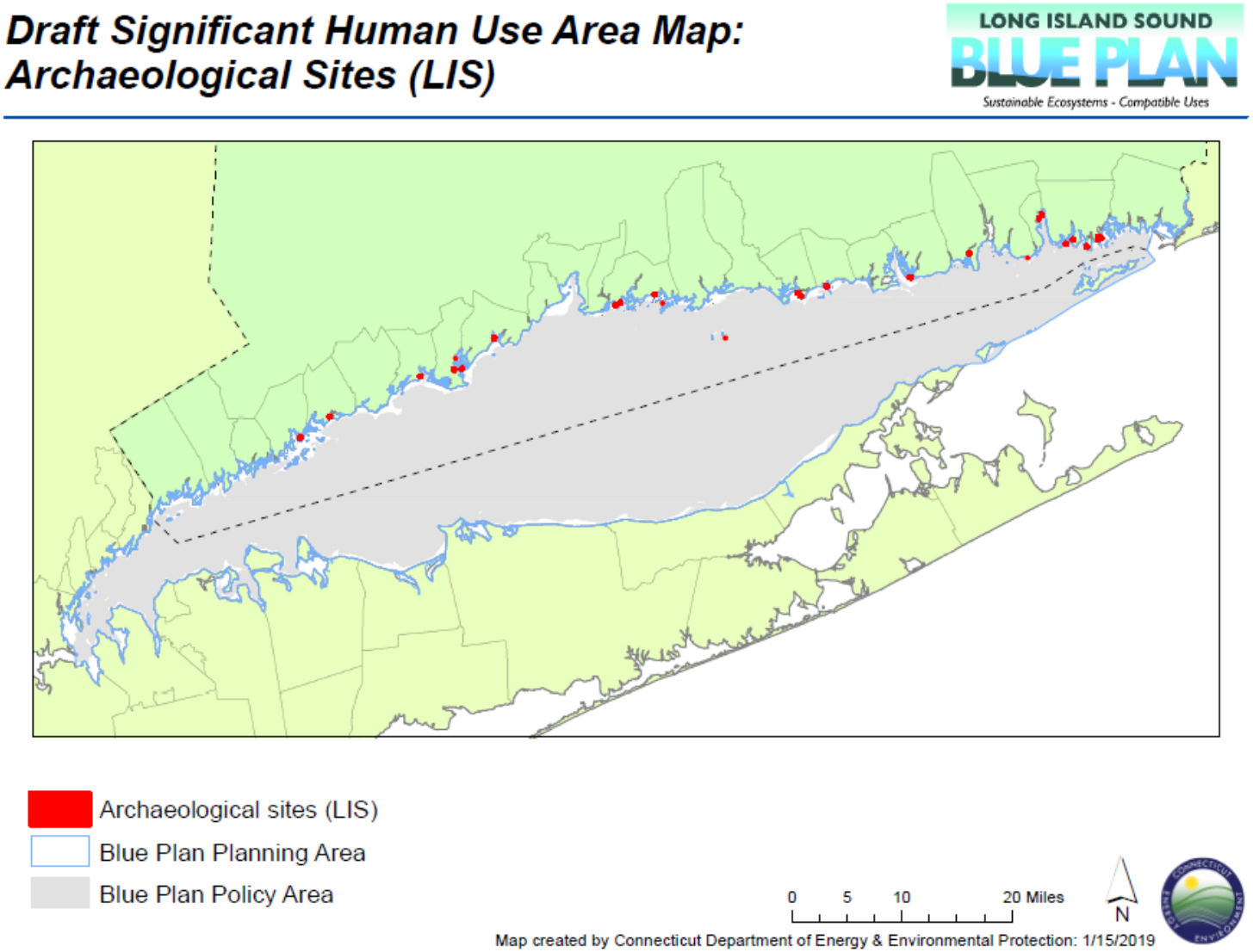


Figure 3a-6 Final SHUA map of archaeological areas (LIS), under the submerged and coastal archaeological areas.

Connecticut Archaeologically Sensitive Areas (submerged)

Table 3a-13 Data construction table for archaeological sites (LIS).

SHUA Criteria	Areas with features of historical, cultural, educational, or research significance
SHUA Sub-criterion	Submerged and coastal archaeological areas
SHUA Sub-criterion Description	Submerged locations of archaeological sensitivity and/or significance.
Data Source(s)	GIS Datalayer: • OSA Site Inventory (CT Office of State Archaeology)
Data Extent	Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	GIS data were clipped to the Data Extent. Resulting sites were buffered by 100ft per the recommendation of the CT State Historic Preservation Office Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment. NOTE: Information provided in the attribute field "SITENO" should be used in referencing any site with CT State Historic Preservation Office.
Date Created	October 2018

Basic Data Description	Inventory of sub-tidal sites from the CT Office of State Archaeology (OSA). For more information on a given site, provide the "Site Number" value to OSA or the CT State Historic Preservation Office (CT SHPO). When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

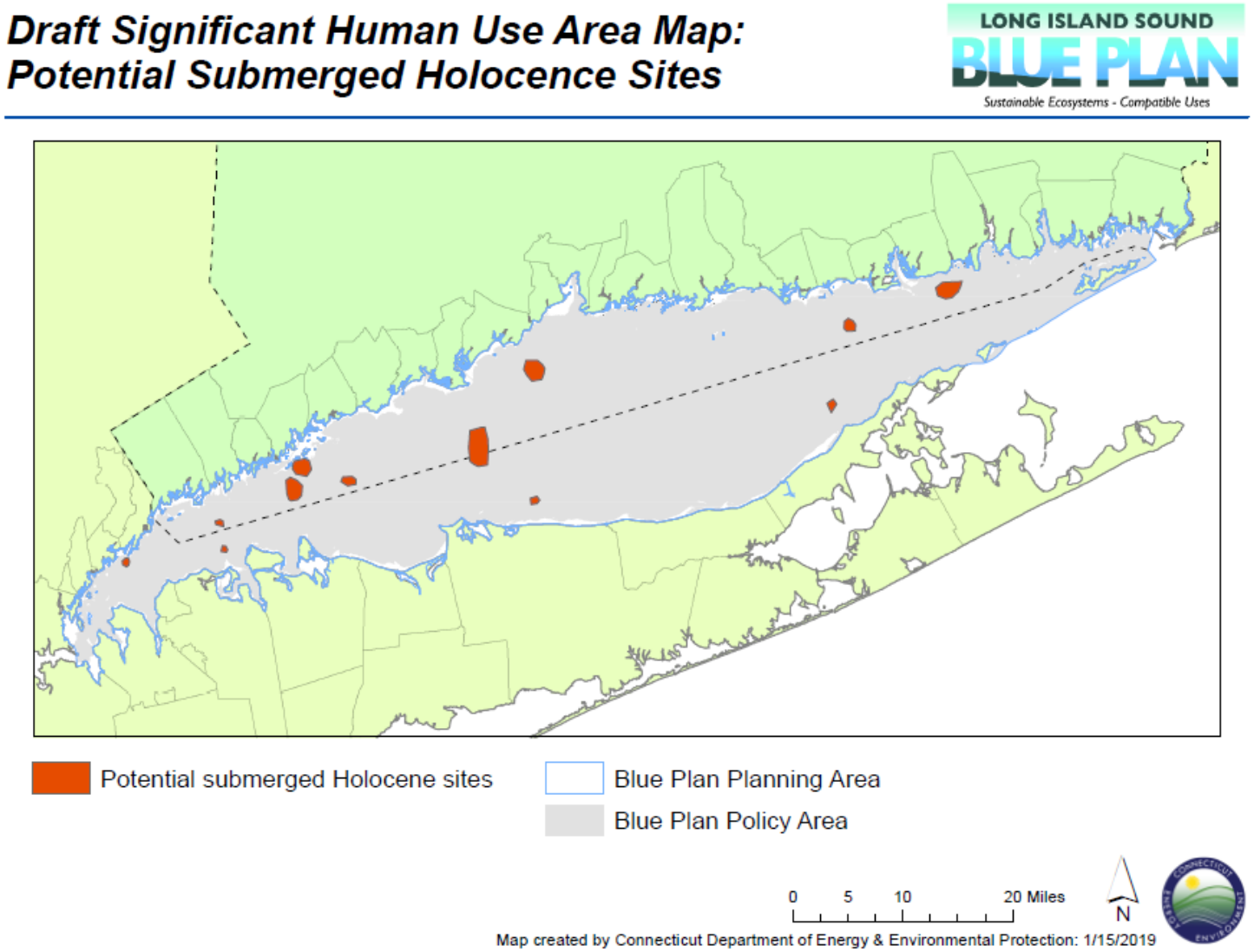


Figure 3a-7 Final SHUA map of potential submerged Holocene sites, under the submerged and coastal archaeological areas criteria.

Potential Holocene Underwater Sites

Table 3a-14 Data construction table for potential Holocene underwater sites.

SHUA Criteria	Areas with features of historical, cultural, educational, or research significance
SHUA Sub-criterion	Submerged and Coastal Archaeological Areas
SHUA Sub-criterion Description	Submerged locations of archaeological sensitivity and/or significance.
Data Source(s)	Taken from maps and analysis contained in the following: • "ARCHAEOLOGICAL AND HISTORICAL RESOURCE STUDY ADRIAEN'S LANDING PROJECT. HARTFORD, CONNECTICUT." Prepared for the Connecticut Office of Policy and Management By Archaeological and Historical Services, Inc. 2006 • Map provided by Brian Jones, CT Office of State Archaeology, depicting areas lacking Holocene Deposition on approximate 9000 rcBP landsurfaces.
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CTD EEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	The Holocene deposition map was georeferenced onto imagery of the study area. The 11 potential sites were approximated by hand-digitizing them from the source map into a GIS layer. Field attributes were added to identify the site name and sources used. Data layer stored in UTM Zone 18N, NAD83
Data Analysis	No additional analysis was performed.

Data Classification	The data are not classified by any attributes.
Date Created	October, 2018
Data Description	Depicts the potential location of land-based settlement ca. 9000 rcBP prior to those shoreline areas being submerged as Long Island Sound filled in.

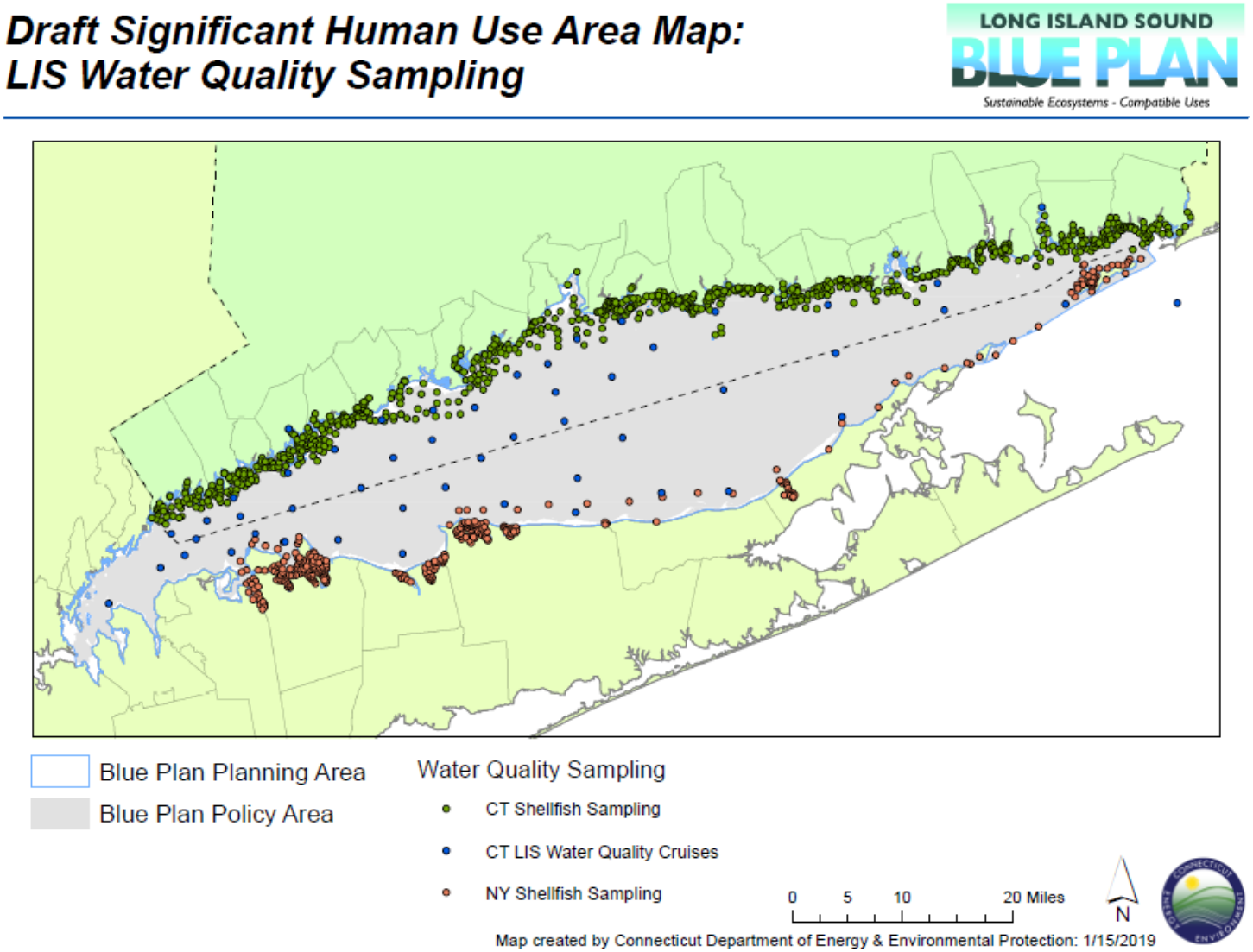


Figure 3a-8 Final SHUA map of water quality sampling sites, under the discrete areas for research, education, and monitoring criteria.

Long Island Sound Water Quality Sampling Sites

Table 3a-15 Data construction table for Long Island Sound Water quality sampling sites.

SHUA Criteria	Areas with features of historical, cultural, educational, or research significance
SHUA Sub-criterion	Discrete Areas for Research, Education, and Monitoring
SHUA Sub-criterion Description	Areas actively and consistently used for research activities, including but not limited to long term monitoring sites, and Sound-dependent experiential educational programming.
Data Source(s)	GIS Data layers: • Shellfish Sampling Stations (CT Dept of Agriculture/Bureau of Aquaculture) • LIS Water Quality Sampling Sites (CT Dept. of Energy & Environmental Protection) • Shellfish Sampling Stations (NY Dept of Environmental Conservation)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CTDEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data were first clipped to the Data Extent. Data from the LIS Water Quality Sampling sites were filtered to remove instance of LISICOS sites which are addressed in a separate layer. Resulting data was appended into a new layer with the CT and NY Shellfish sampling stations. An additional attribute field "BP_Source" was added and populated to identify the source layer of the individual records. Where possible, common field information (name, lat/long, location descriptions, etc.) were compiled into a single field for ease of use. Data layer stored in UTM Zone 18N, NAD83.

Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment, but the "BP_Source" attribute can be used to classify them based on their original data sources.
Date Created	October 2018
Basic Data Description	Locations that generally represent significant and long-standing sources of water quality monitoring spanning the area of Long Island Sound (or large areas of it.) When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

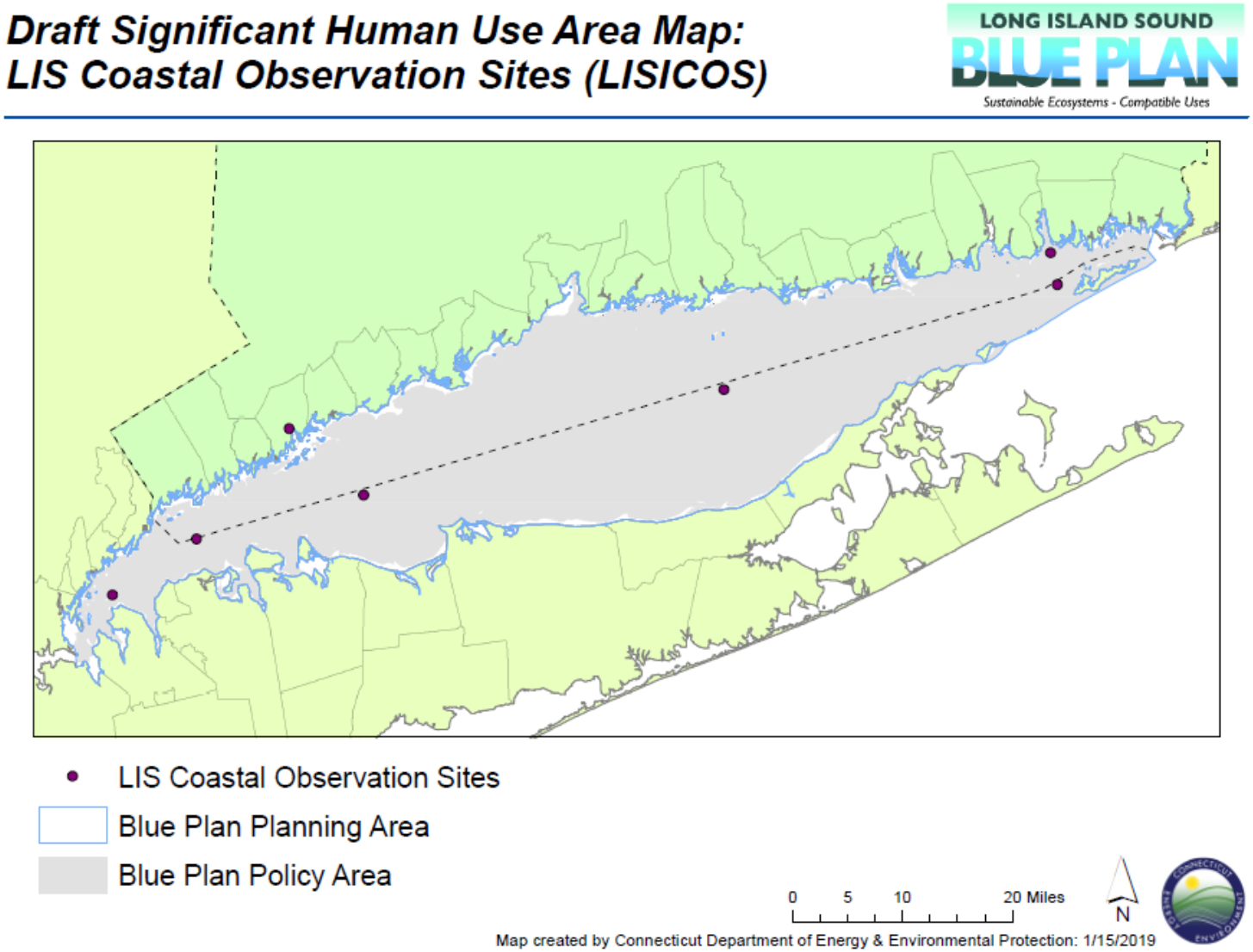


Figure 3a-9 Final SHUA map of LIS Coastal Observation sites (LISICOS), under the discrete areas for research, education, and monitoring criteria.

Long Island Sound Integrated Coastal Observation System (LISICOS) Sites

Table 3a-16 Data construction table for LIS Integrated Coastal Observation System (LISICOS) sites

SHUA Criteria	Areas with features of historical, cultural, educational, or research significance
SHUA Sub-criterion	Discrete Areas for Research, Education, and Monitoring
SHUA Sub-criterion Description	Areas actively and consistently used for research activities, including but not limited to long term monitoring sites, and Sound-dependent experiential educational programming.
Data Source(s)	GIS Datalayer: • Long Island Sound Coastal Environmental Observation Sites (CT Dept. of Energy & Environmental Protection) Website: • http://lisicos.uconn.edu/index.php
Data Extent	Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CTDEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Records from "SOURCE" field values for LISICOS extracted into a new layer. Results cross-referenced to LISICOS observation pages to remove sites classified as discontinued. Data layer stored in UTM Zone 18N, NAD83.

Data Analysis	No additional analysis was performed. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018
Basic Data Description	Representation of operating locations of buoys supporting the Long Island Sound Integrated Coastal Observation System (LISICOS), a subsystem of the Northeast Regional Association of Coastal and Ocean Observation Systems (NERACOOS.) Discontinued LISICOS assets are not included. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

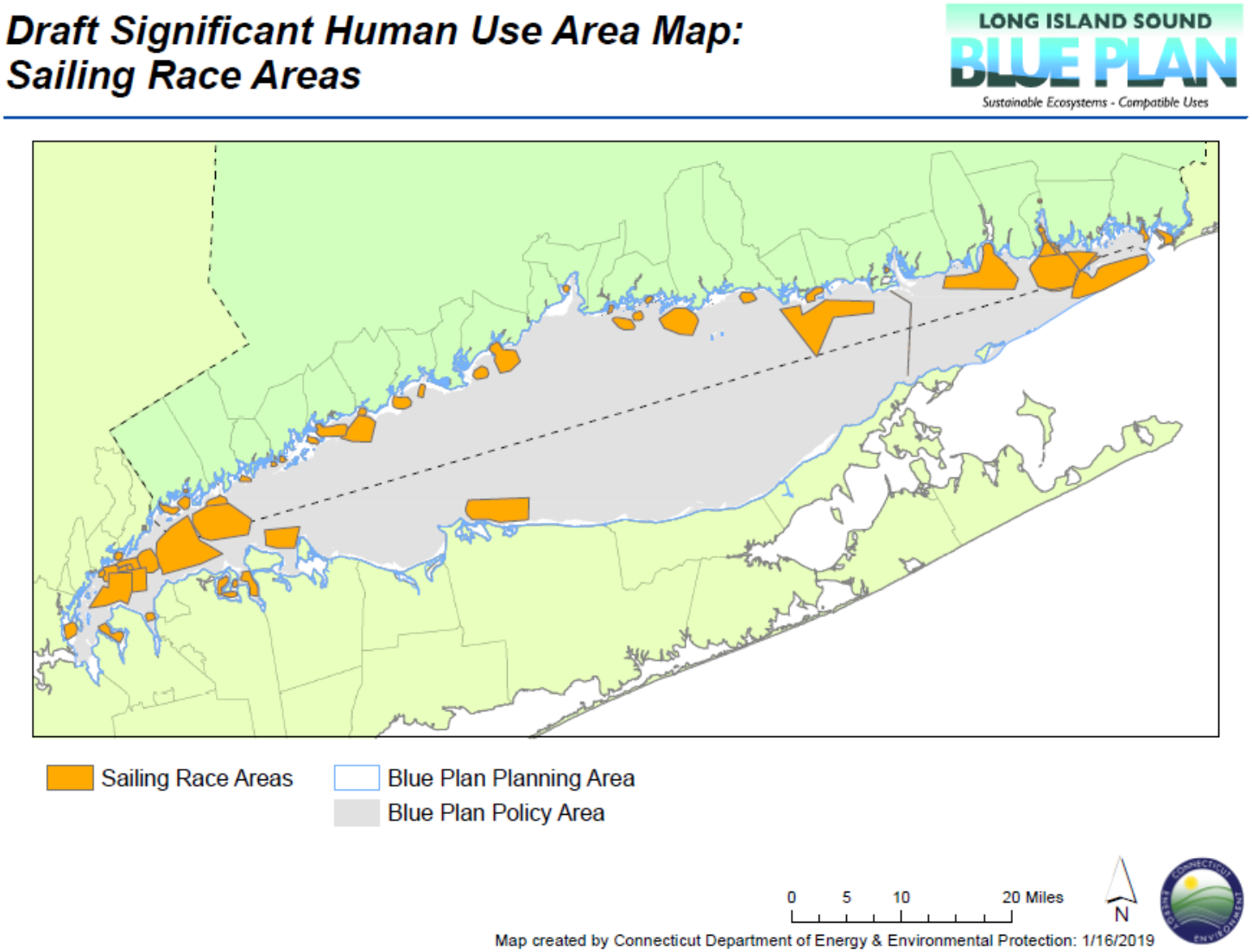


Figure 3a-10 Final SHUA map of Sailing Race areas, under the sailing or rowing races criteria.

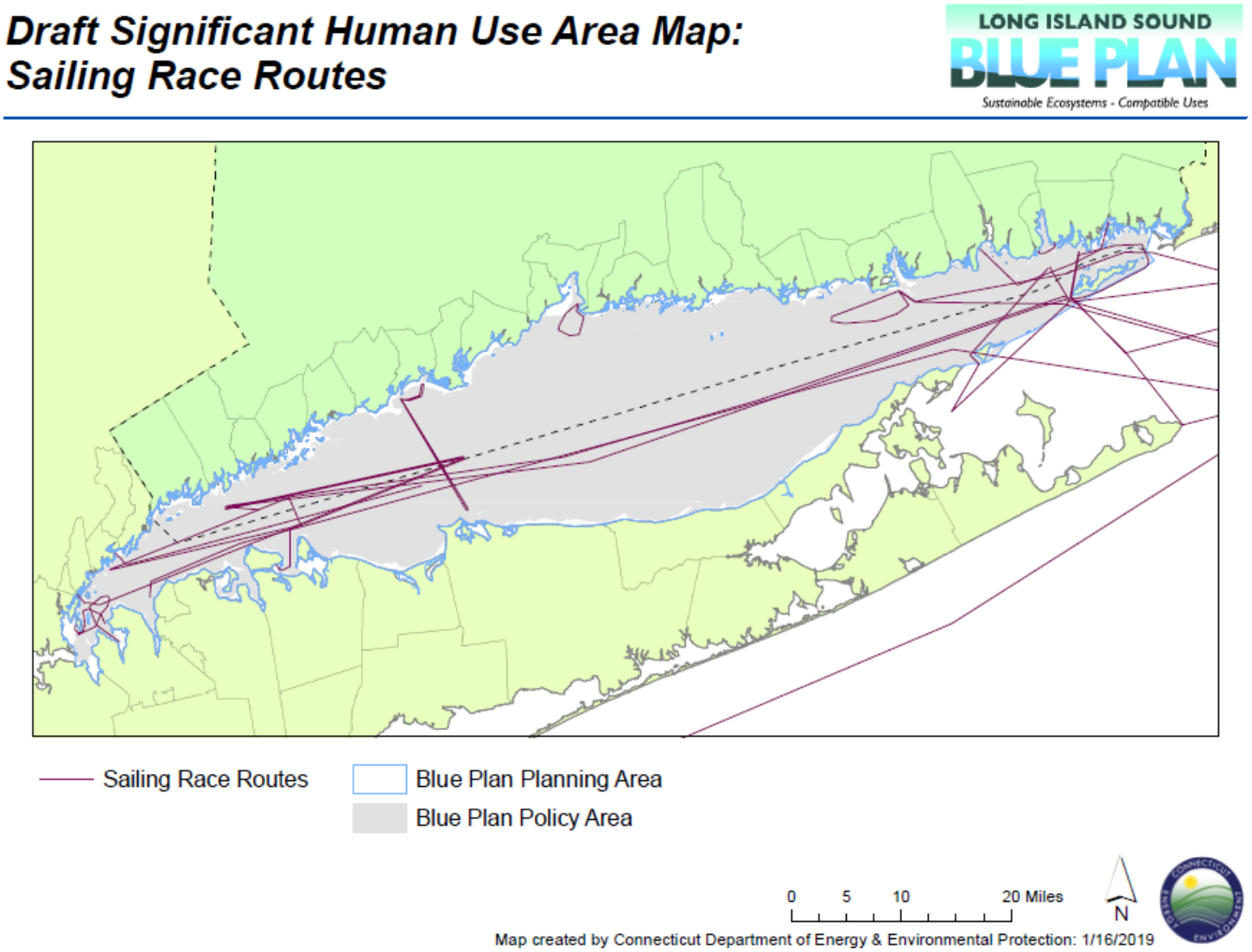


Figure 3a-11 Final SHUA map of sailing race routes, under the sailing or rowing races criteria.

Sailing Race Areas and Routes

Table 3a-17 Data construction table for Sailing Race Areas and Routes

SHUA Criteria	Areas of substantial recreational and/or quality of life value.
SHUA Sub-criterion	Sailing or Rowing Races
SHUA Sub-criterion Description	Areas consistently used by organized clubs and associations. Including but not limited to racing and training areas, and long-distance sailing race routes.
Data Source(s)	Participatory Mapping efforts with racing stakeholder groups
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CTD EEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Blue Plan staff engaged local racing stakeholders to discover and map various sailing race routes and areas within the data extent. Attribute field(s) were added to capture (where appropriate) the race name, type, organization, and frequency of events.) Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018.

General Web Service Data Description	Sailing Race Routes: Areas consistently used by organized clubs and associations. Including but not limited to racing and long-distance sailing race routes. Blue Plan staff engaged local racing stakeholders to discover and map various sailing race routes and areas within the data extent. Attribute field(s) were added to capture (where appropriate) the race name, type, organization, and frequency of events.) When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here. Sailing Race Areas: Areas consistently used by organized clubs and associations. Including but not limited to racing and training areas. Blue Plan staff engaged local racing stakeholders to discover and map various sailing race areas within the data extent. Attribute field(s) were added to capture (where appropriate) the race name, type, organization, and frequency of events.) When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

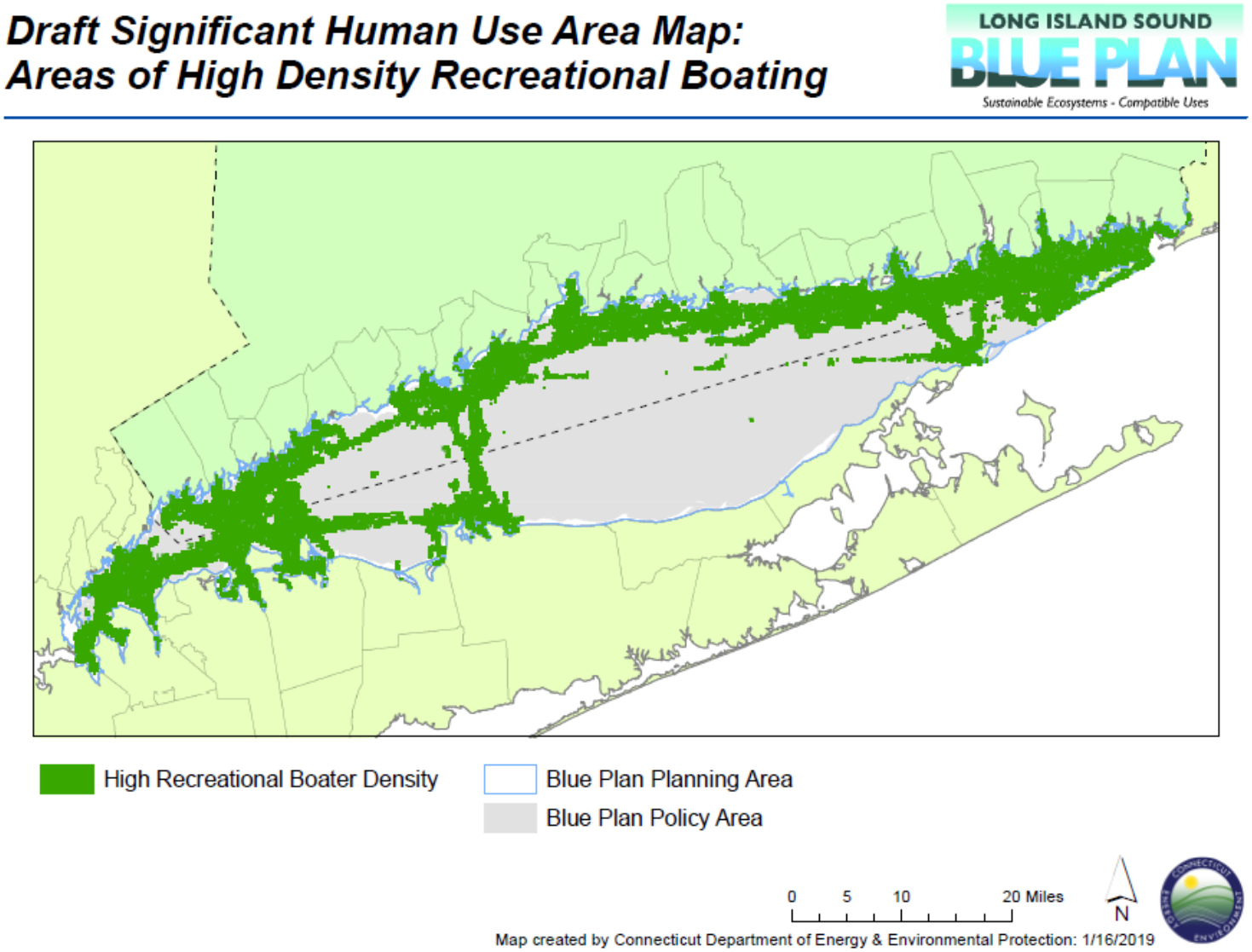


Figure 3a-12 Final SHUA map for High density recreational boating.

High Activity Recreational Boating Areas

Table 3a-18 Data construction table for High Recreational Boating Areas.

SHUA Criteria	Areas of substantial recreational and/or "quality of life" value
SHUA Sub-criterion	High Activity Recreational Boating Areas
SHUA Sub-criterion Description	Approximate areas where the density of recreational boating is substantially higher than the overall mean for LIS.
Data Source(s)	GIS Data layer: • 2012 Northeast Ocean Regional Recreational Boater Survey – Boating Density data
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. (or other) To delineate the Blue Plan planning area, CTD EEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data were clipped to the Data Extent and converted from raster to polygon layer. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	As the data documentation from the survey notes that the values for each grid cell reflect a measure of how much greater than average the boating density is, negative values (where density was lower than average) were removed. The remaining values were classified into five equal quantity classes. The top two classes (e.g., where the cell values exceeded 1.29) were used to depict areas where recreational boating might best be considered "High Activity".
Date Created	October 2018

General Web Service Data Description	Approximate areas where the density of recreational boating is substantially higher than the overall mean for LIS. As the data documentation from the survey notes that the values for each grid cell reflect a measure of how much greater than average the boating density is, negative values (where density was lower than average) were removed. The remaining values were classified into five equal quantity classes. The top two classes (e.g., where the cell values exceeded 1.29) were used to depict areas where recreational boating might best be considered "High Activity". When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

Draft Significant Human Use Area Map: Mooring Fields

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

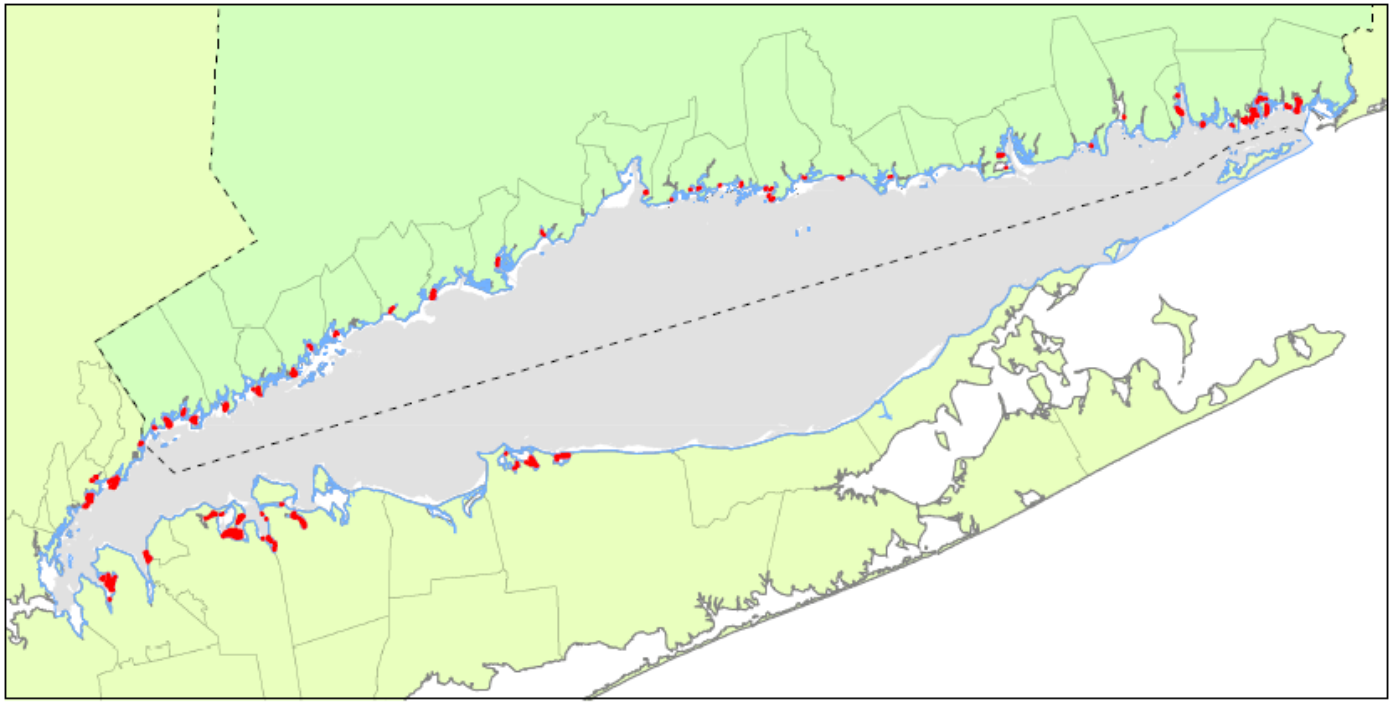


Figure 3a-13 Final SHUA map of mooring fields, also known as boat clusters, under the mooring fields and anchorage area criteria.

Mooring Fields

Table 3a-19 Data construction table for Mooring Fields.

SHUA Criteria	**Areas of substantial recreational and/or "quality of life" value**
SHUA Sub-criterion	Mooring Fields and Anchorage Areas
SHUA Sub-criterion Description	Formally designated or traditional mooring fields as designated or managed by NOAA, municipal Harbor Management, or other organizations.
Data Source(s)	• 2016 NAIP Summer 4band, 1m Orthophotography • NOAA Chart Viewer (https://nauticalcharts.noaa.gov/rnconline/rnconline.html)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CTD EEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Polygons in this layer were created from the 2016 NAIP aerial imagery available online. Polygons were drawn over areas that display a cluster of more than 5 boats that are obviously at anchor or attached to moorings. This mandated being able to see either an anchor line or mooring ball in association with the majority of boats, a qualification that is intended to exclude areas where boats are simply clustered for an activity such as fishing. Rather, boats at anchor or on moorings are assumed to spend more time stopped in, and originate from, these locations, either for the entire boating season or as transients during a multi-day trip. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018

General Web Service Data Description	Formally designated or traditional mooring fields as designated or managed by NOAA, municipal Harbor Management, or other organizations. Polygons in this layer were created from the 2016 NAIP aerial imagery available online. Polygons were drawn over areas that display a cluster of more than 5 boats that are obviously at anchor or attached to moorings. This mandated being able to see either an anchor line or mooring ball in association with the majority of boats, a qualification that is intended to exclude areas where boats are simply clustered for an activity such as fishing. Rather, boats at anchor or on moorings are assumed to spend more time stopped in, and originate from, these locations, either for the entire boating season or as transients during a multi-day trip. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

Draft Significant Human Use Area Map: Anchorage Areas

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

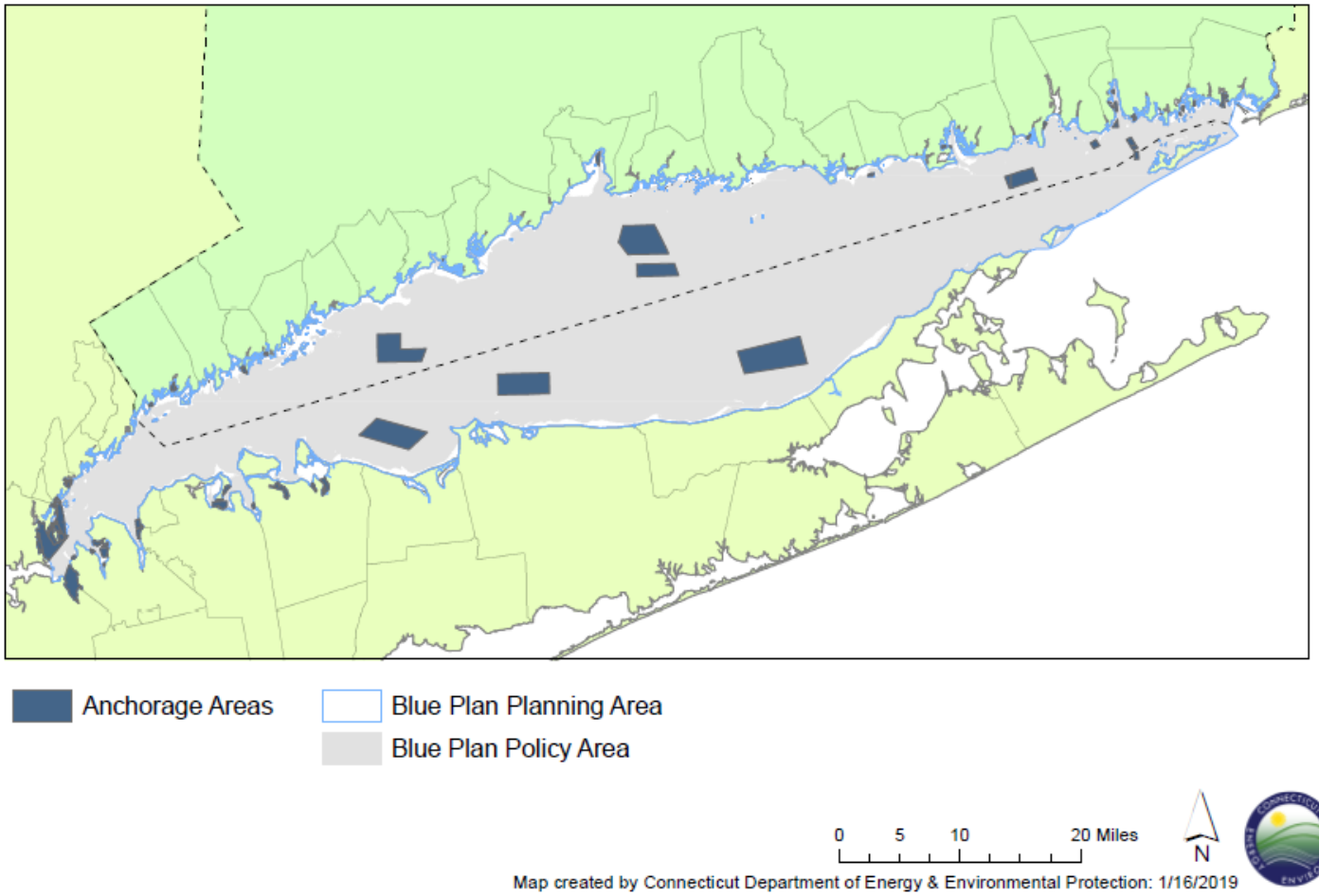


Figure 3a-14 Final SHUA map of anchorage areas, under the mooring fields and anchorage areas criteria.

Anchorage Areas

Table 3a-20 Data construction table for Anchorage Areas.

SHUA Criteria	**Areas of substantial recreational and/or "quality of life" value**
SHUA Sub-criterion	Designated Anchorage Areas
SHUA Sub-criterion Description	Anchorage areas as they appear on the NOAA charts, and are generally used by commercial vessels.
Data Source(s)	GIS Data layer: • Anchorage Areas (NOAA Electronic Nautical Charts – Approach data)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CTD EEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data were clipped to the Data Extent. Where no values appeared in "OBNAM" filed, values of "unnamed/unknown" were added. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October 2018

General Web Service Data Description	Anchorage areas as they appear on the NOAA charts. Data were clipped to the Data Extent (the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66). Where no values appeared in "OBNAM" filed, values of "unnamed/unknown" were added. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

Draft Significant Human Use Area Map: Marinas, Yacht Clubs, Etc.

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

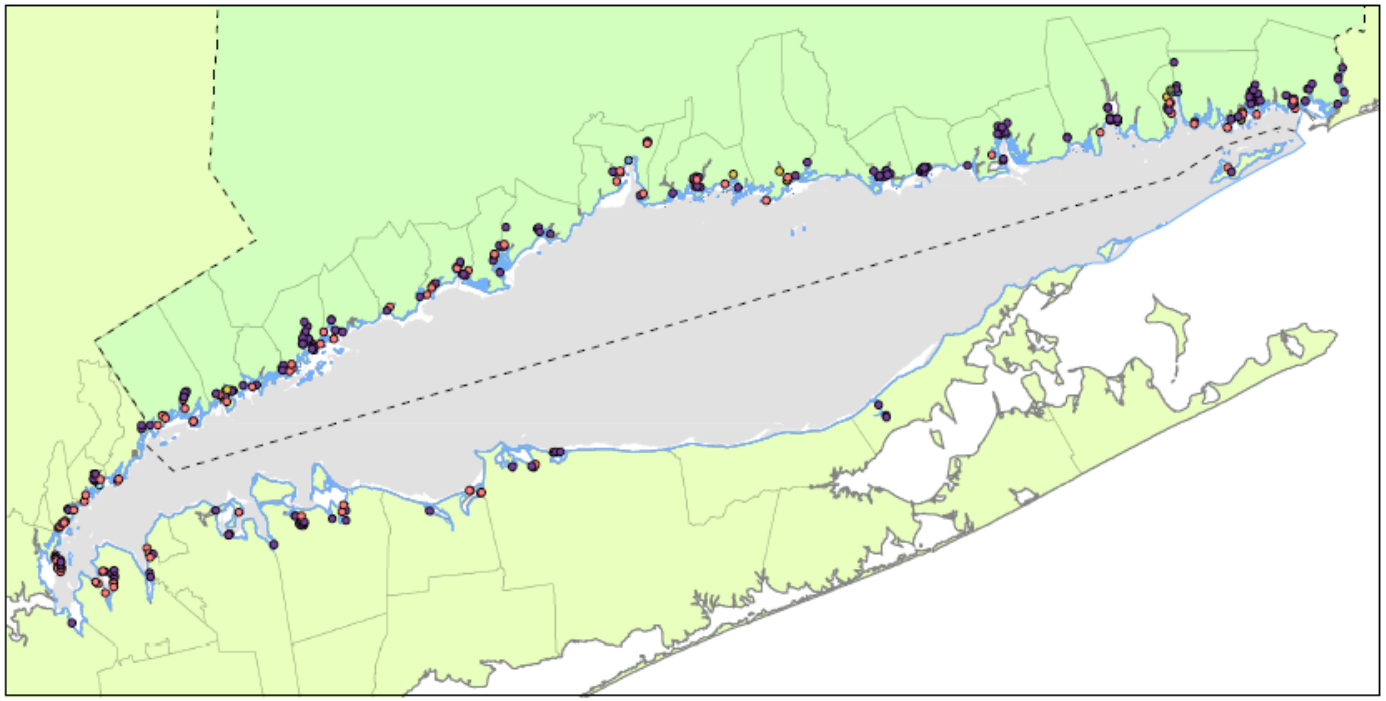


Figure 3a-15 Final SHUA map of marinas, yacht clubs, etc., under the marinas, yacht clubs, and boat launches criteria.

Marinas & Yacht Clubs

Table 3a-21 Data construction table for Marinas and Yacht Clubs

SHUA Criteria	Areas of substantial recreational and/or quality of life value.
SHUA Sub-criterion	LIS Marinas, Yacht Clubs, and Boat Launches
SHUA Sub-criterion Description	Locations of marinas and yacht clubs that are within the Blue Plan planning area.
Data Source(s)	GIS data layers: • Connecticut Marina Facilities (CTDEEP Boating Division) • Data for New York created by mapping locations from 2017 LIS Cruising Guide
Data Extent	The Connecticut and New York coastal town boundaries adjacent to the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66.
Data Adjustment and Pre-processing	CT Marina Facilities data were clipped to the data extent. These data were merged in to a new layer along with the cruising guide data for New York to create one unified layer of known marinas and yacht clubs. Data layers stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018.
General Web Service Data Description	Locations of marinas and yacht clubs that are within the Blue Plan planning area. CT Marina Facilities data were clipped to the data extent. These data were merged in to a new layer along with the cruising guide data for New York to create one unified layer of known marinas and yacht clubs. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

Draft Significant Human Use Area Map: Boat Launches

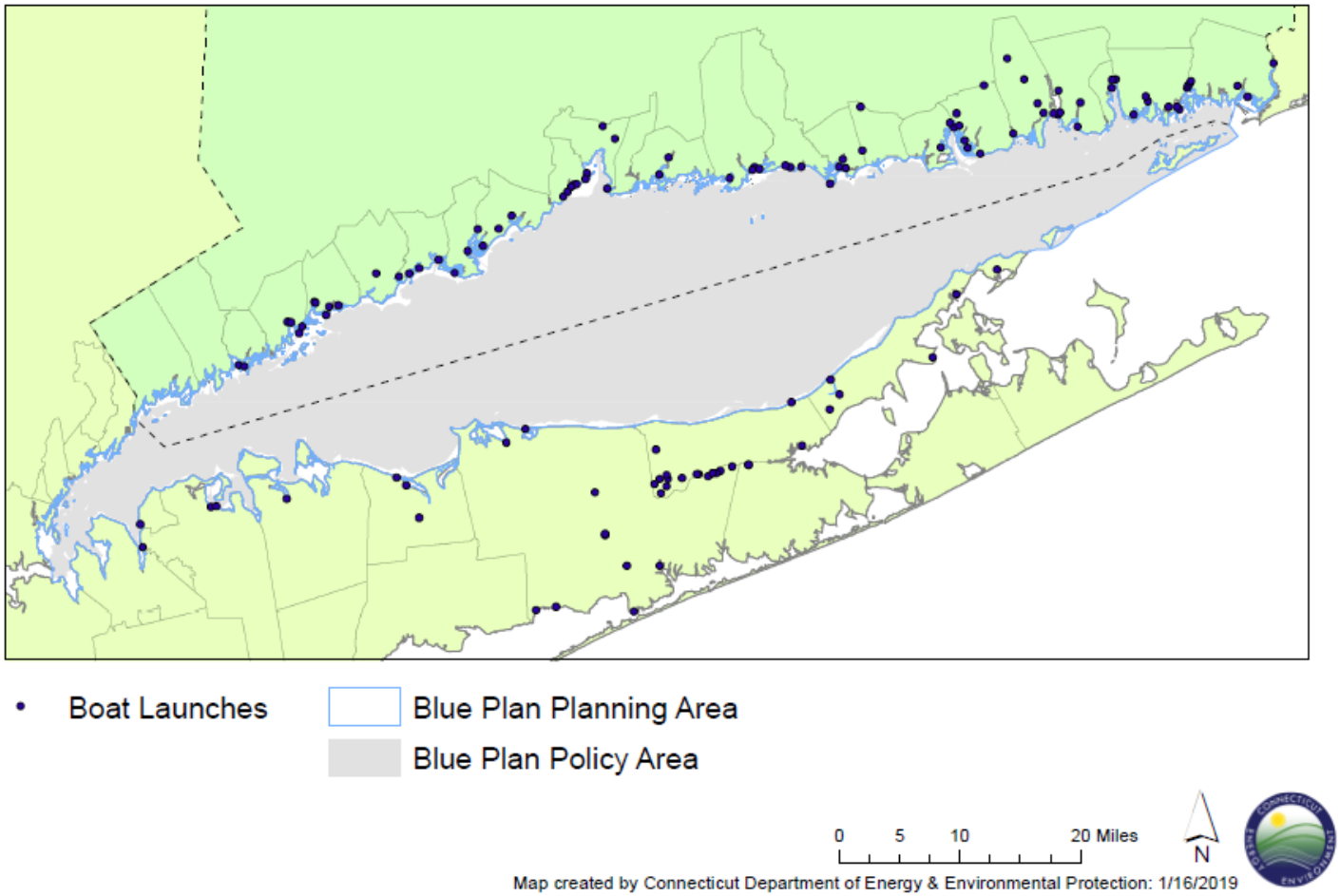


Figure 3a-16 Final SHUA map of boat launches, under the marinas, yacht clubs, and boat launches criteria.

LIS Boat Launches

Table 3a-22 Data construction table for Boat Launches.

SHUA Criteria	Areas of substantial recreational and/or quality of life value.
SHUA Sub-criterion	LIS Marinas, Yacht Clubs, and Boat Launches
SHUA Sub-criterion Description	Locations of boat launches that are within the Blue Plan planning area.
Data Source(s)	GIS data layer: • Boat Launches (Northeast Ocean Data portal)
Data Extent	The Connecticut and New York coastal town boundaries adjacent to the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66.
Data Adjustment and Pre-processing	Boat launch data from the Northeast Ocean Data portal was clipped to the data extent. Data layers stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018.
General Web Service Data Description	Boat launches are state, municipal, local, or privately owned sites that provide boating access to coastal waters, lakes, ponds, and rivers. Sites may be ramps suitable for trailered or carried-in boats, or landing facilities. Locations only suitable for shoreline fishing access and not boat put-in were not included in this dataset. This dataset is comprised of individual datasets provided by various sources in the northeastern U.S. Boat launch specific data was extracted from the source data, duplicate records were removed based on point location accuracy and data acquisition date, and datasets were merged into a single regional product. Points outside a 10km coastal buffer were eliminated. Based on source data, this product may not indicate private or public access for a given launch site and users are advised to determine accessibility prior to using a site.

	When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

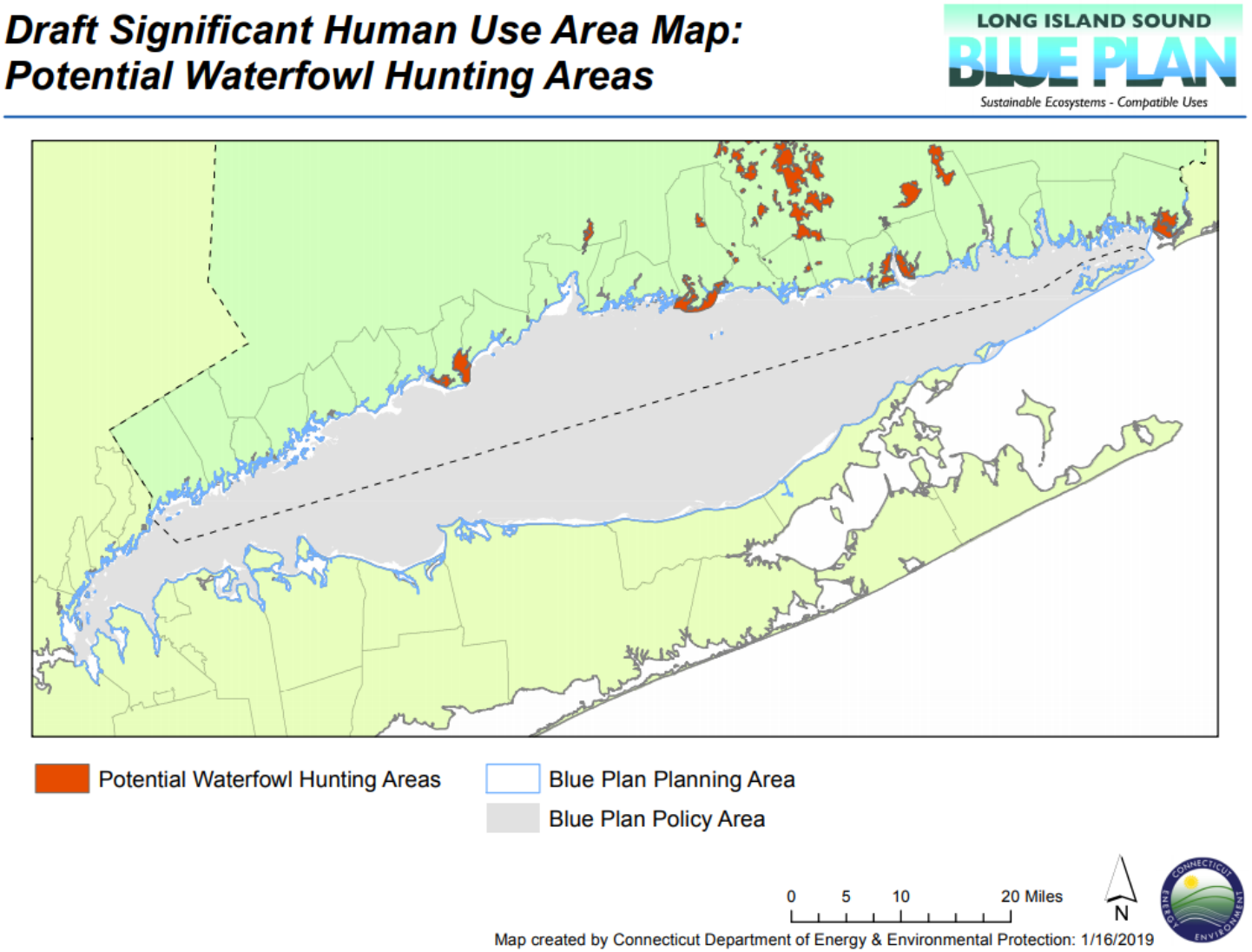


Figure 3a-17 Final map of potential waterfowl hunting areas, under the Waterfowl Hunting SHUA criteria.

Potential Waterfowl Hunting Areas

Table 3a-23 Data construction table for waterfowl hunting areas.

SHUA Criteria	**Areas of substantial recreational and/or "quality of life" value**
SHUA Sub-criterion	Waterfowl Hunting
SHUA Sub-criterion Description	Areas in Long Island Sound important for waterfowl hunting, including sea duck habitat.
Data Source(s)	GIS Data layer: • CTDEEP Areas Open For Hunting • CTDEEP Migratory Waterfowl Concentration Areas
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66 and the Connecticut and New York coastal town boundaries adjacent to the Long Island Sound Blue Plan planning area. To delineate the Blue Plan planning area, CTD EEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data from each source were clipped to the Data Extent. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	Data from the Areas Open for Hunting layer were selected to include those areas designated as open to waterfowl hunting. As these areas are generally reflective of upland marshes, areas from the Migratory Waterfowl Concentration layer (which typically includes both coastal marshland and offshore areas) that were adjacent to waterfowl hunting areas were also selected. The selected records were merged together into a new layer with the attribute field "BP_Source" used to identify areas from the original source material
Data Classification	The data are not classified by any attributes to support the SHUA assessment, but the "BP_Source" attribute can be used to classify them based on their original data sources.

Date Created	December, 2018
General Web Service Data Description	Areas in Long Island Sound important for waterfowl hunting, including sea duck habitat. Data from the Areas Open for Hunting layer were selected to include those areas designated as open to waterfowl hunting. As these areas are generally reflective of upland marshes, areas from the Migratory Waterfowl Concentration layer (which typically includes both coastal marshland and offshore areas) that were adjacent to waterfowl hunting areas were also selected. The selected records were merged together into a new layer with the attribute field "BP_Source" used to identify areas from the original source material When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

Draft Significant Human Use Area Map: Dive Locations

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

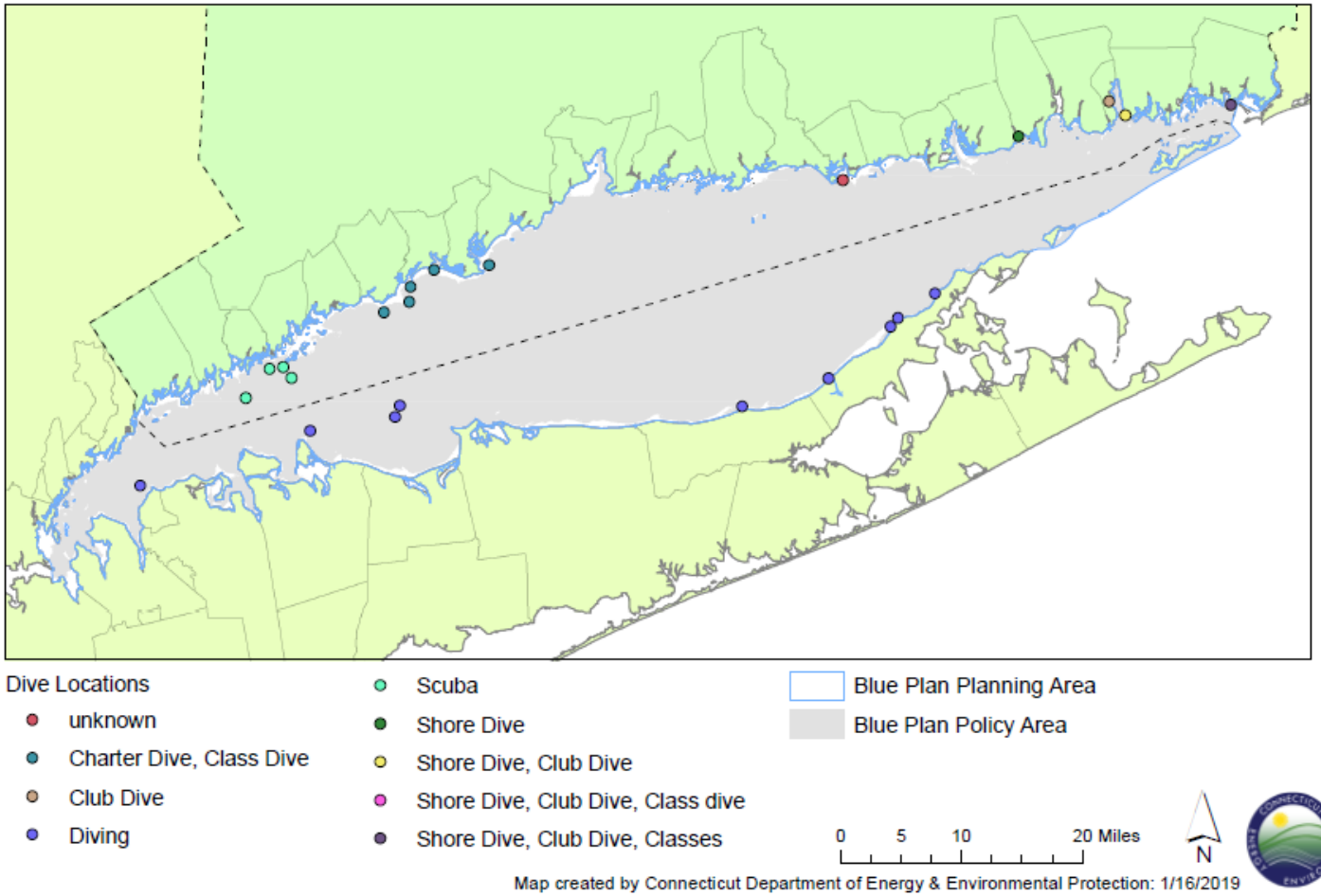


Figure 3a-18 Final SHUA map of dive locations, under the dive sites criteria.

Dive Locations

Table 3a-24 Data construction table for dive locations, under the dive sites criteria.

SHUA Criteria	Areas of substantial recreational and/or "quality of life" value
SHUA Sub-criterion	Dive Sites
SHUA Sub-criterion Description	Locations in Long Island Sound important for SCUBA activities.
Data Source(s)	Locations dive sites in LIS provided through a participatory mapping exercise with stakeholders from the LIS diving community
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	An online web mapping viewer was created to log point locations provided by stakeholders from the LIS diving community.
Data Analysis	The online web mapping viewer was used during several public meetings to log places and basic information on LIS diving locations. Point locations used NOAA Nautical charts for reference, but should be considered approximate. Data from the mapping exercises were projected in UTM Zone 18N NAD83. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.
Data Classification	N/A
Date Created	November 2018

General Web Service Data Description	Locations dive sites in LIS provided through a Blue Plan participatory mapping exercise with stakeholders from the LIS diving community. An online web mapping viewer was created to log point locations provided by stakeholders from the LIS diving community. The online web mapping viewer was used during several public meetings during 2018 to log places and basic information on LIS diving locations. Point locations used NOAA Nautical charts for reference, but should be considered approximate. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

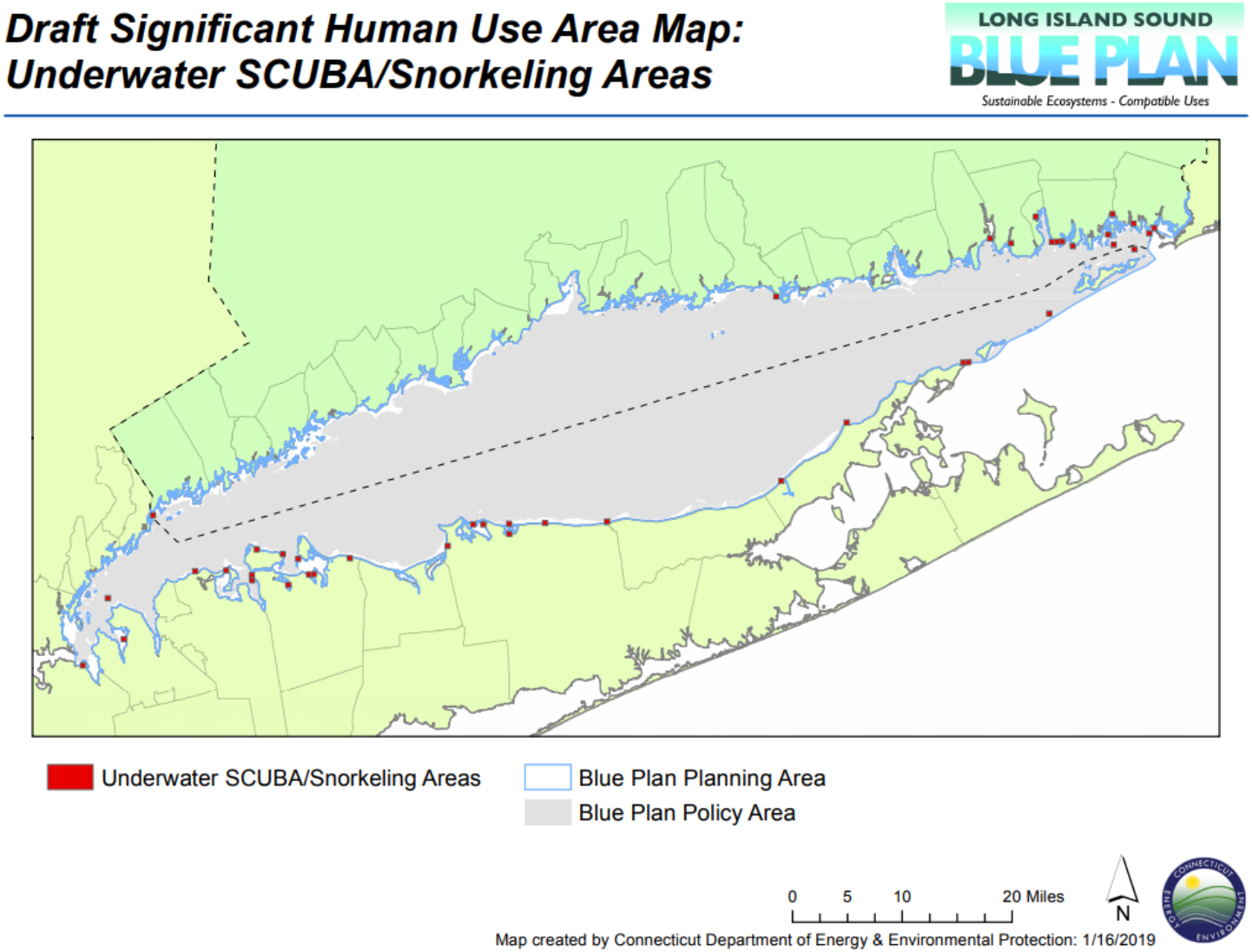


Figure 3a-19 Final SHUA map for Underwater SCUBA and Snorkeling areas, under the dive sites criteria.

Underwater SCUBA/Snorkeling Areas

Table 3a-25 Data construction table for underwater SCUBA and Snorkeling areas.

SHUA Criteria	Areas of substantial recreational and/or "quality of life" value
SHUA Sub-criterion	Dive Sites
SHUA Sub-criterion Description	Locations in Long Island Sound important for SCUBA activities.
Data Source(s)	GIS Data layer: • Mid Atlantic Coastal and Ocean Recreation Study - Underwater-based Activities (Mid-Atlantic Regional Coastal and Ocean (MARCO) data portal)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CTDEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Underwater-based activity data from the MARCO data portal was clipped to the data extent. Data layers stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	November 2018

General Web Service Data Description	The goal of this study was to gather data on coastal and ocean recreation spatial use patterns to inform marine planning efforts in the U.S. Mid Atlantic region. The following is a description of the methods used to create the data for the Mid Atlantic Coastal and Ocean Recreation Study. The data were collected through an online survey deployed from July 1, 2013 to December 31, 2013. The survey respondents provided spatial information by placing a marker to indicate where they recreated on the coast in the last 12 months. The activity points used for this sightseeing activities group were SCUBA diving from a charter boat, SCUBA diving from shore or a boat, and free diving/snorkeling. This dataset shows a 1 kilometer by 1 kilometer planning unit grid that the underwater activity points were summarized to.

Draft Significant Human Use Area Map: Recreational SCUBA Areas

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

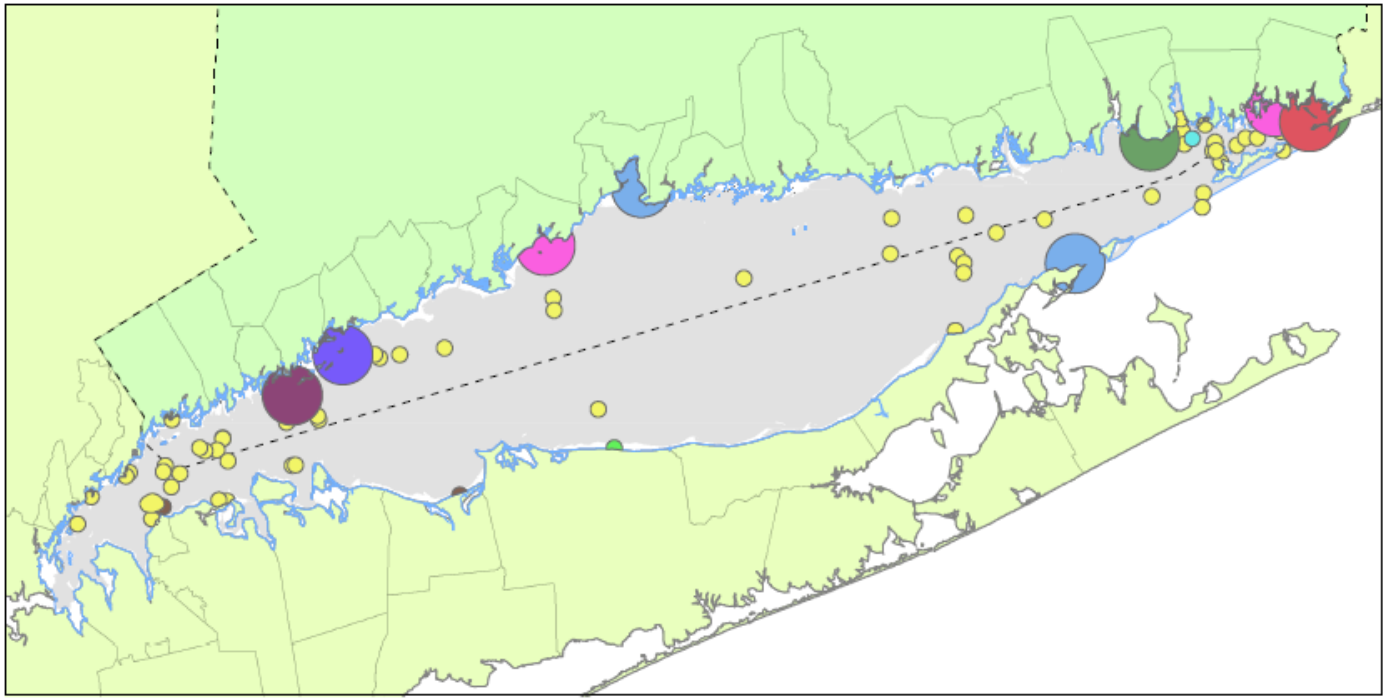


Figure 3a-20 Final SHUA map of recreational SCUBA areas, under the dive sites criteria.

Recreational SCUBA Areas

Table 3a-26 Data construction table for Recreational SCUBA areas.

SHUA Criteria	Areas of substantial recreational and/or "quality of life" value
SHUA Sub-criterion	Dive Sites
SHUA Sub-criterion Description	Locations in Long Island Sound important for SCUBA activities.
Data Source(s)	GIS Data layer: • 2015 Northeast Coastal and Ocean Recreational Use Characterization Study - SCUBA Activities (Northeast Ocean data portal)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CTD EEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Underwater-based activity data from the NEDOP data portal was clipped to the data extent. Data layers stored in UTM Zone 18N, NAD83.
Data Analysis	Based on the list of use types found in the "SiteChar" attribute field and the overall location and extent of the values listed as "unspecified", locations with the "unspecified" classification were removed from consideration.

Data Classification	The data do not include any locations where the "siteChar" field contained values of "unspecified."
Date Created	October, 2018
General Web Service Data Description	The Recreational SCUBA Diving Areas layer depicts activity areas mapped by participants in the Northeast Coastal and Marine Recreational Use Characterization Study, which was conducted by SeaPlan, the Surfrider Foundation, and Point 97 under the direction of the Northeast Regional Planning Body (NE RPB). In order to fill a regional need to better understand the spatial patterns of important recreational activities in New England, the study was focused on collecting information on commercial whale watching, SCUBA diving, sailing races and regattas, competitive board and paddle events, beach going, wildlife viewing, surfing, and non-motorized boating sports. This document describes the processes for developing the SCUBA diving data component of the study. Additional information can be found in the study's final report. Shore- and boat-based recreational SCUBA diving is a popular activity occurring at various sites throughout the Northeast, primarily focusing around historical shipwrecks, interesting benthic habitat communities, and popular wildlife viewing areas. Despite the relatively cool water temperatures, diving activity in the Northeast occurs year-round but is concentrated in the months of May through October, and is clustered around regions with attractive underwater topography. Much diving activity occurs from private boats or from the shore, while groups may also charter diving excursions through professional dive boats. Characterization of recreational SCUBA diving was a priority for the NE RPB and this study, since SCUBA divers are impacted by economic and environmental forces and because of the high potential for interaction between SCUBA diving and other ocean uses. The team collaborated with SCUBA diving experts, such as dive club members, dive shop owners and instructors, and charter operators to help guide the development, execution, and review of the study components. Based on the input from diving experts and guidance from an NE RPB project steering committee, initial data collection efforts began in the spring of 2015. Data collection This study was an attempt to compile data from multiple sources by using a single methodology to characterize SCUBA activity on a region-wide scale. Data collection took place using both online tools and in-person workshops, as well as by researching publicly-available online and print sources of information for regional diving locations. The first phase of data collection took place using an online survey tool. Dive club members, dive shop owners and employees, tour and charter operators, and other diving experts were invited to register for the online survey, and received a unique link to the survey via email. The survey was live from March 31st – May 25th, 2015 and utilized Google Maps and a nautical chart interface which allowed users to map polygons depicting highly-used recreational dive sites. After mapping a diving area, survey users were asked to provide details on the site, including: The features of interest at the wreck (e.g., man-made structure, habitat, or wildlife) Whether the area was a wreck site The name of the wreck (if applicable) The age of the wreck (if applicable) The type of vessel of the wreck (if applicable) Whether the area was considered sensitive The number of divers that typically visit the site in a year Types of activities that typically took place at the site (e.g., exploration, photography, fishing) Site access (i.e. shore or boat) Amenities at shore-based access point (e.g., parking, dive shop, restrooms) Water visibility at site Season when site is most frequently visited Best moon phase at which to visit site While the survey was live, the team used SeaSketch, a web-based platform that allows registered users to view and interact with mapped ocean data, to vet interim data with industry experts in order to identify data gaps and strategize additional outreach opportunities. Once survey data were analyzed, the team presented the data at four dedicated meetings in the study area. These meetings took place in

	Portland, ME, Nahant, MA, West Sayville, NY and East Lyme, CT during Summer 2015. At these meetings, industry representatives had the opportunity to view and provide feedback on the data collected using the online survey and SeaSketch, and were also able map new sites or provide additional detail on existing sites, if known; however, for the sake of time, workshop participants were not asked to provide as many site-specific characteristics (e.g. water visibility, ideal moon phase) as were requested in the survey. Additional mapping was conducted using the eBeam tool. The eBeam tool consists of a wireless electronic stylus, a receiver, and computer software, and utilizes a projector to project a computer screen onto a flat surface (such as a whiteboard or wall) onto which a stylus is used by participants to draw areas of activity. With this implementation of the eBeam tool, participants digitized polygons on the projected GIS-based map which allowed the features to be automatically saved and then attributed with information the participants shared during the concurrent discussion. The team also held several webinars in which SCUBA experts could identify and fill in data gaps. SCUBA experts who were unable to attend the meetings were allowed to review and add data in SeaSketch, or to add data remotely via webinar. As part of the process of updating the Rhode Island Ocean Special Area Management Plan (RI OSAMP), Rhode Island Coastal Resources Center/Rhode Island Sea Grant (RI CRC/RI SG) held in-person meetings with stakeholder experts who identified additional, highly-used SCUBA diving areas in or near RI waters. During this process, the team collaborated closely with RI CRC/RI SG to determine how best to integrate these, as well as data from the existing OSAMP into the study data. Background research and conversations with diving experts identified a number of both online and print sources that provided additional data on popular dive sites. This led to the creation of an additional spatial dataset depicting the point locations of popular dive sites, as identified on state-based geospatial data resources, diving websites, as well as published diving guidebooks. In general, data from these additional sources do not provide the level of detail on site characteristics (e.g. moon phase) as were requested from survey participants. As such, data from these sources focus on location and nearby landmarks. Data processing In order to protect the location of potentially sensitive diving areas, such as historic or culturally important wrecks and other archeological resources, the team generalized the data of the more specific mapped sites from the online survey by taking the center point of each mapped polygon, and applying a 5 km buffer around each center point. Areas mapped during the in-person workshops were either very small and site specific or very large and general. Small, site-specific data from the PGIS workshops were treated similarly to the site-specific data from the online survey, except the buffer distance used was 1 km. The justification for the smaller buffer distance stems from workshop participants assertions that the areas that they were mapping were not considered sensitive. Larger, mapped areas that may cover some sensitive sites were considered large and general enough to be kept as is. These data were edited to eliminate self-intersecting loops and other topological errors using ArcGIS editing tools. In order to make these data geometrically compatible with the data collected from study participants, 1 km buffer was also added to the following, additional sources: Data gathered from the RI OSAMP meetings (buffer applied to center point of mapped area) Data gathered from print or online SCUBA guides (buffer applied to point location) Data gathered from other sources (e.g. phone calls or unpublished data sources) (buffer applied to center point of mapped area) For the online survey data, the team also filtered mapped SCUBA sites based on the size of the mapped polygon. The size and spatial resolution of mapped polygons varied widely, with some users mapping polygons that covered extremely large areas, including one that spanned the majority of the Gulf of Maine. Because these large areas have limited utility from an ocean planning perspective, the team characterized all mapped areas larger than 100 km2, as general, rather than specific diving areas. These general diving areas are not included in maps and spatial data products because of their limited utility, but rather, are listed in the final report of the study.

	For the purposes of the LIS BLue Plan, Underwater-based activity data from the NEDOP data portal was clipped to the data extent. Based on the list of use types found in the "SiteChar" attribute field and the overall location and extent of the values listed as "unspecified", locations with the "unspecified" classification were removed from consideration. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

Draft Significant Human Use Area Map: Coastal Access Sites

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

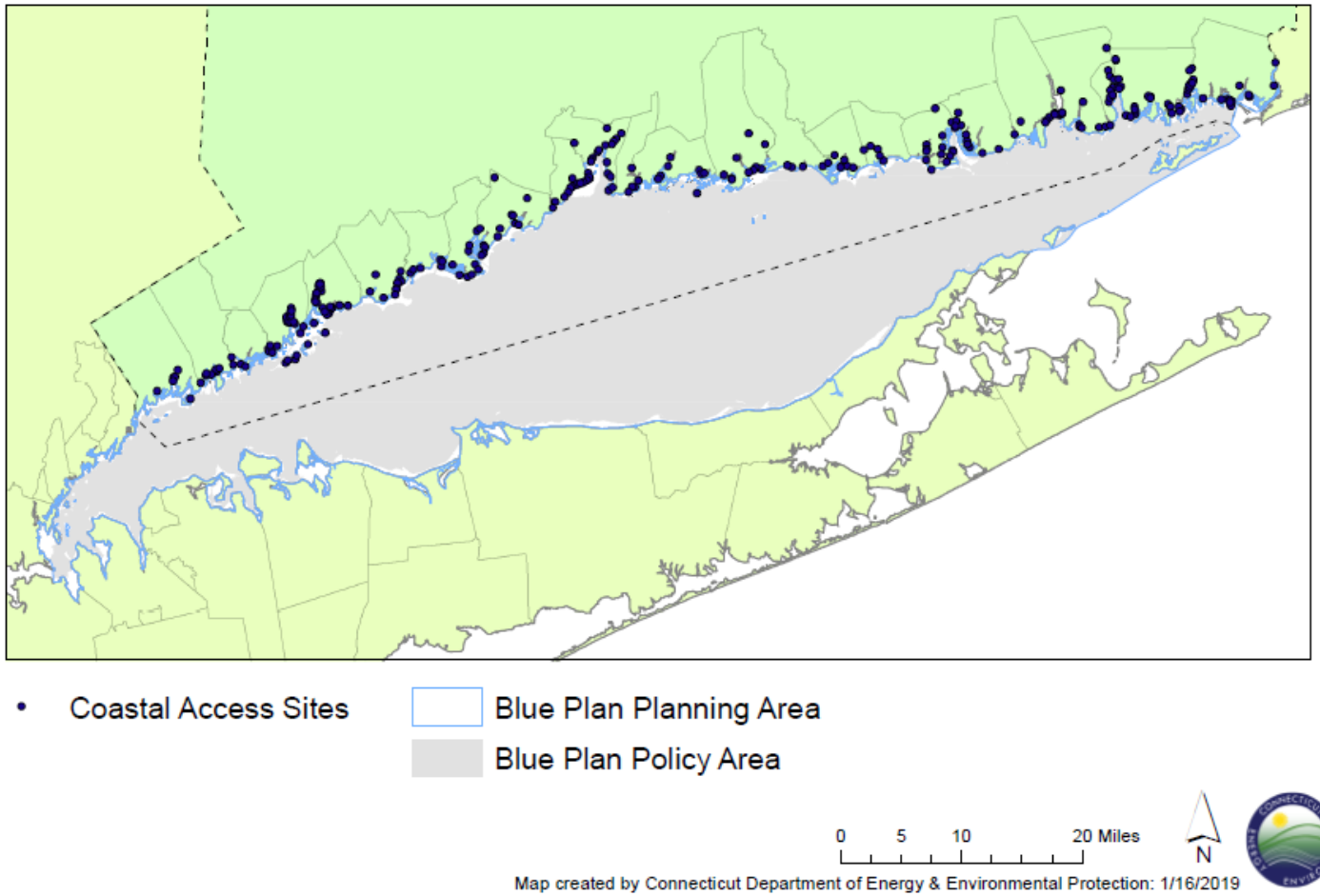


Figure 3a-21 Final SHUA map of coastal access sites, under the coastal public use areas criteria.

Coastal Access Sites

Table 3a-27 Data construction table for Coastal Access Sites.

SHUA Criteria	Areas of substantial recreational and/or "quality of life" value
SHUA Sub-criterion	Coastal Public Use Areas
SHUA Sub-criterion Description	Areas important for public access and use of Long Island Sound for recreational activities including but not limited to swimming, paddling, and wildlife watching.
Data Source(s)	GIS Data layer: • Connecticut Coastal Access Sites (CTDEEP)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CTD EEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	The data layer was clipped to the data extent. Data layer was stored in UTM Zone 18N, NAD83.
Data Analysis	The data provide a comprehensive listing of locations along the Connecticut coast providing public access, but there are locations already reflected in other data sets such as "CT & NY Open Space and Parklands" and "Boat Launches". Therefore, coastal access sites with the same name and in the same general location were removed, leaving the records from the other layers to identify these locations. This prevented the inclusion of multiple instances of the same sites across different layers.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018

General Web Service Data Description	Areas important for public access and use of Long Island Sound for recreational activities including but not limited to swimming, paddling, and wildlife watching. The data provide a comprehensive listing of locations along the Connecticut coast providing public access, but there are locations already reflected in other data sets such as "CT & NY Open Space and Parklands" and "Boat Launches". Therefore, coastal access sites with the same name and in the same general location were removed, leaving the records from the other layers to identify these locations. This prevented the inclusion of multiple instances of the same sites across different layers. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

Draft Significant Human Use Area Map: Individual Ocean Uses

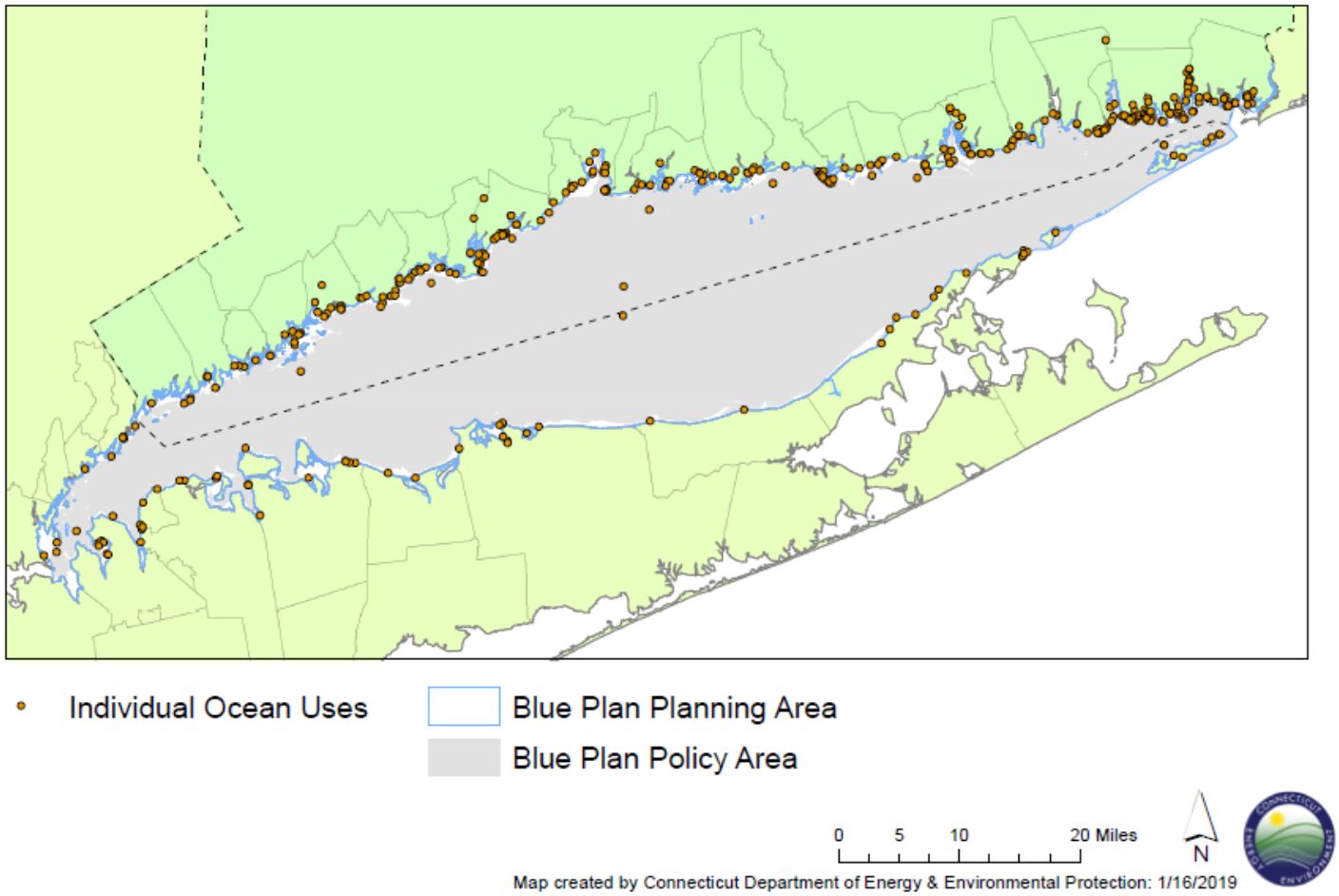


Figure 3a-22 Final SHUA map of individual ocean uses, under the coastal public use areas criteria.

Individual Ocean Uses

Table 3a-28 Data construction table for Individual Ocean Uses.

SHUA Criteria	Areas of substantial recreational and/or "quality of life" value
SHUA Sub-criterion	Coastal Public Use Areas
SHUA Sub-criterion Description	Areas important for public access and use of Long Island Sound for recreational activities including but not limited to swimming, paddling, and wildlife watching.
Data Source(s)	GIS Data layer: • 2015 Northeast Coastal and Ocean Recreational Use Characterization Study – Individual Use Survey components (Northeast Ocean data portal)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CTD EEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Individual Ocean Use activity data from the NEDOP data portal was clipped to the data extent. Data layers stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018

General Web Service Data Description	The Individual Ocean Uses layer depicts activity areas mapped by participants in the Northeast Coastal and Marine Recreational Use Characterization Study, which was conducted by the Surfrider Foundation, SeaPlan, and Point 97 under the direction of the Northeast Regional Planning Body (NE RPB). In order to fill a regional need to better understand the spatial patterns of important recreational activities in New England, the study was focused on collecting information on commercial whale watching, SCUBA diving, sailing races and regattas, competitive board and paddle events, beach going, wildlife viewing, surfing, and non-motorized boating sports. This document describes the processes for developing the data component of the study which focuses on individual coastal and ocean recreational uses, such as beach going, surfing, board and paddle sports, wildlife viewing, sightseeing, and other activities described in further detail below. Note that SCUBA diving was included in this survey so that data collected from individual users could be viewed alongside data collected in the separate component of this study that targeted SCUBA divers more specifically (see study technical report for details). This dataset depicts data from the web-based Individual User Survey (IU Survey) component of the study. The survey employed an opt-in approach where anyone 18+ years of age could participate in mapping the locations of their coastal and marine recreational activities that took place over the last twelve months. This method was optimal for increasing sample sizes to obtain data from specific user group niches (e.g., windsurfers, bird watchers, kayakers) that are difficult to adequately and confidently capture through a general population survey. This approach is particularly relevant for economically valuable and spatially localized activities such as surfing, kayaking, and kiteboarding. These types of activities are practiced by a relatively small percentage of the overall coastal and marine recreational population, yet they contribute significantly to local economies. Data collection To collect spatially explicit data on coastal and marine recreational activities, the team utilized Point 97's survey and mapping platform that was customized to this project and accessible through mobile phones, tablets, and desktop/laptop computers. The online survey was launched on November 13, 2014 and ended April 30, 2015. In the survey, respondents were asked to recount details of their coastal and marine recreation trips over the previous 12 months, and separately, of their last trip, including information about participation in recreational activities, the location of activities, and expenditures made. Through outreach efforts led by the Surfrider Foundation, survey respondents were directed to a webpage to register for the survey. Respondents then received an email with a unique link to the online survey, which they could use at any time to return to the survey if they did not complete the questions in one sitting. The survey tool allowed users to map recreational activity by placing points on a map that depicted the location where an activity took place Users could choose from the following categories: Beach going (sitting, walking, running, dog walking, kite flying, etc…) Scenic enjoyment/sightseeing Swimming or body surfing Biking or hiking Watching birds, whales, seals, and/or other marine life (from shore or private boat) Watching birds, whales, seals, and/or other marine life (from a charter/party vessel) Photography Sitting in the car watching the scene Collection of non-living resources (e.g. beach glass, shells, fossils)/beachcombing Kayaking or other paddling activity (e.g. canoe, standup paddleboard) Boating/sailing Surfing Camping Free diving/snorkeling (from shore or boat) Skimboarding SCUBA diving (from shore or private boat) SCUBA diving (from charter/party vessel) Kiteboarding Hang gliding/parasailing Each point represents the response from a unique user; however, the user could record multiple activities at the same point. Users were then asked specific questions about each mapped point and follow-up questions about their most recent trip.After the data collection phase was completed, the Surfrider Foundation conducted additional outreach to the SWG and gatekeepers to provide an update on the study and to validate the spatial data collected using SeaSketch, a web-based platform that allows registered users to view and interact with mapped ocean data, as well as webinars. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

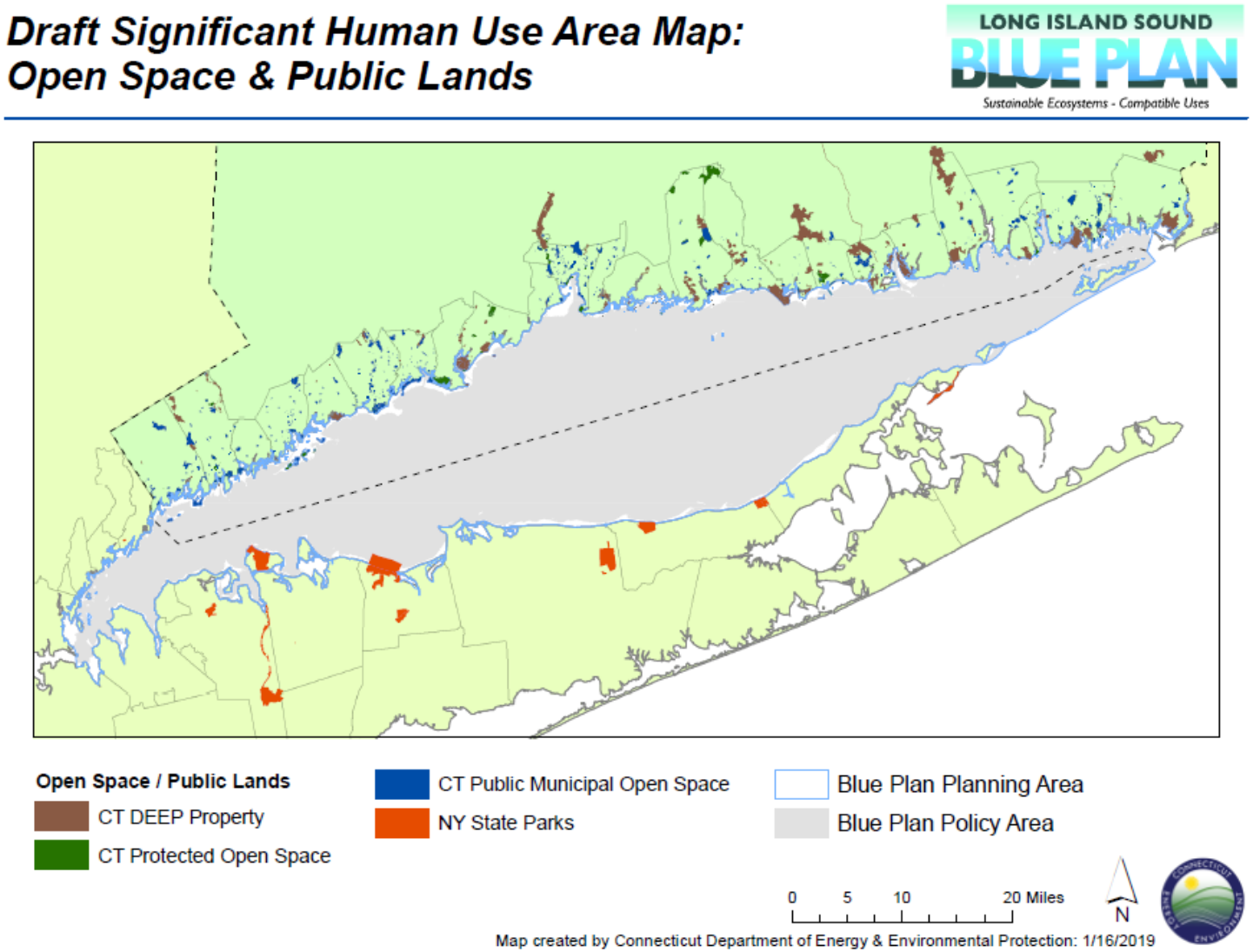


Figure 3a-23 Final SHUA map of open space and public lands, under the coastal public use areas criteria.

Open Space and Public Lands

Table 3a-29 Data construction table for Open Space and Public Lands.

SHUA Criteria	Areas of substantial recreational and/or "quality of life" value
SHUA Sub-criterion	Coastal Public Use Areas
SHUA Sub-criterion Description	Views of Long Island Sound's scenic resources from publicly accessible coastal land.
Data Source(s)	GIS data layers: • CT Protected Open Space Mapping (CTPOSM) Inventories (CT Dept. of Energy & Environmental Protection) • CT DEEP Property (CT Dept. of Energy & Environmental Protection) • CT Municipal Open Space (CT Dept. of Energy & Environmental Protection) • NY State Parks (NYS Office of Parks, Recreation and Historic Preservation)
Data Extent	The Connecticut and New York coastal town boundaries adjacent to the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66.

Data Adjustment and Pre-processing	All data were first clipped to the data extent. CTPOSM data were first filtered to identify Open Space Types of Municipal, Municipal with Buildings, or Federal. All Federal properties were retained. Municipal properties were further filtered to retain only those parcels where an entry in the "Offic_Name" field indicated or seemed to indicate it could support public access, natural area preservation/conservation, or general recreation. This could include, but not be limited to parks, recreation areas, town greens, preserves, beaches, open space, etc. No formal or definitive cross-referencing or validations were performed to conclusively verify these. CT DEEP Municipal Open Space data were filtered to focus on parcels classified within the "DESCRIPT" field as "municipal, open to the public without fee." There were further filtered to remove parcels such as cemeteries, churches, or other similar areas that based on best professional judgment, may not best support the intent of providing a location to view the scenery and vistas of Long Island Sound. No formal or definitive cross-referencing or validations were performed to conclusively verify these. New York State Parklands were included in their entirety within the Data extent. No filtering or removals were performed. CTDEEP Property were included in their entirety within the Data extent. No filtering or removals were performed. The final property layers were appended into a master layer, retaining the attribute schemes from their original sources. An additional attribute field "BP_Source" was added and populated to identify the source layer of the individual records. Where possible, common field information (name, lat/long, location descriptions, etc.) were compiled into a single field for ease of use. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment, but the "BP_Source" attribute can be used to classify them based on their original data sources.
Date Created	October, 2018

Basic Data Description	A synthesis of several sources of open space and publically accessible properties that can serve as vantage points for visual vistas of Long Island Sound. CT Protected Open Space data were first filtered to identify Open Space Types of Municipal, Municipal with Buildings, or Federal. All Federal properties were retained. Municipal properties were further filtered to retain only those parcels where an entry in the "Offic_Name" field indicated or seemed to indicate it could support public access, natural area preservation/conservation, or general recreation. This could include, but not be limited to parks, recreation areas, town greens, preserves, beaches, open space, etc. No formal or definitive cross-referencing or validations were performed to conclusively verify these. CT DEEP Municipal Open Space data were filtered to focus on parcels classified within the "DESCRIPT" field as "municipal, open to the public without fee." There were further filtered to remove parcels such as cemeteries, churches, or other similar areas that based on best professional judgment, may not best support the intent of providing a location to view the scenery and vistas of Long Island Sound. No formal or definitive cross-referencing or validations were performed to conclusively verify these. New York State Parklands were included in their entirety within the Data extent. No filtering or removals were performed. CTDEEP Property were included in their entirety within the Data extent. No filtering or removals were performed. The final property layers were appended into a master layer, retaining the attribute schemes from their original sources. An additional attribute field "BP_Source" was added and populated to identify the source layer of the individual records. Where possible, common field information (name, lat/long, location descriptions, etc.) were compiled into a single field for ease of use. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

Draft Significant Human Use Area Map: Water Trails

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

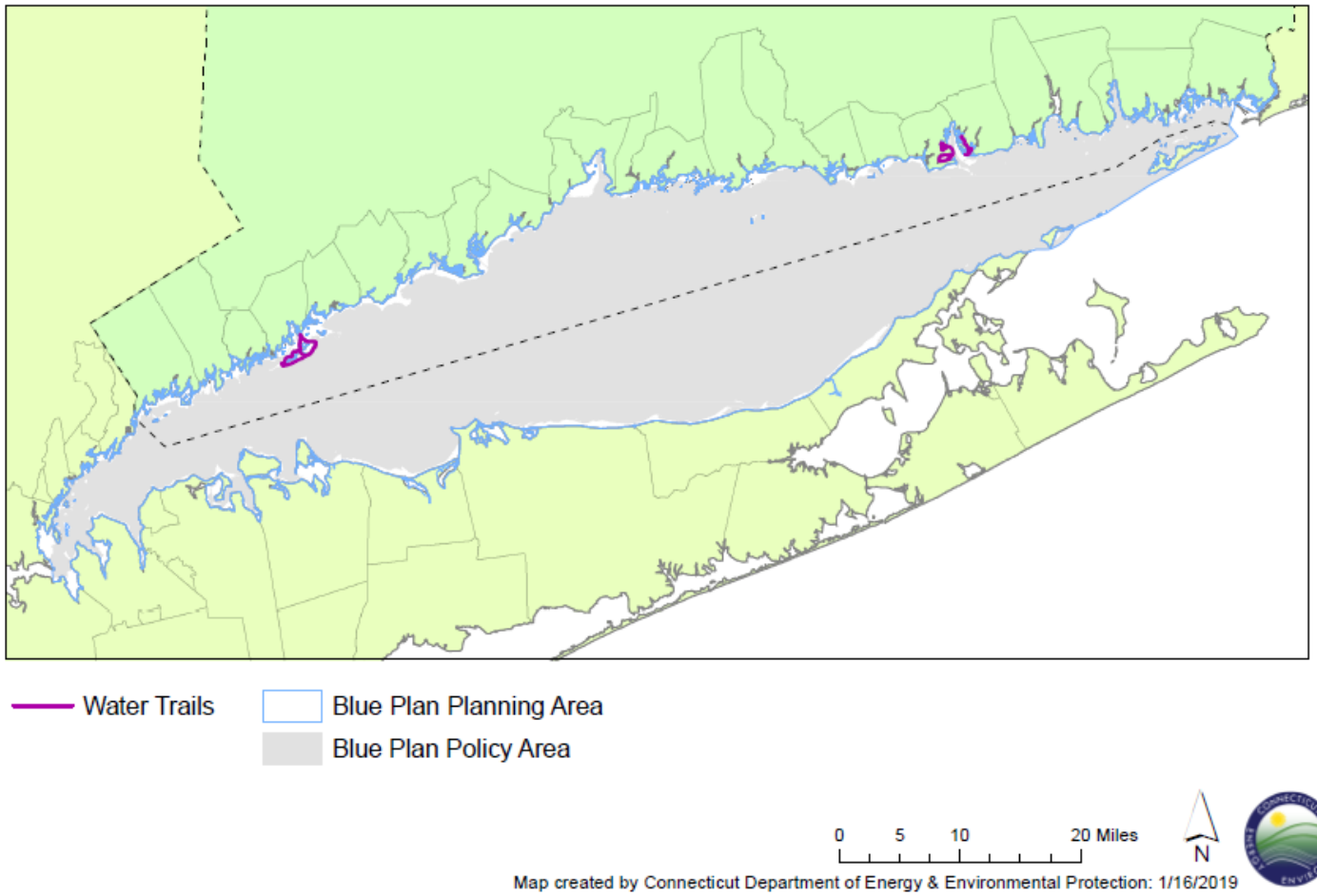


Figure 3a-24 Final SHUA map of water trails, under the coastal public use areas criteria.

Water Trails

Table 3a-30 Data construction table for Water Trails.

SHUA Criteria	Areas of substantial recreational and/or quality of life value.
SHUA Sub-criterion	Coastal Public Use Areas
SHUA Sub-criterion Description	Areas important for public access and use of Long Island Sound for recreational activities including but not limited to swimming, paddling, and wildlife watching.
Data Source(s)	GIS data layer: • Water Trails (Northeast Ocean Data portal)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CTD EEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Water Trails data from the Northeast Ocean Data portal was clipped to the data extent. Data layers stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018.

General Web Service Data Description	This dataset shows coastal water trails in the northeast United States. A water trail is an officially designated water route, or blueway, that is maintained by an agency or association. Water trails are typically used recreationally by paddlers in non-motorized boats such as kayaks or canoes. Water trails are deemed coastal if they are located within or have an endpoint in a saline water body. Information on water trails was obtained from a number of different sources which manage individual trails or which aggregate information about multiple trails in one virtual location. Source data included online web maps, static maps in PDF format, textual descriptions, and direct conversations with sponsoring agencies. This dataset is meant to depict the distribution and general locations of water trails throughout the region. It does not contain any information regarding tides, navigation, safety, navigable route within the trail, or difficulty level. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

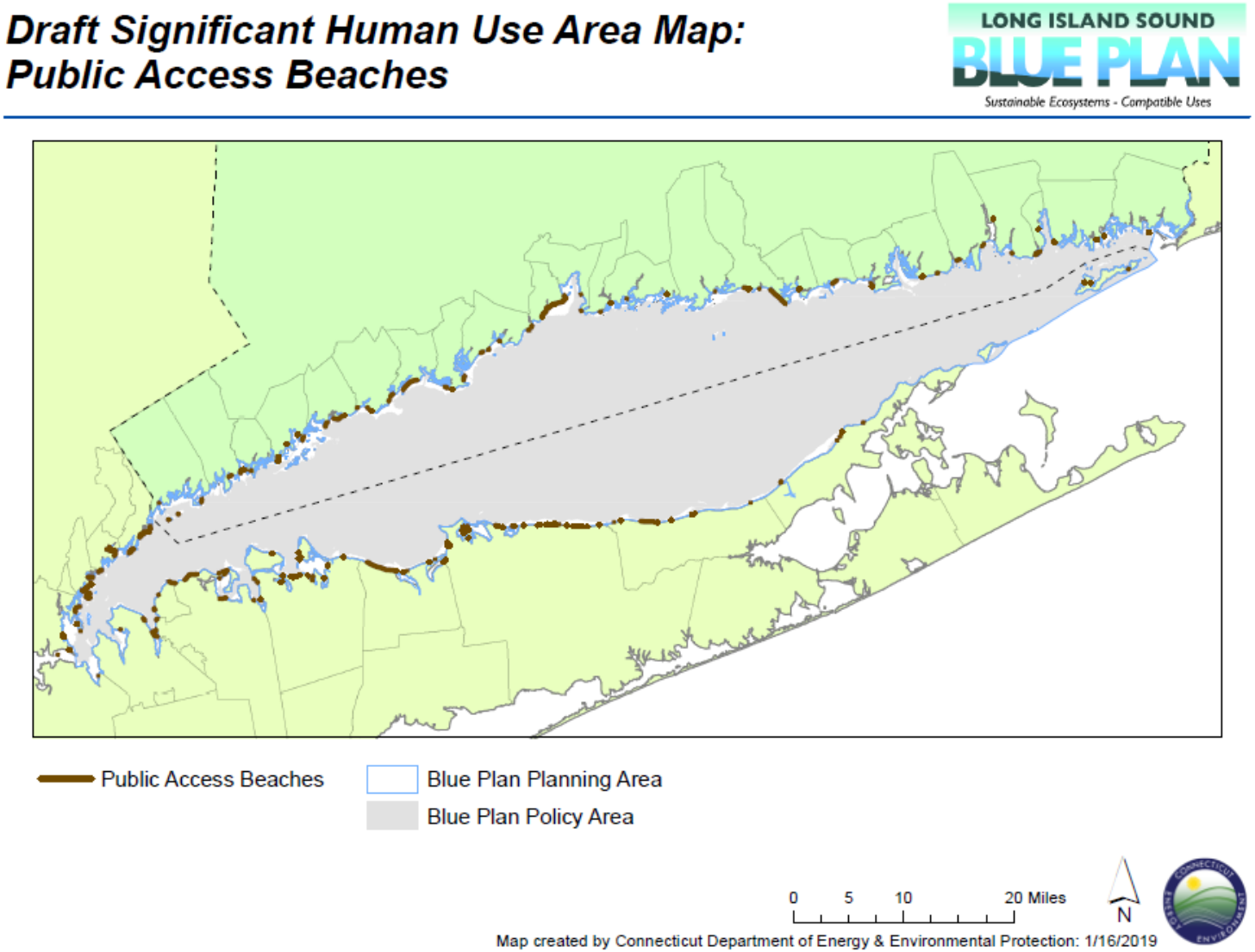


Figure 3a-25 Final SHUA map of public access beaches, under the coastal public use areas criteria.

Public Access Beaches

Table 3a-31 Data construction table for Public Access Beaches.

SHUA Criteria	Areas of substantial recreational and/or "quality of life" value
SHUA Sub-criterion	Coastal Public Use Areas
SHUA Sub-criterion Description	Areas important for public access and use of Long Island Sound for recreational activities including but not limited to swimming, paddling, and wildlife watching.
Data Source(s)	GIS Data layer: • Connecticut & New York Beaches (EPA Beaches Environmental Assessment and Coastal Health (BEACH) Reach Address Database - Beaches NHDPlus Indexed Dataset) Spreadsheet: • Connecticut & New York Beaches (EPA BEACON 2.0 Database)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CTD EEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	The GIS data layers were clipped to the data extent. Data layer was stored in UTM Zone 18N, NAD83.
Data Analysis	The GIS data provided limited usable attribute information to describe beaches overall and more critically identify public from private beaches. Spreadsheet data for public beaches that reflected this information were downloaded separately for Connecticut and New York from the EPA BEACON 2.0 database and joined to the GIS layers based on a common identifier code. The data for Connecticut and New York were then merged together to form a unified layer for the data extent.

Data Classification	The data are not classified by any attributes to support the SHUA assessment, but reflect only those beaches in Connecticut and the north shore of Long Island that are classified as "public" from EPA BEACON 2.0.
Date Created	December, 2018
General Web Service Data Description	Areas important for public access and use of Long Island Sound for recreational activities including but not limited to swimming, paddling, and wildlife watching. The GIS data provided limited usable attribute information to describe beaches overall and more critically identify public from private beaches. Spreadsheet data for public beaches that reflected this information were downloaded separately for Connecticut and New York from the EPA BEACON 2.0 database and joined to the GIS layers based on a common identifier code. The data for Connecticut and New York were then merged together to form a unified layer for the data extent. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

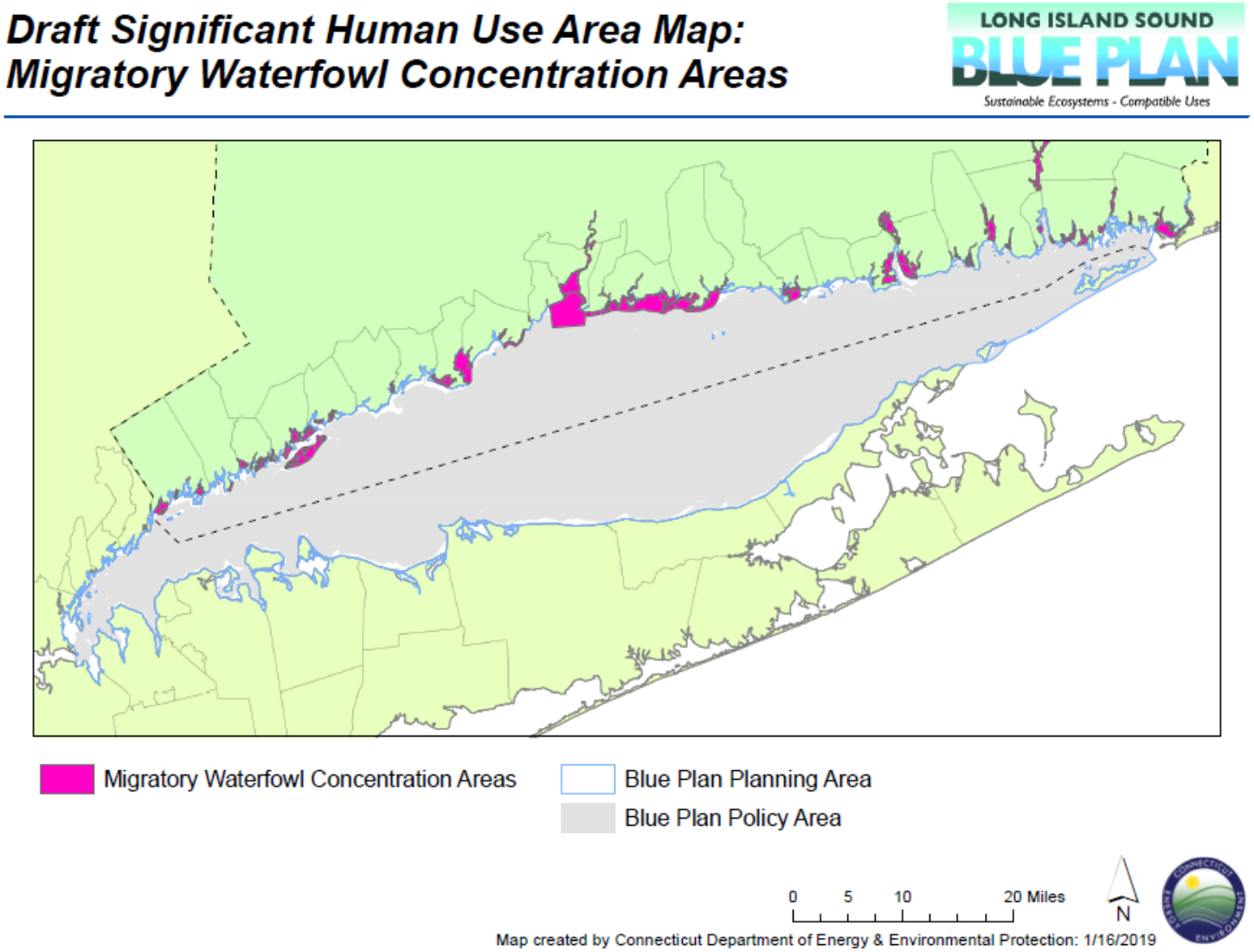


Figure 3a-26 Final SHUA map of migratory waterfowl concentration areas, under the waterfowl hunting criteria.

Waterfowl Concentration Areas

Table 3a-32 Data construction table for Waterfowl Concentration Areas.

SHUA Criteria	**Areas of substantial recreational and/or "quality of life" value**
SHUA Sub-criterion	Coastal Public Use Areas
SHUA Sub-criterion Description	Areas important for public access and use of Long Island Sound for recreational activities including but not limited to swimming, paddling, and wildlife watching.
Data Source(s)	GIS Data layer: • CTDEEP Migratory Waterfowl Concentration Areas
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66 and the Connecticut and New York coastal town boundaries adjacent to the Long Island Sound Blue Plan planning area. To delineate the Blue Plan planning area, CTD EEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data layer was clipped to the Data Extent. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018

General Web Service Data Description	Areas important for public access and use of Long Island Sound for recreational activities including but not limited to swimming, paddling, and wildlife watching. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

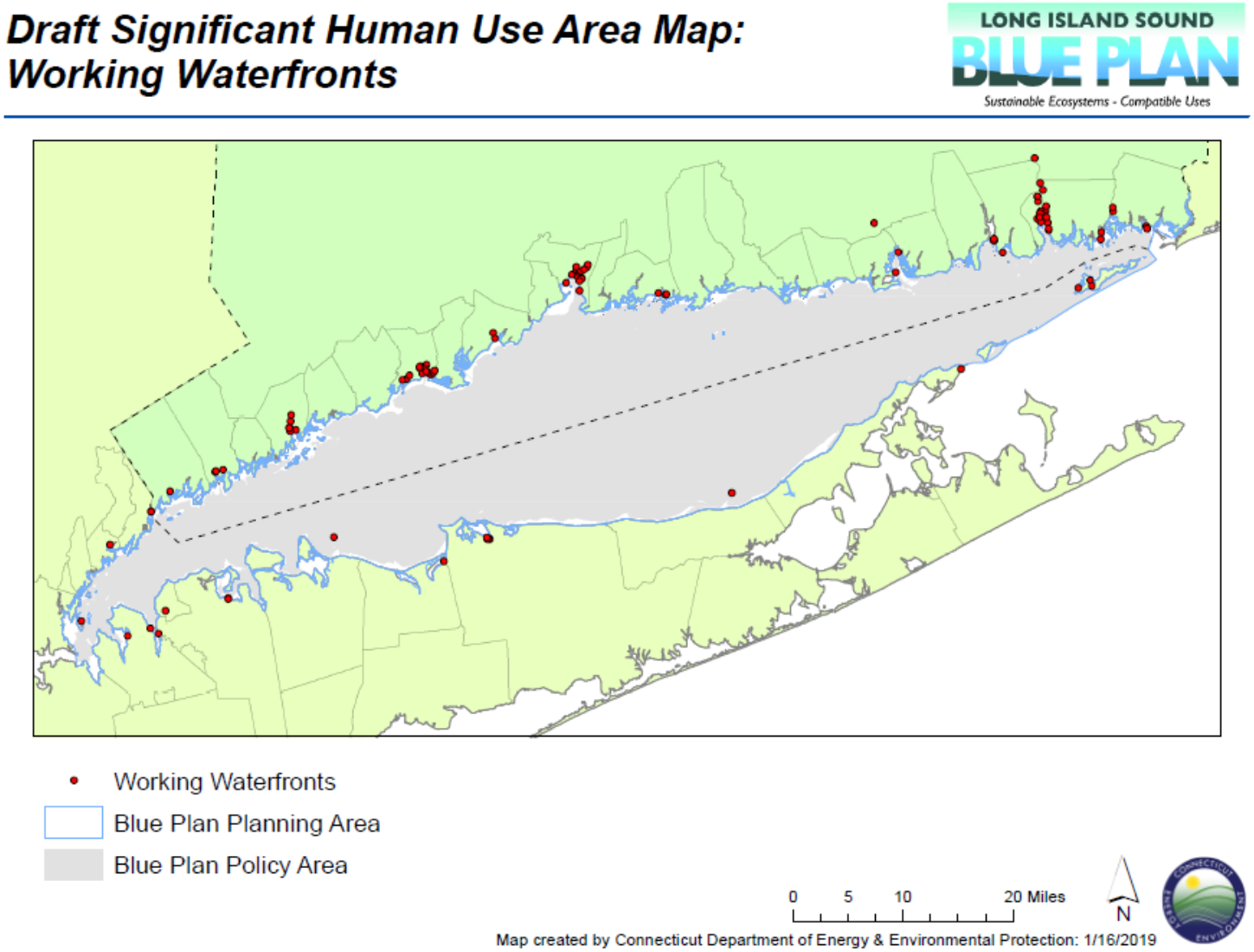


Figure 3a-27 Final SHUA map of working waterfronts, under the working waterfronts, ports, and marine commercial areas criteria.

Connecticut and New York Working Waterfronts

Table 3a-33 Data construction table for working water fronts.

SHUA Criteria	Areas important for navigation, transportation, infrastructure, and economic activity
SHUA Sub-criteria	Working Waterfronts, Ports, and Marine Commercial Areas
SHUA Sub-criterion Description	Commercial facilities that are water dependent, or service water dependent uses on Long Island Sound, including but not limited to onshore and offshore terminals and port facilities.
Data Source(s)	• Visual inventory/inspection of Aerial Imagery • CT Deep Water Port Strategy Study (CT Office of Policy & Management) • Maptech Embassy Cruising Guide: LIS • Federal Energy Regulatory Commission • US Army Corps - LIS Dredged Material Management Plan • Participatory Mapping from CT Dept. of Energy & Environmental Protection Land and Water Resource Staff
Data Extent	The Connecticut and New York coastal town boundaries adjacent to the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66.
Data Adjustment and Pre-processing	Commercial facilities that are water dependent, or service water dependent uses on Long Island Sound, including but not limited to onshore and offshore terminals and port facilities. A point based layer serving as an initial inventory was created from working waterfront facilities requiring dredging identified in the USACE DMMP. This initial dataset was enhanced with points placed on the centroid of parcels identified in OPM's Deep Water Port Strategy Study. Working waterfront points were also added from Google orthophotography and the Embassy Cruising Guide for LIS. Finally, regulatory staff from the CT Dept. of Energy & Environmental Protection Land and Water Resources familiar with water-dependent coastal waterfronts and facilities reviewed the initial inventory and added locations based on local knowledge/best-professional judgment.

	Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018.
Basic Data Description	Commercial facilities that are water dependent, or service water dependent uses on Long Island Sound, including but not limited to onshore and offshore terminals and port facilities. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

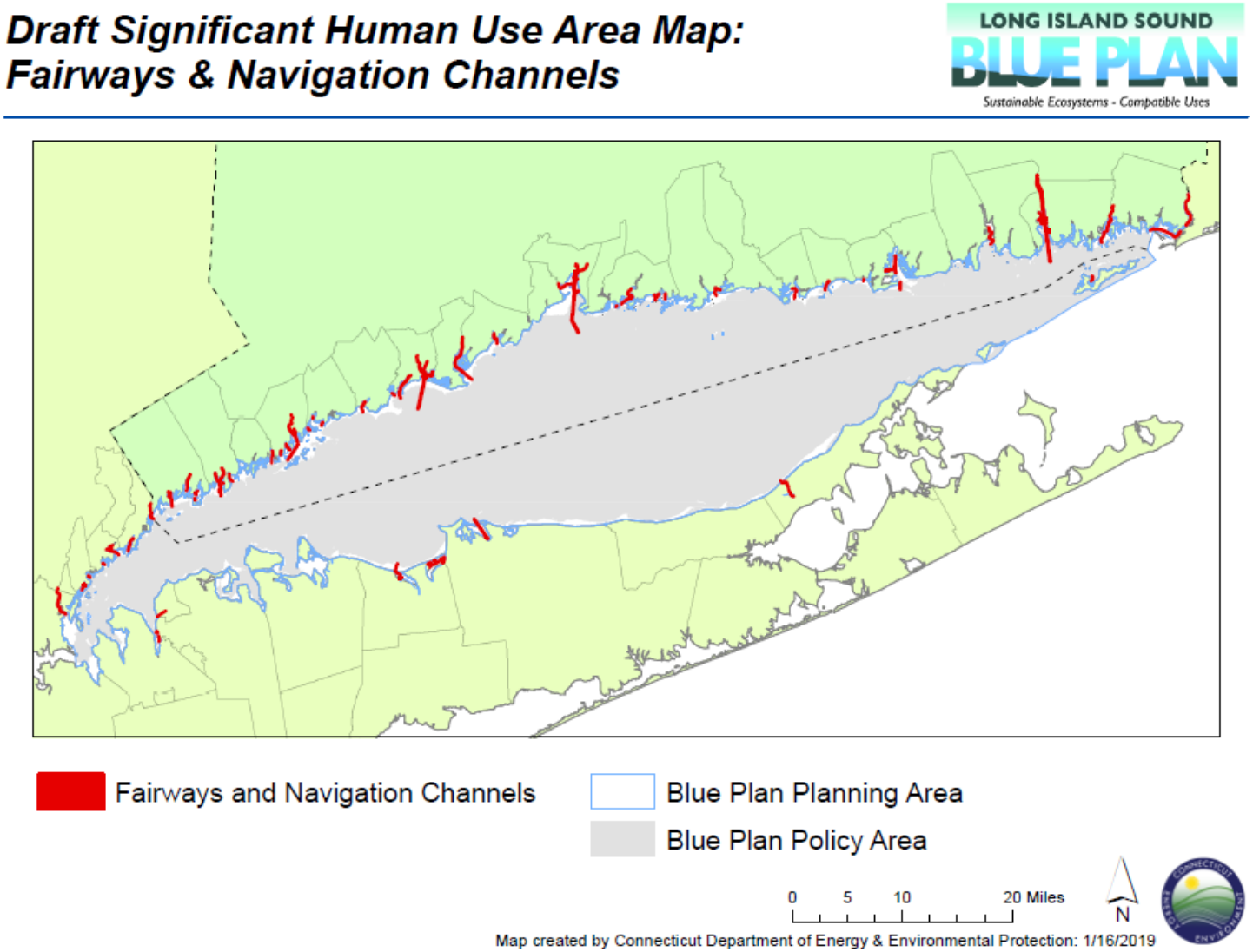


Figure 3a-28 Final SHUA map of Fairways and Navigation channels, under the designated navigational channels, fairways, and basins.

Long Island Sound Fairways and Navigation Channels

Table 3a-34 Data construction table for fairways and navigational channels.

SHUA Criteria	Areas important for navigation, transportation, infrastructure, and economic activity
SHUA Sub-criterion	Designated Navigational Channels, Fairways, and Basins
SHUA Sub-criterion Description	Designated and maintained navigational channels as they appear on the NOAA-published charts and USACE management plans. Also includes authorized privately maintained navigational channels, fairways, and basins, excluding facilities for individual residential use.
Data Source(s)	GIS Data layer: • Fairway Areas (NOAA Electronic Nautical Chart Approach data)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data were clipped to the Data Extent. Areas with no values in the OBJNAM field were flagged as "unnamed/unknown." Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.

Date Created	October, 2018
General Data Description	Designated and maintained navigational channels as they appear on the NOAA-published charts. Data were clipped to the Data Extent (the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66). Areas with no values in the OBJNAM field were flagged as "unnamed/unknown." When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

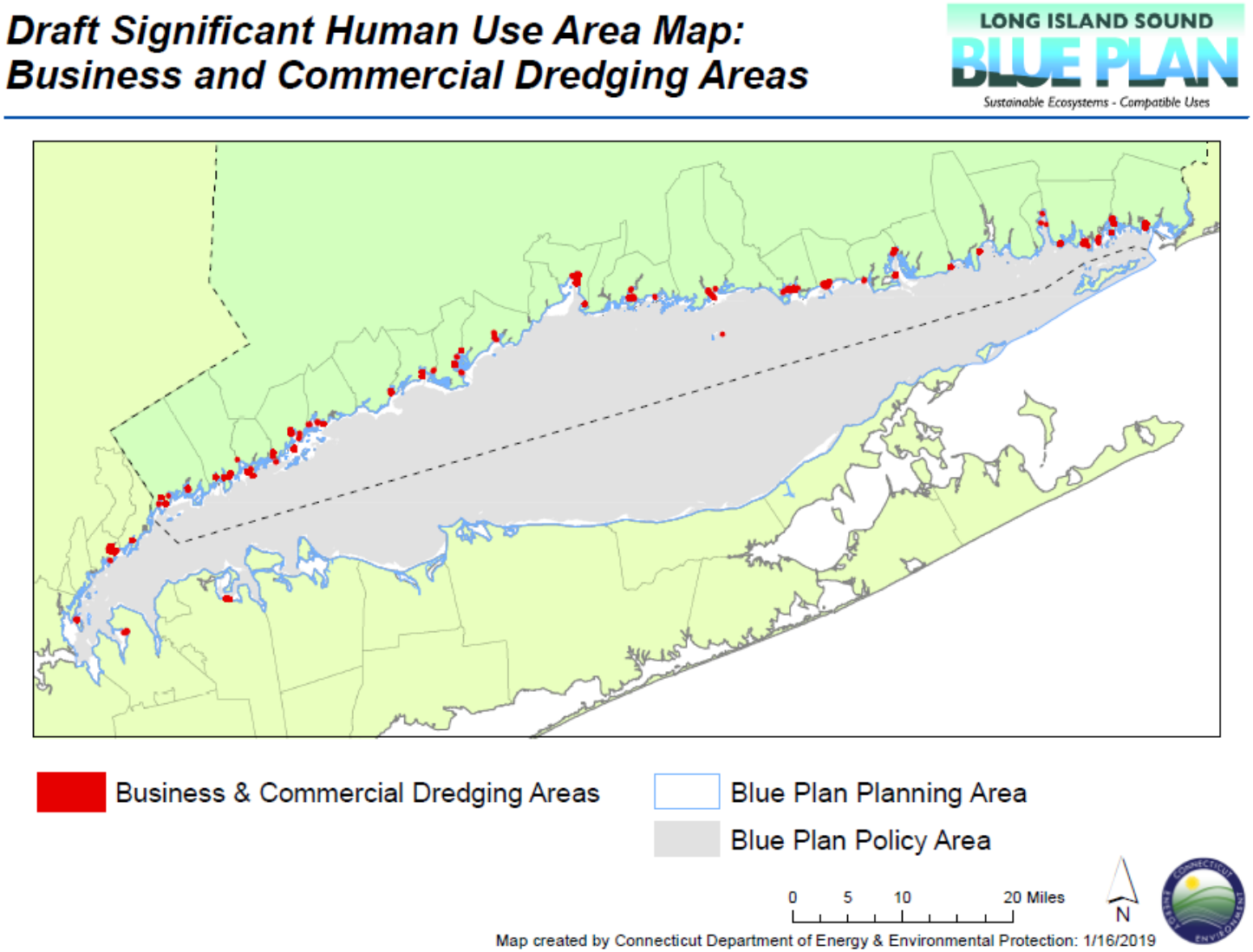


Figure 3a-29 Final SHUA map of business and commercial dredging areas, from the Sediment Quality Information Database, under the designated navigational channels, fairways, and basins criteria.

Sediment Quality Information Database - Dredged Areas

Table 3a-35 Data construction table for dredged areas from the Sediment Quality Information database.

SHUA Criteria	Areas important for navigation, transportation, infrastructure, and economic activity
SHUA Sub-criterion	Designated Navigational Channels, Fairways, and Basins
SHUA Sub-criterion Description	Designated and maintained navigational channels as they appear on the NOAA-published charts and USACE management plans. Also includes authorized privately maintained navigational channels, fairways, and basins, excluding facilities for individual residential use.
Data Source(s)	GIS Data layer: • Dredged footprint areas taken from CT DEEP Sediment Quality Information Database (SQUID)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data represent areas permitted by CTDEEP for dredging or dredged material disposal in Connecticut waters for projects authorized from the late 1980s to 2001. Areas already contained in NOAA ENC datasets as well as areas known or reasonably known to reflect projects from private homeowners were excluded. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018

General Data Description	An approximate inventory of privately maintained navigational channels, fairways, and basins, excluding facilities for individual residential use. Data represent areas permitted by CTDEEP for dredging or dredged material disposal in Connecticut waters for projects authorized from the late 1980s to 2001. Areas already contained in NOAA ENC datasets as well as areas known or reasonably known to reflect projects from private homeowners were excluded. Data reflects the best possible information as of 2001. Data were taken from permit authorizations, although there is no guarantee the permitted activities were actually carried out. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

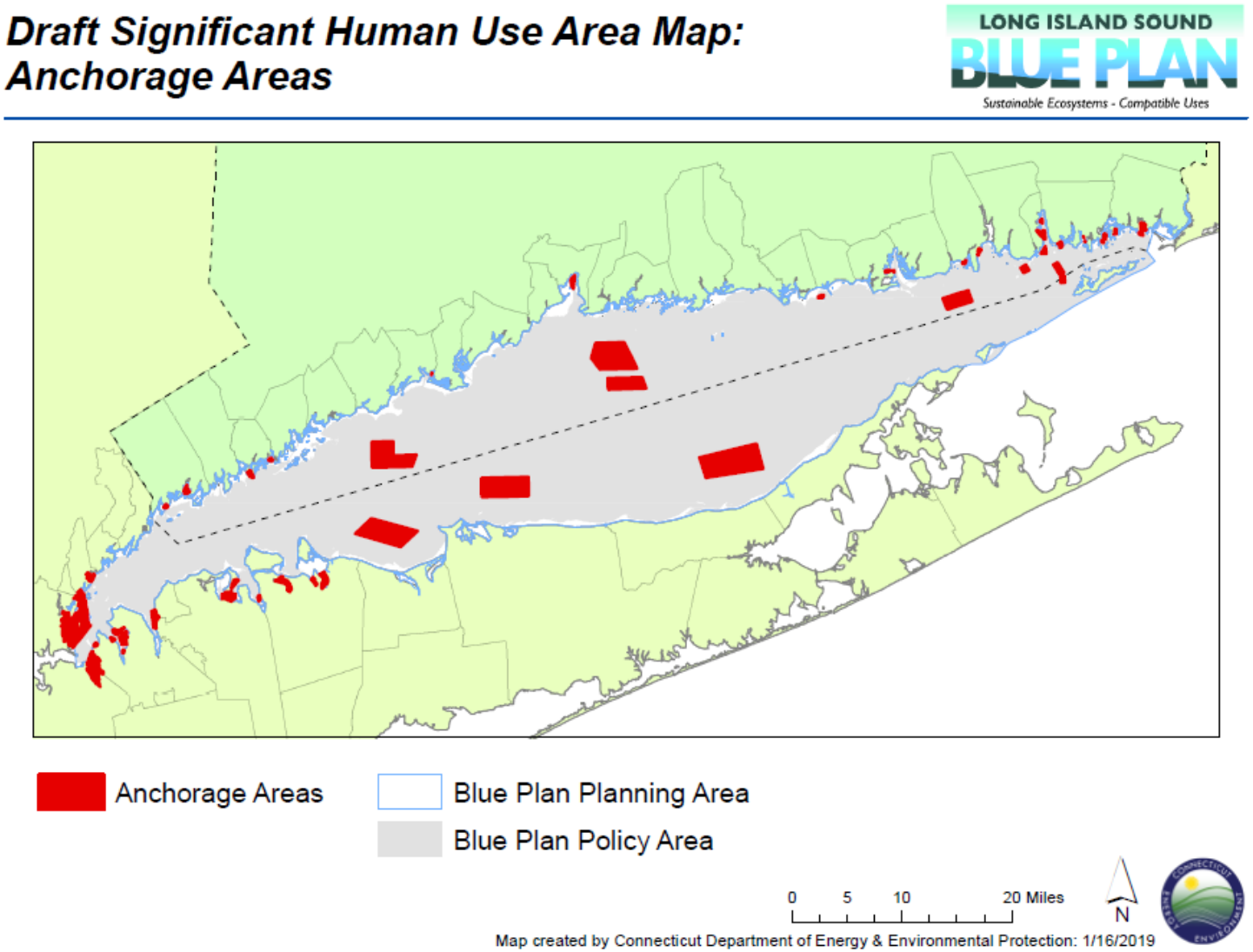


Figure 3a-30 Final SHUA map of designated anchorage areas.

Long Island Sound Anchorages

Table 3a-36 Data construction table of LIS Anchorages.

SHUA Criteria	Areas important for navigation, transportation, infrastructure, and economic activity
SHUA Sub-criterion	Designated Anchorage Areas
SHUA Sub-criterion Description	Anchorage areas as they appear on the NOAA charts, and are generally used by commercial vessels.
Data Source(s)	GIS Data layer: • Anchorage Areas (NOAA Electronic Nautical Charts – Approach data)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data were clipped to the Data Extent. Where no values appeared in "OBNAM" filed, values of "unnamed/unknown" were added. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October 2018

General Data Description	Anchorage areas as they appear on the NOAA charts. Data were clipped to the Data Extent (the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66). Where no values appeared in "OBNAM" filed, values of "unnamed/unknown" were added. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

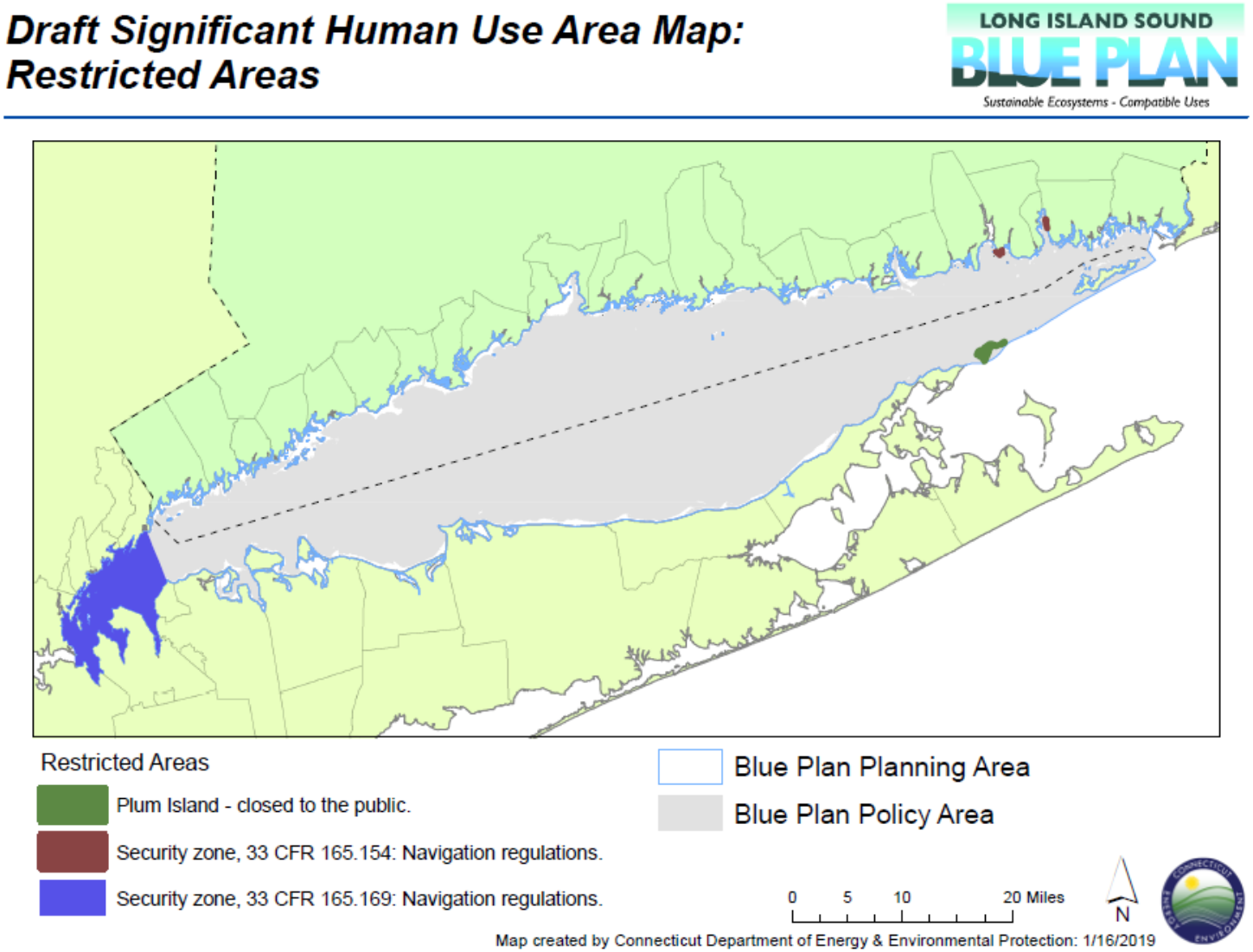


Figure 3a-31 Final SHUA map of restricted areas.

Long Island Sound Safety/Security Zones

Table 3a-37 Data construction table for LIS safety and security zones.

SHUA Criteria	Areas important for navigation, transportation, infrastructure, and economic activity
SHUA Sub-criterion	Security Zones and other Designated Areas
SHUA Sub-criterion Description	Security zones and other operational zones, as designated by the Coast Guard or other appropriate authority.
Data Source(s)	GIS Data layer: • Restricted Areas (NOAA Electronic Nautical Charts – Approach data)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data were clipped to the Data Extent. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	Upon review by the Blue Plan Planning Team, areas designated solely as Regulated Navigation areas per 40 CFR 140 were removed. Areas classified as Security Zones per 33 CFR 165.154 & 33 CFR 165.169 and the restricted access area of Plum Island were retained.
Data Classification	The data are not classified by any attributes to support the SHUA assessment, but the "INFORM" and "CATREA" attributes can be used to classify them based on the specific security zone designation.

Date Created	October 2018
General Data Description	Security zones and other operational zones, as designated by the Coast Guard or other appropriate authority. The Blue Plan removed areas designated solely as Regulated Navigation areas per 40 CFR 140, as these covered the majority of the Sound and were not considered restricted in the strictest sense. Areas classified as Security Zones per 33 CFR 165.154 & 33 CFR 165.169 and the restricted access area of Plum Island were retained. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

Draft Significant Human Use Area Map: Lightering Zones

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

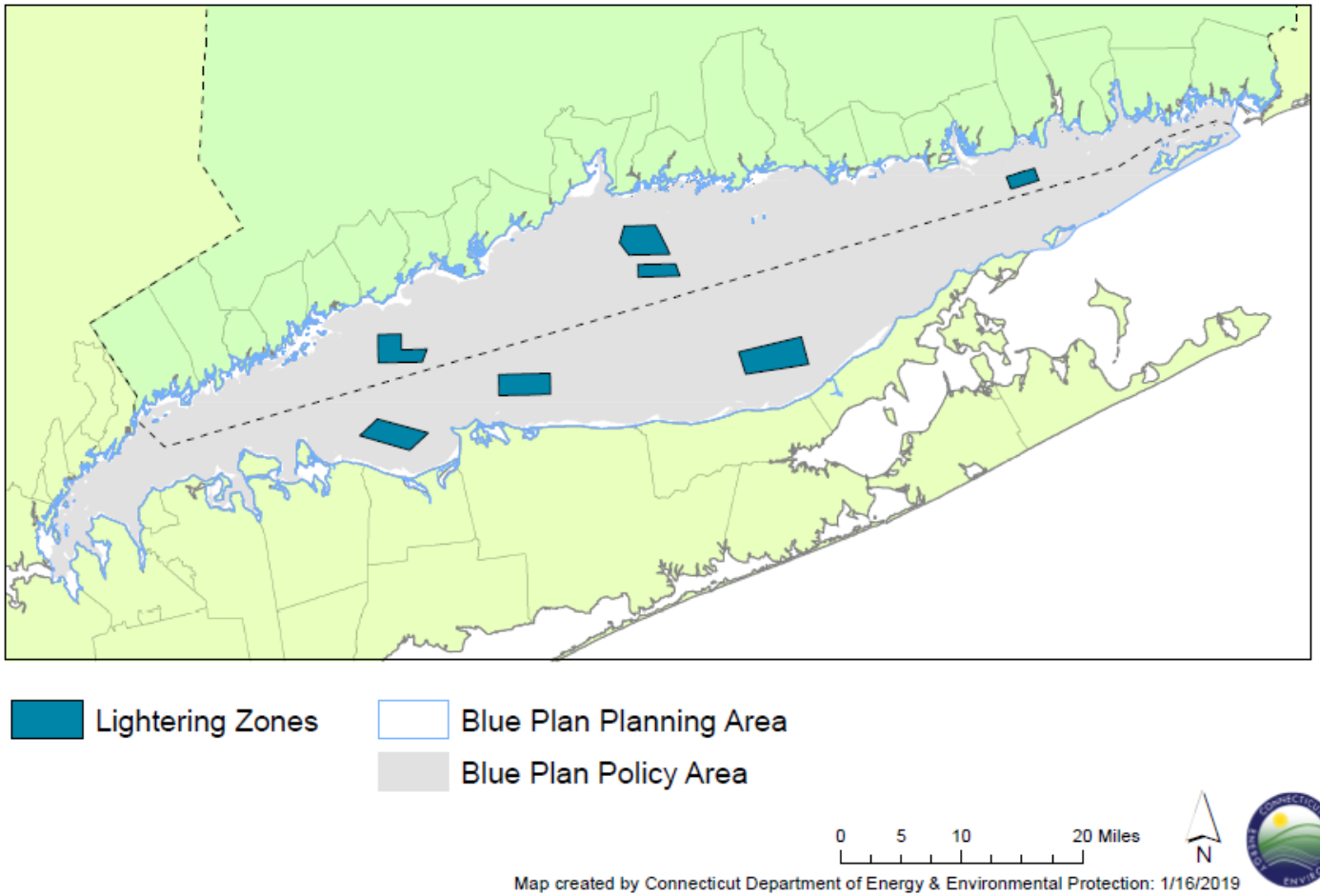


Figure 3a-32 Final SHUA map of Lightering Zones.

Long Island Sound Lightering Areas

Table 3a-38 Data construction table for lightering areas.

SHUA Criteria	Areas important for navigation, transportation, infrastructure, and economic activity
SHUA Sub-Criterion	Areas of Lightering Activity
SHUA Sub-criterion Description	Areas designated by the Coast Guard for ship-to-ship transfer (lightering), and other areas regularly used for such transfers.
Data Source(s)	GIS Data layer: • Anchorage Areas (NOAA Electronic Nautical Charts – Approach data) US Coast Guard LIS Policy Letter 3/1999 – Lightering Zones
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CTD EEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW.) The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data were clipped to the Data Extent. Anchorage areas corresponding to those identified in the US Coast Guard policy letter were extracted. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.

Date Created	October 2018.
General Data Description	Areas designated by the Coast Guard for ship-to-ship transfer (lightering), and other areas regularly used for such transfers. Data were clipped to the Data Extent (the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66.) Anchorage areas corresponding to those identified in the US Coast Guard policy letter were extracted. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here.

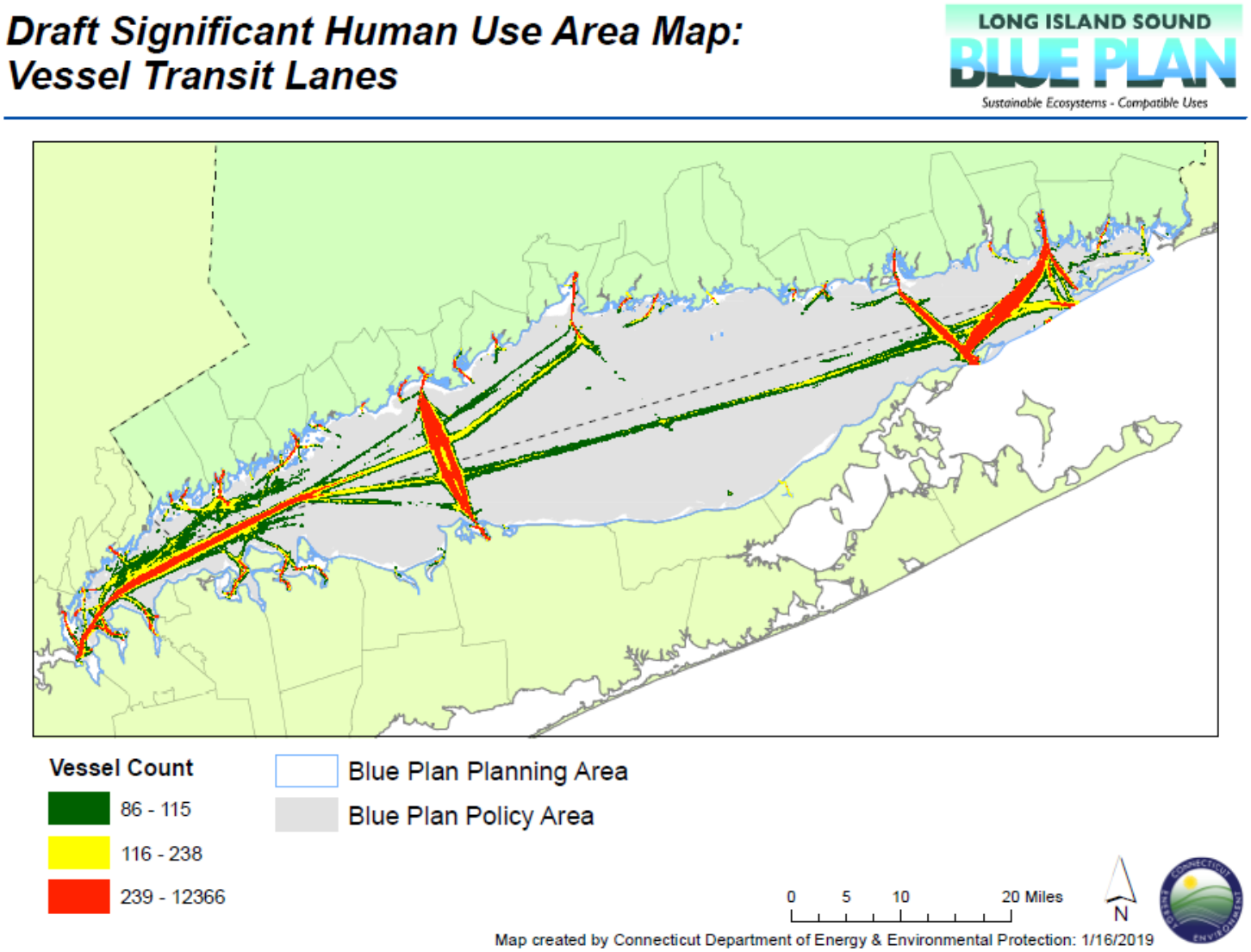


Figure 3a-33 Final map of vessel transit lanes.

LIS Vessel Traffic Areas

Table 3a-39 Data construction map for LIS Vessel Traffic areas.

SHUA Criteria	Areas important for navigation, transportation, infrastructure, and economic activity
SHUA Sub-criteria	Vessel Traffic Areas
SHUA Sub-criterion Description	Areas of high traffic use by vessels with AIS transponders including but not limited to ferries and commercial ships. High traffic use is defined by areas that exceed the mean value of transit counts.
Data Source(s)	GIS data layer: • 2016 Automated Information System (AIS) All Vessel Transit Counts (Northeast Ocean Data Portal)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Raster data were clipped to the Data Extent and converted to shapefile. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	Since the Vessel Transit data covered nearly the entirety of Long Island Sound, the Blue Plan Planning Team explored several different options to establish thresholds that approximated several well-known high-transit routes such as ferry crossings. Values that exceeded the mean transit count of 85 seemed to best differentiate these areas from the rest and captured several other notable lanes (e.g., Ferry transits) through the Sound.

Data Classification	Data values above the mean transit count (85) can be symbolized into 3 quantile classes to visualize relative route intensity
Date Created	October 2018
General Data Description	Areas of high traffic use by vessels with AIS transponders including but not limited to ferries and commercial ships. Since the AIS Vessel Transit data covered nearly the entirety of Long Island Sound, the Blue Plan Planning Team explored several different options to establish thresholds that approximated several well-known high-transit routes such as ferry crossings. Values that exceeded the mean transit count of 85 seemed to best differentiate these areas from the rest and captured several other notable lanes (e.g., Ferry transits) through the Sound. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here. Northeast Ocean Data Portal Source metadata: https://www.northeastoceandata.org/files/metadata/Themes/AIS/AllAISVesselTransitCounts2016.pdf

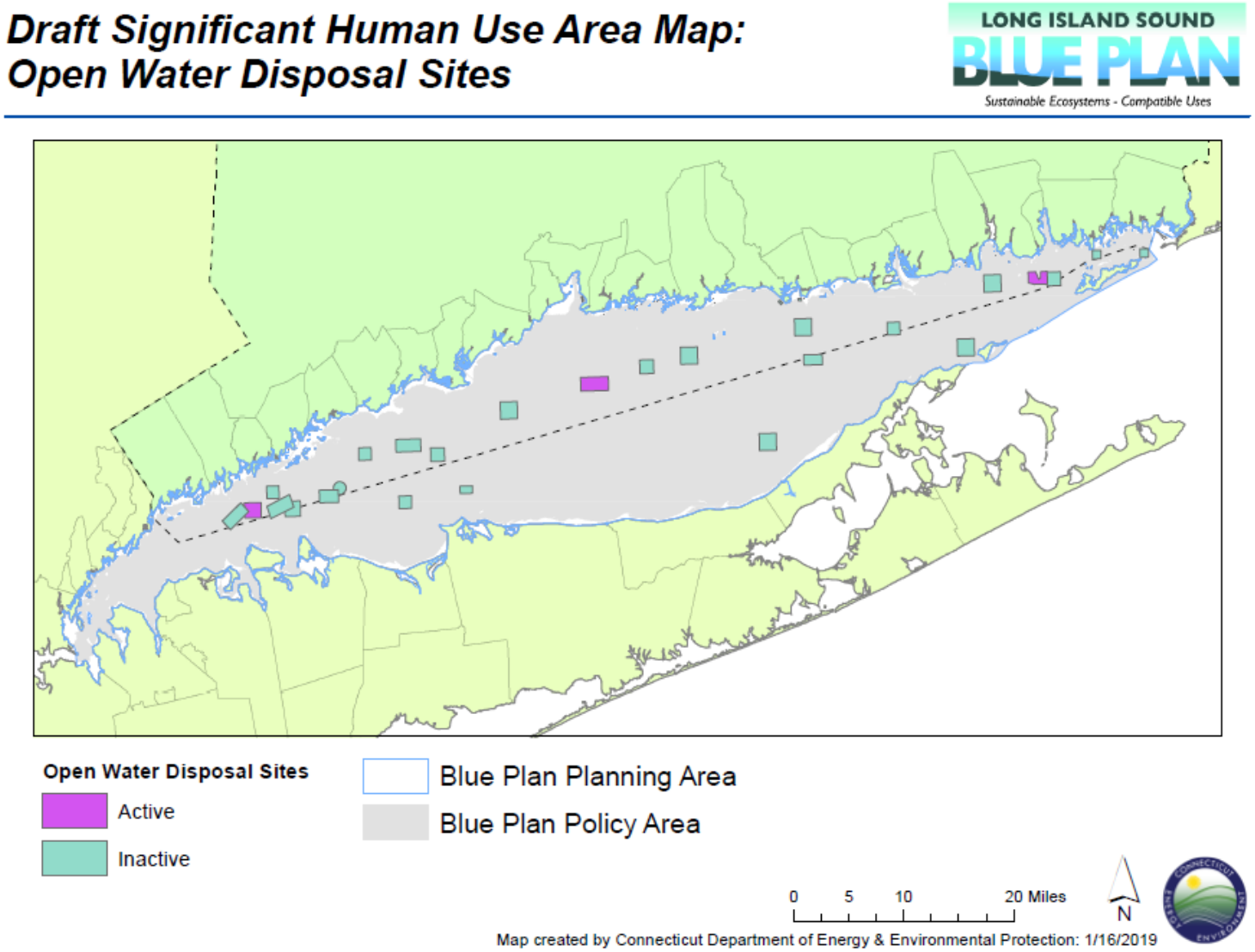


Figure 3a-34 Final SHUA map of open water disposal sites.

Long Island Sound Disposal Sites

Table 3a-40 Data construction table for LIS disposal sites.

SHUA Criteria	Areas important for navigation, transportation, infrastructure, and economic activity
SHUA Sub-criterion	Dredged Material Disposal Areas (Active and Historic)
SHUA Sub-criterion Description	Dredged material disposal sites as they appear on the NOAA charts, in the LIS DMMP, or designated by EPA. Includes areas currently and historically used. Also includes confined aquatic disposal (CAD) cells.
Data Source(s)	GIS Data layer: • Ocean Disposal Sites 2016 (Northeast Ocean Data Portal) Report: • Supplemental Environmental Impact Statement for the Designation of Dredged Material Disposal Site(s) in Eastern Long Island Sound, Connecticut and New York (Final). Prepared for: United States Environmental Protection Agency. Prepared by: Louis Berger and University of Connecticut November 2016
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data were clipped to the Data Extent. Coordinates for the revised Eastern Long Island Disposal site were taken from the report and used to create a new disposal site feature. Relevant descriptive and source material fields were attributed accordingly and statuses were updated to reflect current active/inactive states. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.

Data Classification	The data are not classified by any attributes to support the SHUA assessment, although they can be displayed as Active/Inactive by using the "STATUS" attribute field.
Date Created	October 2018
General Data Description	Dredged material disposal sites as they appear on the NOAA charts, in the LIS DMMP, or designated by EPA. Includes areas currently and historically used. Also includes confined aquatic disposal (CAD) cells. Data were clipped to the Data Extent (the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66.) Coordinates for the revised Eastern Long Island Disposal site were taken from the report and used to create a new disposal site feature. Relevant descriptive and source material fields were attributed accordingly and statuses were updated to reflect current active/inactive states. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here. Northeast Ocean Data Portal Source metadata: https://www.northeastoceandata.org/files/metadata/Themes/MarineTransportation/OceanDisposalSites2016.pdf

Draft Significant Human Use Area Map: Underwater Cables

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

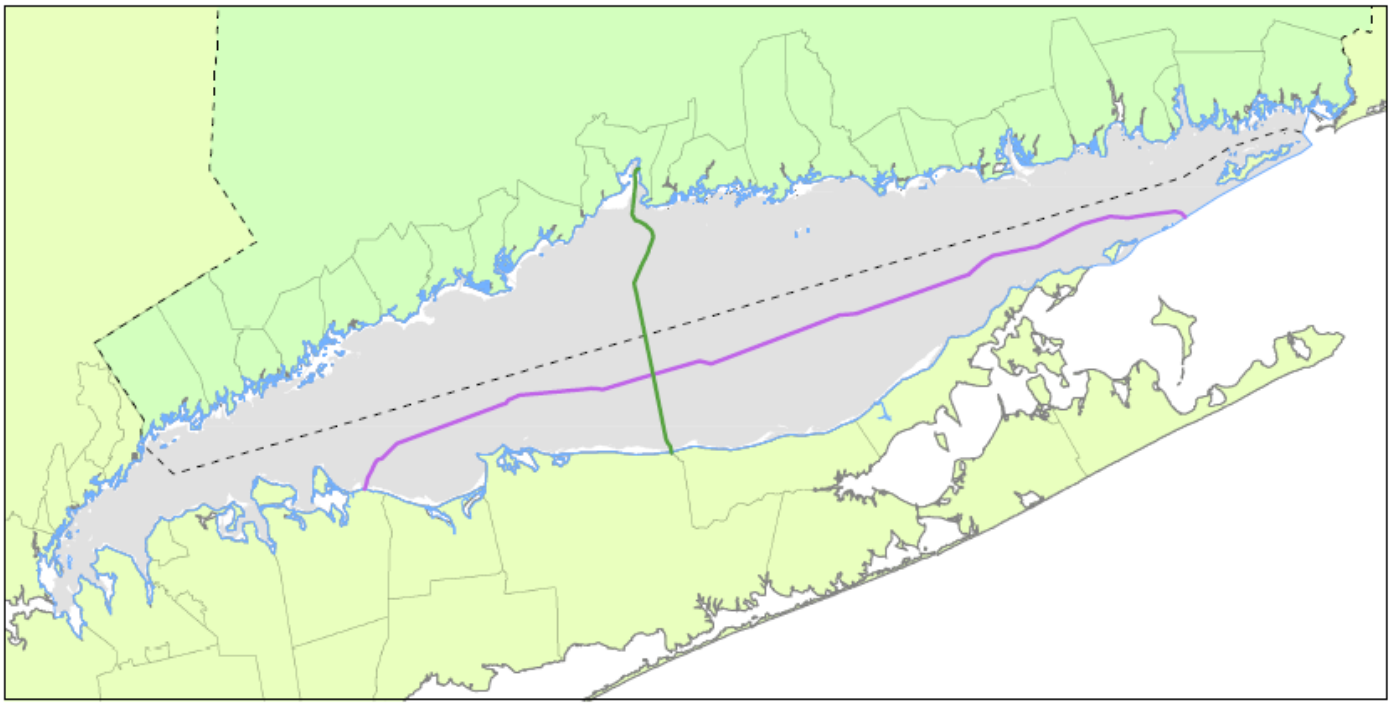


Figure 3a-35 Final SHUA map of underwater cables, under the cables, pipelines, and cable/pipeline areas.

Long Island Sound Submarine Cables

Table 3a-41 Data construction table for underwater or submarine cables.

SHUA Criteria	Areas important for navigation, transportation, infrastructure, and economic activity
SHUA Sub-criterion	Cables, Pipelines, and Cable/Pipeline Areas
SHUA Sub-criterion Description	Submerged cables, including but not limited to those indicated on NOAA navigational charts.
Data Source(s)	GIS Data layer (identifies specific cables): • Submarine Cables (Northeast Ocean Data Portal)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data were clipped to the Data Extent. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018

General Data Description	Submerged cables in LIS taken from data hosted by the Northeast Ocean Data Portal. Data were clipped to the Data Extent (the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66.) When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here. Northeast Ocean Data Portal Source Metadata: https://www.northeastoceandata.org/files/metadata/Themes/MarineTransportation/SubmarineCables

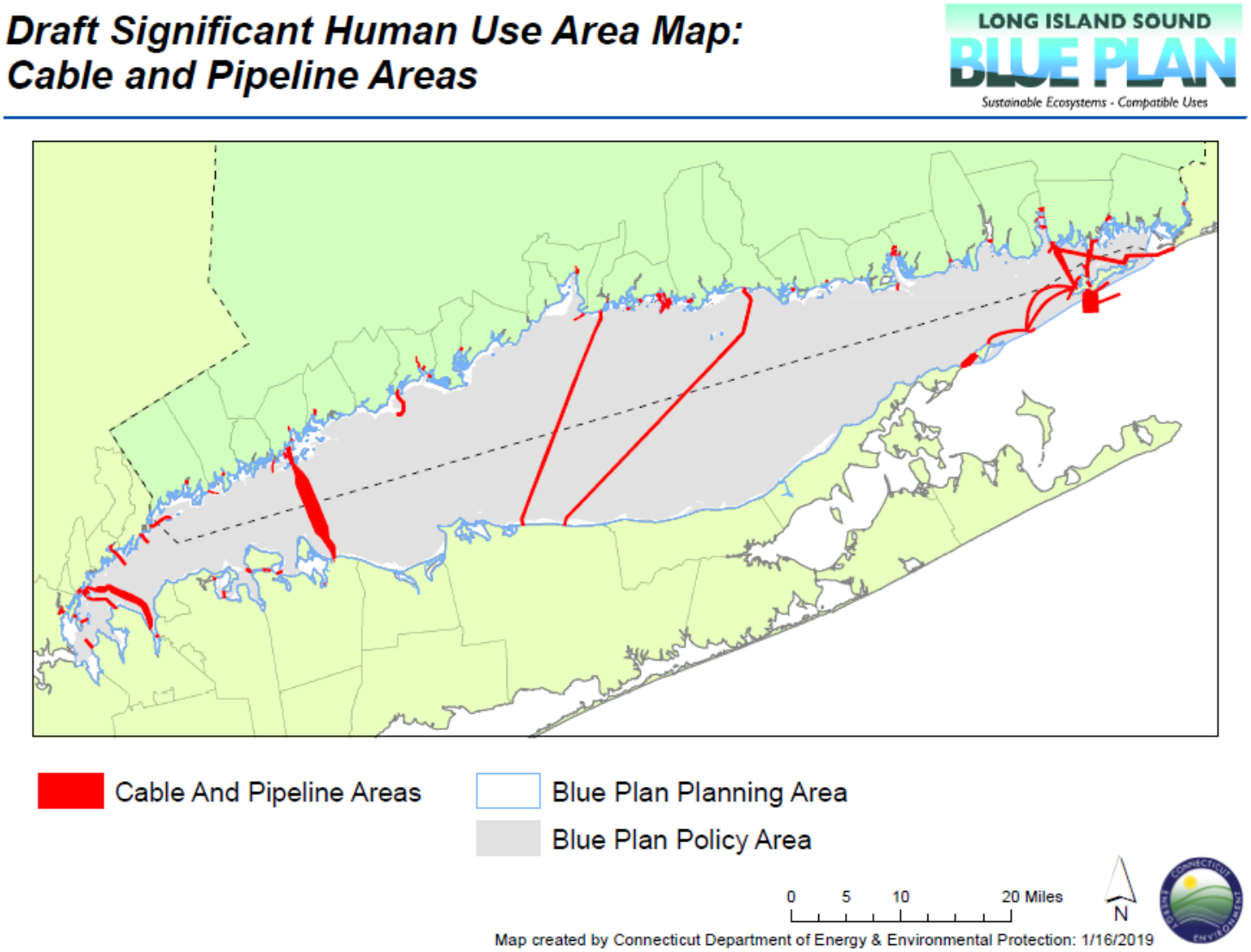


Figure 3a-36 Final SHUA map of cable and pipeline areas, under the cables, pipelines, and cable/pipeline areas criteria.

Long Island Sound Cable and Pipeline Areas

Table 3a-42 Data construction table for LIS cable and pipeline areas.

SHUA Criteria	Areas important for navigation, transportation, infrastructure, and economic activity
SHUA Sub-criterion	Cables, Pipelines, and Cable/Pipeline Areas
SHUA Sub-criterion Description	Submerged cable and pipeline infrastructure areas, including but not limited to those indicated on NOAA navigational charts.
Data Source(s)	GIS Data layer (identifies areas where cables and/or pipelines are known to be located): • Cable and Pipeline Areas (Northeast Ocean Data Portal)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data were clipped to the Data Extent. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.

Date Created	October, 2018
General Data Description	Submerged cable and pipeline infrastructure areas. Data were clipped to the Data Extent (the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66.) When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here. Source metadata from Northeast Ocean Data Portal: https://www.northeastoceandata.org/files/metadata/Themes/EnergyAndInfrastructure/CableAndPipelineAreas

Draft Significant Human Use Area Map: Coastal Energy Facilities

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

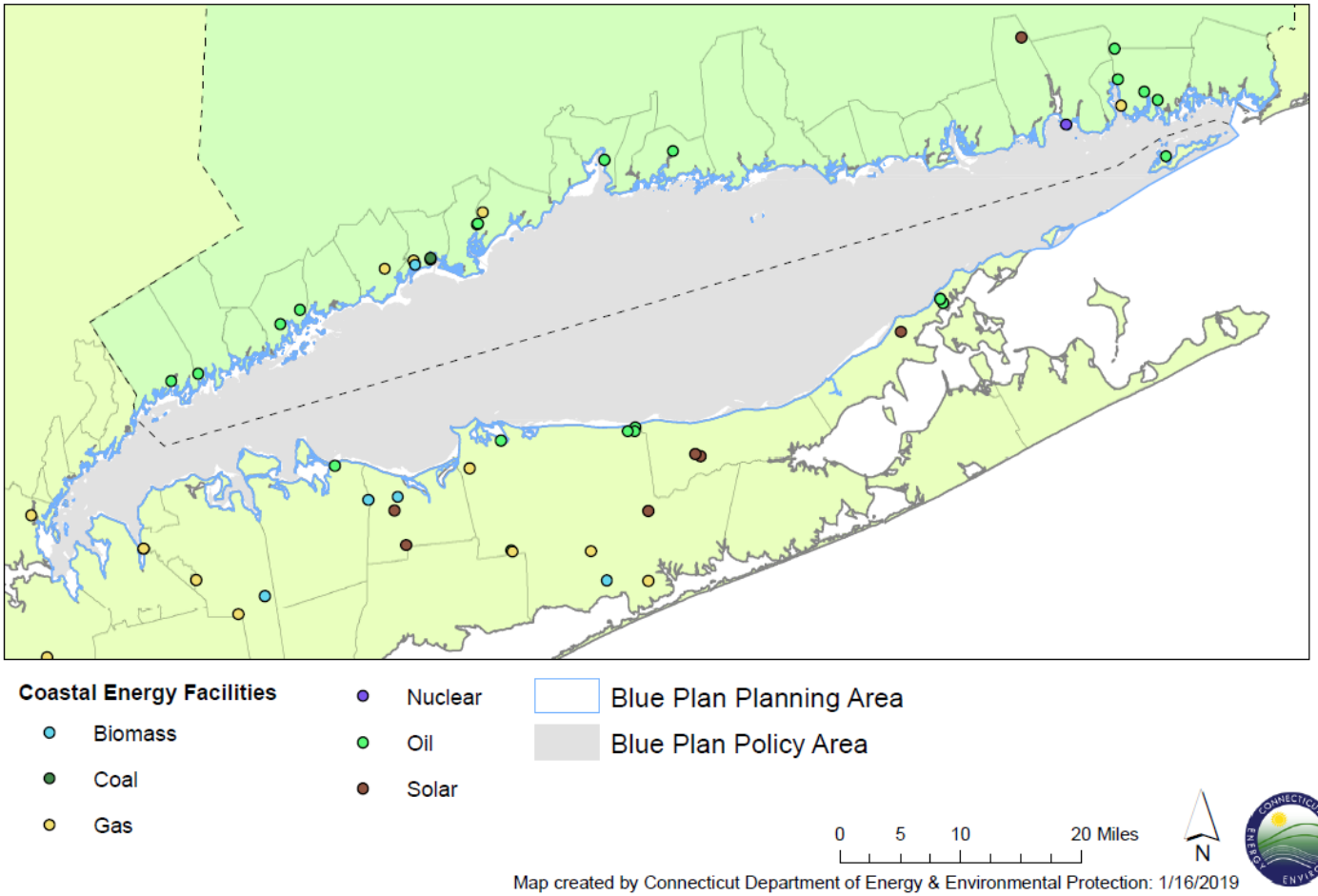


Figure 3a-37 Final SHUA map of coastal energy facilities, under the coastal energy generating facilities and transmission facilities.

Coastal Energy Generating and Transmission Facilities

Table 3a-43 Data construction table for coastal energy facilities.

SHUA Criteria	Areas important for navigation, transportation, infrastructure, and economic activity
SHUA Sub-criterion	Coastal Energy Generating and Transmission Facilities
SHUA Sub-criterion Description	Coastal energy generating and transmission facilities and associated infrastructure, including areas of Long Island Sound adjacent thereto.
Data Source(s)	GIS data layer: • Coastal Energy Facilities (https://marinecadastre.gov/nationalviewer/)
Data Extent	The Connecticut and New York coastal town boundaries adjacent to the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66.
Data Adjustment and Pre-processing	Data were clipped to the Data Extent. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October 2018.
General Data Description	Coastal energy generating and transmission facilities and associated infrastructure, including areas of Long Island Sound adjacent thereto. Data were clipped to the Data Extent (The Connecticut and New York coastal town boundaries adjacent to the Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66.)

	When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary or only selected if uses occurred within it. As a result, it is possible that there are other locations for particular uses that occur outside the planning area, but are not reflected here. Source metadata from NOAA Marine Cadastre: https://inport.nmfs.noaa.gov/inport/item/48858

Draft Significant Human Use Area Map: Recreational Fishing Activity

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

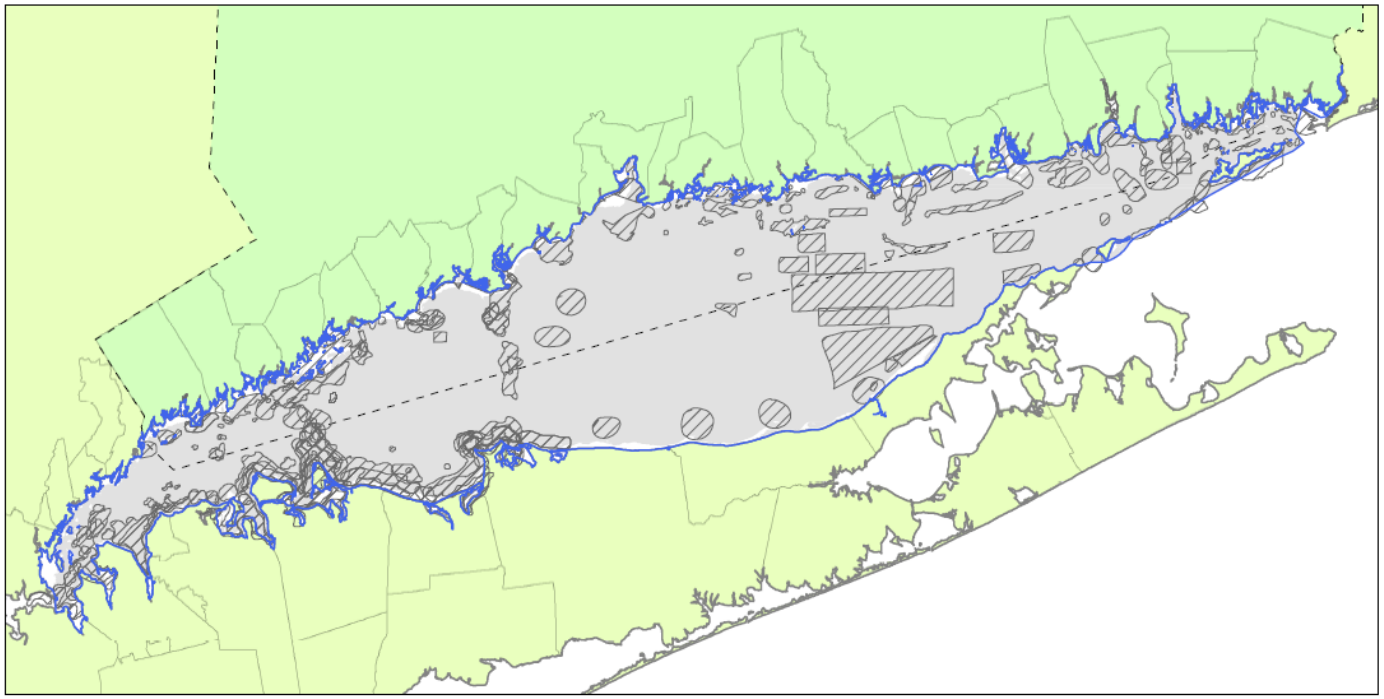


Figure 3a-38 Final SHUA map of recreational fishing activity.

LIS Recreational Fishing

Table 3a-44 Data construction table for recreational fishing.

SHUA Criteria	**Areas important to Fishing and Aquaculture**
SHUA Sub-criterion	Recreational Fishing
SHUA Sub-criterion Description	Areas significant for recreational fishing, as identified by DEEP Fisheries and the recreational fishing community of Long Island Sound
Data Source(s)	GIS Data layer: • Popular places to fish (CTDEEP) Data provided through participatory mapping exercises with LIS recreational fishing community.
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	GIS data layer was clipped to the Data Extent. An online web mapping viewer was created to log locations provided by stakeholders from the LIS recreational fishing community.
Data Analysis	The online web mapping viewer was used during several public meetings to log places and basic information on LIS diving locations. CTDEEP Popular Places to Fish were displayed as starting point overlaid on NOAA Nautical charts for reference. New areas were added based on stakeholder input. All areas should be considered approximate. Data from the mapping exercises were projected in UTM Zone 18N NAD83.

Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	December, 2018.
General Data Description	Original locations were compiled iteratively over time by CT-DEEP Marine Fisheries Division Staff. The Blue Plan effort used participatory mapping efforts to engage the LIS angling community to expand this to include other areas in CT as well as NY waters. No assurance of catching fish is implied. There may be additional areas important for recreational fishing that are not included. Areas and species information should be considered approximate and used as general guidance.

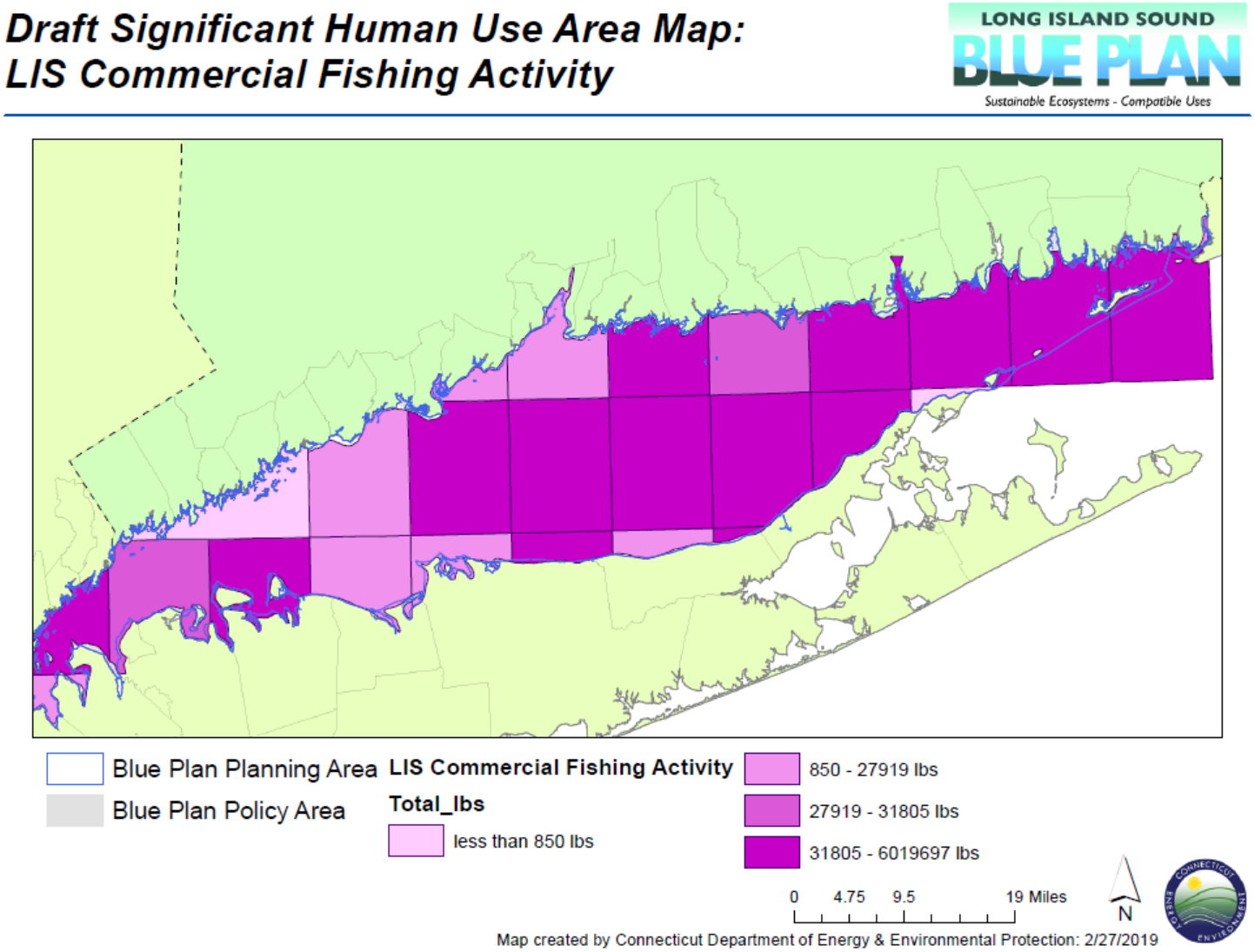


Figure 3a-39 Final SHUA map of LIS commercial fishing activity.

Commercial Fishing

Table 3a-45 Data construction table for commercial fishing.

SHUA Criteria	**Areas important to Fishing and Aquaculture**
SHUA Sub-criterion	Commercial Fishing
SHUA Sub-criterion Description	Areas of substantial value to the commercial fishing community in Long Island Sound.
Data Source(s)	GIS data layers: • 2000-2010 NOAA Vessel Trip Report (VTR) Landings – Gillnet/Sein/Otter Trawl/Pot (NY Geographic Information Gateway)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data were clipped to the Data Extent. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	Conversations with the commercial fishing industry suggested that despite the coarse geographic coverage, combing data from all four landing source layers (gillnets, seine, otter trawls, and pots) would be more reflective of the overall commercial fishing picture for Long Island Sound. The four data layers were merged, then dissolved based on unique grid cells with values for total landing pounds summed accordingly. An attribute field of "Gear Type" was added to log the types of gear used in each grid cell.

Data Classification	After conferring with commercial fishing stakeholders, applying a five-binned quantile classification scheme and taking the top two bins was recommended as a threshold to identify the areas with the highest overall landing pounds during 2000-2010.
Date Created	October, 2018
Basic Data Description:	These data were originally maintained and provided by the National Marine Fisheries Service. Please note that the use and analysis of these geographic data are limited by the scale at which the data were collected and mapped; as a regional analysis, these data are not intended for site level decisions.

Draft Significant Human Use Area Map: Recreational Shellfish Beds (CT)

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

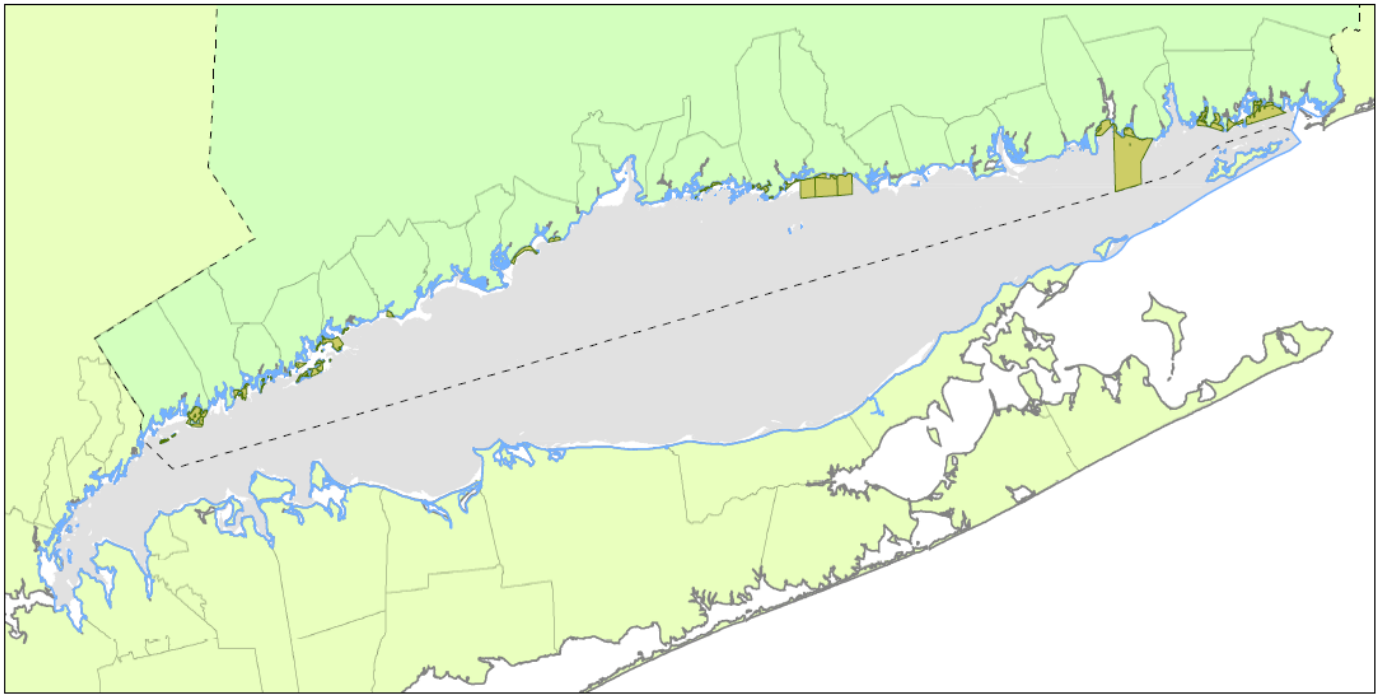


Figure 3a-40 Final SHUA map of recreational shellfish beds.

Recreational Shellfish Areas

Table 3a-46 Data construction table for recreational shellfish areas.

SHUA Criteria	**Areas important to Fishing and Aquaculture**
SHUA Sub-criterion	Recreational Shellfish Areas
SHUA Sub-criterion Description	Town and/or state managed recreational shellfishing areas in Connecticut.
Data Source(s)	GIS datalayer: • Recreational Shellfish Beds (CT Dept. of Agriculture/Bureau of Aquaculture)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data were clipped to the Data Extent. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018.

Basic Data Description	In Connecticut, shellfish are defined as oysters, clams, mussels and scallops; either shucked or in the shell, fresh or frozen, whole or in part. Scallops are excluded from this definition when the final product is the shucked adductor muscle only. Lobsters, crabs, snails and finfish are not included in this definition. In 1881 a line was established, referred to as the Commissioners line, that divides the waters of the state into a northern and southern section. All beds south of this line are State beds and most beds north of this line are town beds. DA/BA still controls all the licensing and regulations north and south of this line, for example DA/BA determines when an area will be closed to shellfishing due to a change in water quality and what licenses are required for specific activities. Undesignated Town Bed Beds under town or state jurisdiction which are not currently designated as "Natural Bed" under section 2326 of the CGS of 1888 or leased, licensed or otherwise managed for commercial activity through the local shellfish commission. These beds may or may not sustain natural shellfish populations. Undesignated beds may be managed as "Recreational Beds" by the municipality, where water quality classification permits. Undesignated beds have been mapped by CT DABA in Greenwich, Darien, Westport and Branford for shellfish program management purposes. Undesignated beds were mapped by using waterbodies that appear as area features in the shellfish classification polygon data as the baseline area, and mapping areas those areas that fall within shellfish classification areas and are located geographically outside of designated natural beds and existing Town managed beds. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary. As a result, it is possible that not all source locations are reflected.

Draft Significant Human Use Area Map: Aquaculture Operations (CT)

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

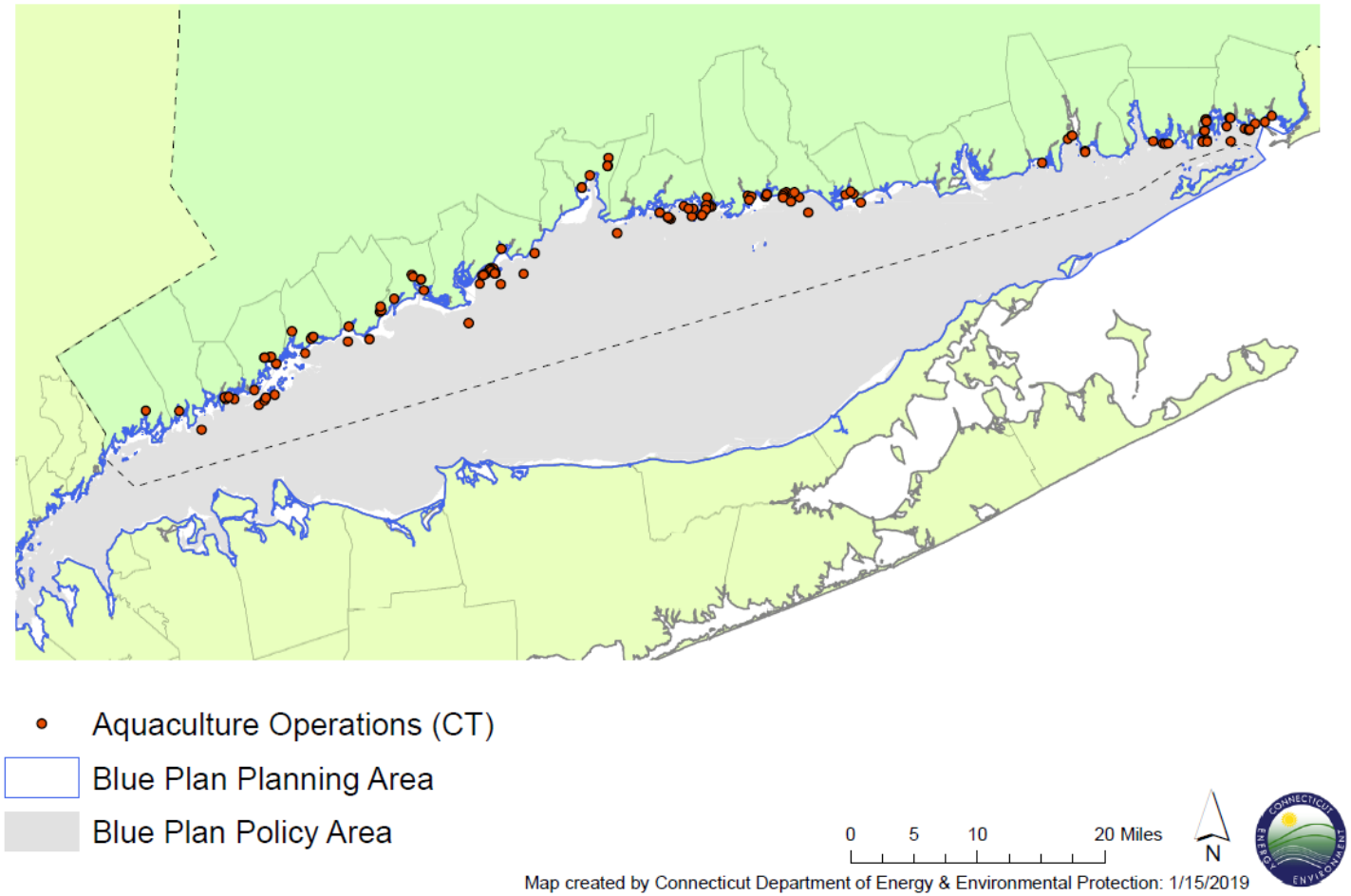


Figure 3a-41 Final SHUA map of aquaculture operations, under the commercial aquaculture locations criteria.

Draft Significant Human Use Area Map: Seaweed Licenses (CT)

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

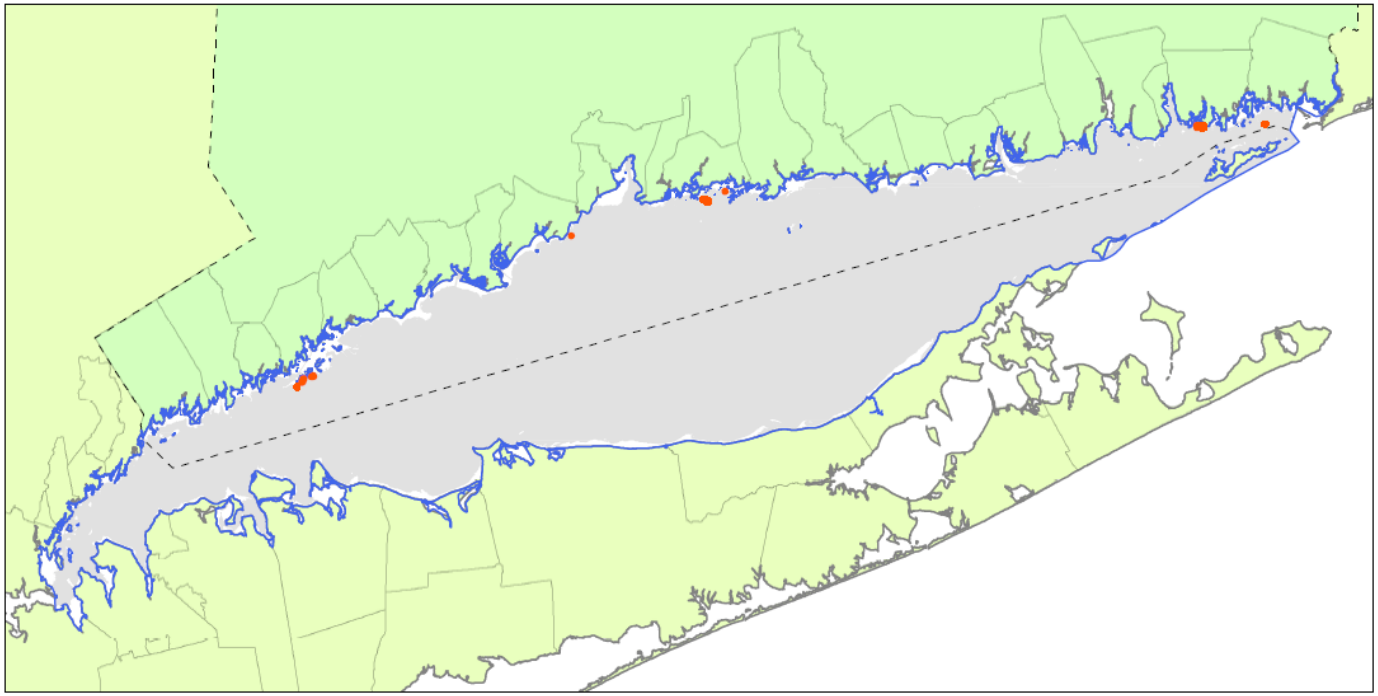


Figure 3a-42 Final SHUA map of CT Seaweed licenses, under the commercial aquaculture locations.

Draft Significant Human Use Area Map: Aquaculture Gear Areas (CT)

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

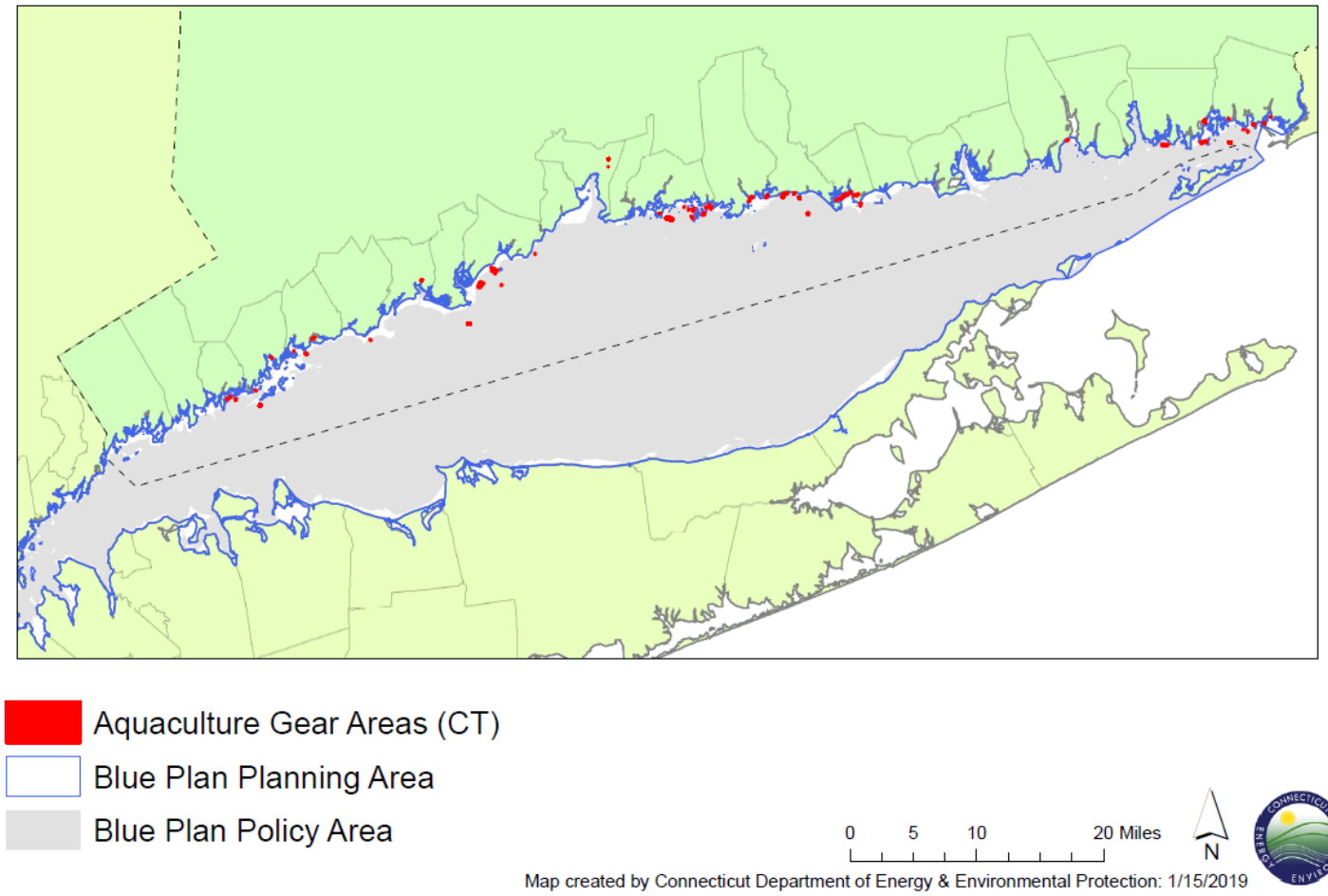


Figure 3a-43 Final SHUA map of aquaculture gear areas, under the commercial aquaculture locations criteria.

Draft Significant Human Use Area Map: State Managed Shellfish Beds (CT)

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

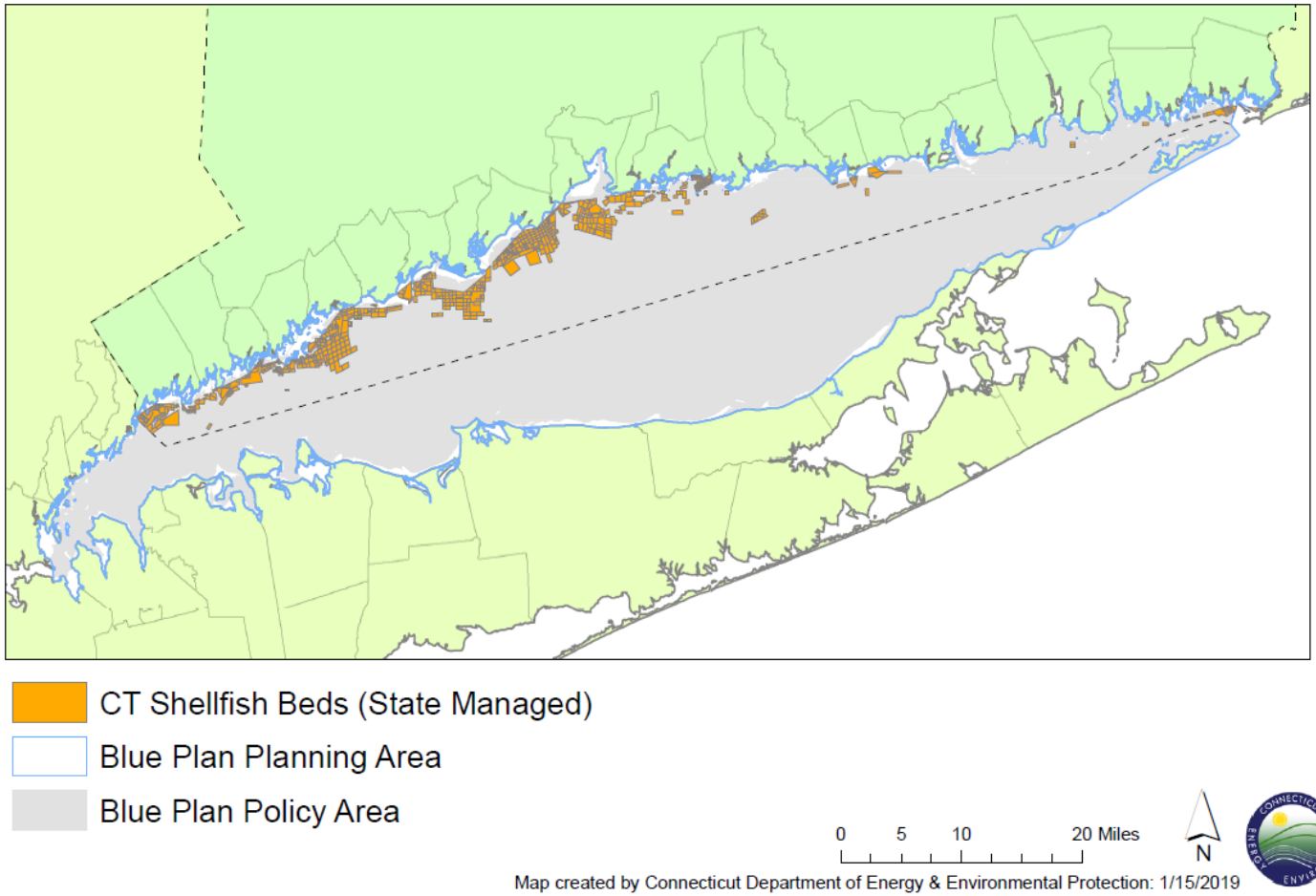


Figure 3a-44 Final SHUA map of state managed shellfish beds (CT), under the commercial aquaculture locations criteria.

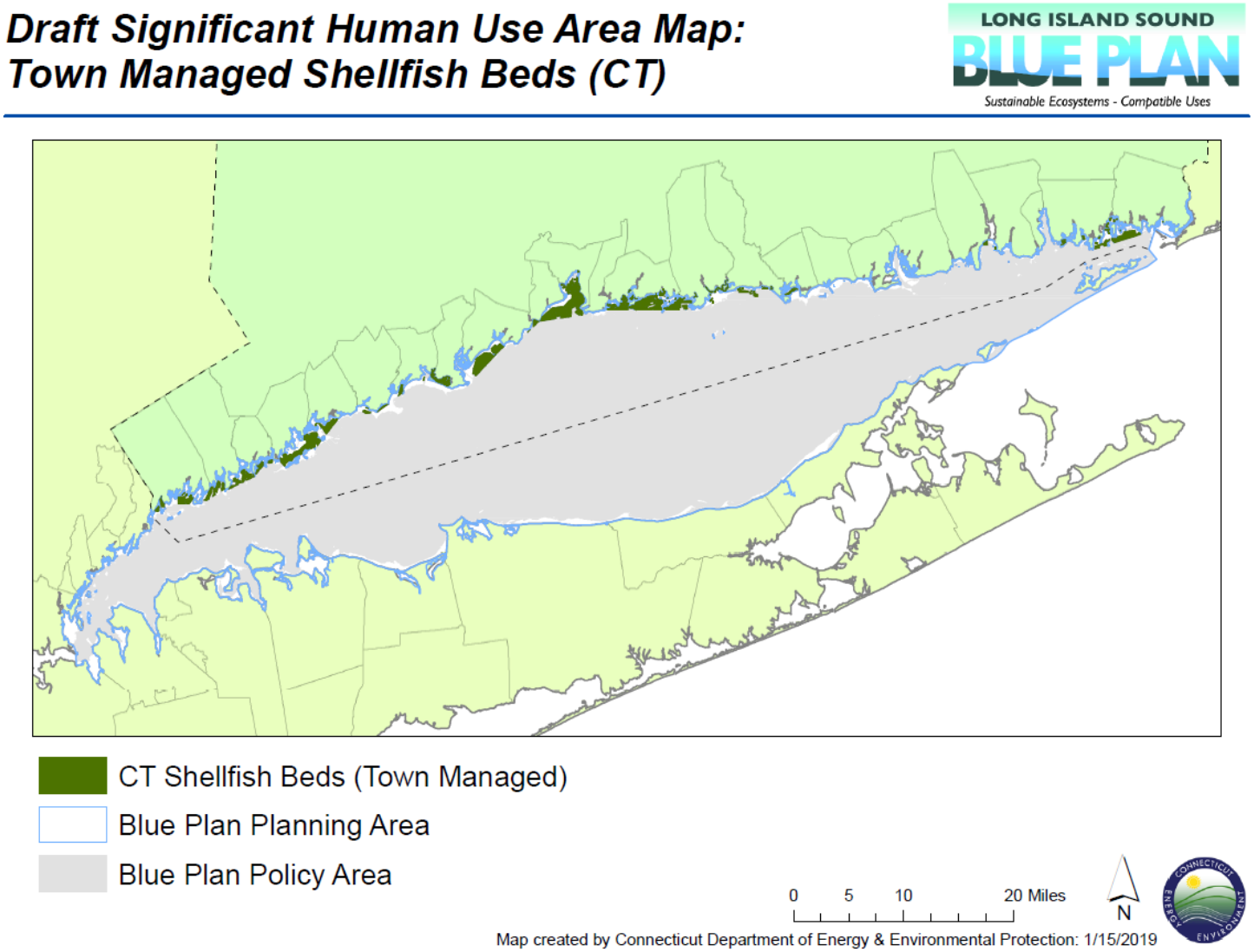


Figure 3a-45 Final SHUA map of town managed shellfish beds (CT), under the commercial aquaculture locations criteria.

Connecticut Aquaculture Layers

Table 3a-47 Data construction table for all Connecticut commercial aquaculture locations.

SHUA Criteria	**Areas important to Fishing and Aquaculture**
SHUA Sub-criterion	Commercial Aquaculture Locations
SHUA Sub-criterion Description	Shellfish leases, seaweed leases, gear areas, designated natural beds, and any other type of authorized aquaculture venture in CT and NY as applicable.
Data Source(s)	GIS Data layers - Connecticut Department of Agriculture Bureau of Aquaculture (DA/BA): • Aquaculture Operations (CT Dept. of Agriculture / Bureau of Aquaculture) • Seaweed Licenses (CT Dept. of Agriculture / Bureau of Aquaculture) • Aquaculture Gear areas (CT Dept. of Agriculture / Bureau of Aquaculture) • Town/State Shellfish Lease beds (CT Dept. of Agriculture / Bureau of Aquaculture) • Natural Area Beds (CT Dept. of Agriculture / Bureau of Aquaculture)
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Data were clipped to the Data Extent. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.

Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018
Basic Data Description	CT Aquaculture Operations/Gear Area: Point data representing the approximate geographical location of "Certificate for Aquaculture Operation" permitted facilities/gear in via the State of Connecticut Application for Joint Programmatic General Permit (PGP) for Aquaculture Department of the Army General Permit. Permitted projects have undergone review by the State of Connecticut Department of Agriculture Bureau of Aquaculture, the U.S. Army Corps of Engineers New England District, and the Connecticut Department of Energy and Environmental Protection. The data was created by the Connecticut Department of Agriculture Bureau of Aquaculture and is intended to be used for informational purposes only. Data is subject to change on a frequent basis and is updated as necessary. Corresponding polygon data for each gear area is also available from the Connecticut Department of Agriculture. CT Shellfish Beds: In Connecticut, shellfish are defined as oysters, clams, mussels and scallops; either shucked or in the shell, fresh or frozen, whole or in part. Scallops are excluded from this definition when the final product is the shucked adductor muscle only. Lobsters, crabs, snails and finfish are not included in this definition. In 1881 a line was established, referred to as the Commissioners line, that divides the waters of the state into a northern and southern section. All beds south of this line are State beds and most beds north of this line are town beds. DA/BA still controls all the licensing and regulations north and south of this line, for example DA/BA determines when an area will be closed to shellfishing due to a change in water quality and what licenses are required for specific activities. Natural beds: These get their name from the fact that shellfish, especially oysters, naturally inhabited the area. Natural beds have specific regulations concerning their use including licensing and harvesting methods. They are predominately oyster seed beds that cannot be mechanically harvested. Use of the natural beds requires a Relay/Transplant License I or II and/or Seed Oyster Harvesting License. Any person assisting in the harvesting of seed oysters must have a Helper's License. These beds cannot be leased or subdivided; they are to remain open to any properly licensed shellfisherman. A complete listing of regulations are available from DA/BA.) Descriptions of these beds can be found in section 3295 of the Connecticut General Statutes (CGS), revision of 1918. Not all of the beds listed in section 3295 were mapped. Many of the natural beds in state waters off of Greenwich are now covered with leases. The town natural beds were defined by law under section 2326 of the CGS of 1888. Each town had the opportunity to map areas that they wanted to be considered natural bed. The documents, written descriptions and maps, were submitted to the Superior Court that had jurisdiction for that town. Several towns did not avail themselves of this opportunity. Some areas such as in Westport have been changed in recent court decisions. There are some areas

	that may have been declared natural bed that now have leases on them. State natural beds are simply natural beds south of the Commissioners line that fall under State jurisdiction. This data is subject to change and the DA/BA may have more recent information for some areas. Town beds: Are under town jurisdiction and may be leased, licensed or otherwise managed through the local shellfish commission. Towns may require additional local permits to work in waters under local jurisdiction. The beds north of the line in Milford, West Haven, and New Haven are exceptions to this as they are under state jurisdiction. The sources of data for the town managed beds layer were quite varied. The sources included longitude/latitude data and maps from Connecticut Department of Agriculture Bureau of Aquaculture (DA/BA), maps and longitude/latitude provided by local shellfish commissions and longitude/latitude data and maps obtained from Tallmadge Brothers. Additionally, a few towns provided maps of their beds in an electronic format such as CAD or shapefile. This data is subject to change and the DA/BA may have more recent information for some areas. State Beds: All the Beds under state jurisdiction were mapped using longitude/latitude data from a DA/BA access database. These coordinates were taken from converted sextant angles. This data is subject to change and the DA/BA may have more recent information for some areas. Seaweed Licenses: The Department of Agriculture Bureau of Aquaculture issues licenses for the planting and cultivating of seaweed as defined by the Connecticut General Statutes Chapter 422 Sec. 22-11j. These non-transferable licenses allow the planting and cultivating of seaweed for an annual license fee of twenty-five dollars per acre. Although not a shellfish bed, the activity of aquaculture seaweed production is subject to the General Joint Aquaculture Programmatic Permit Process Review of the Department of Agriculture's Bureau of Aquaculture, the Department of Energy and Environmental Protection's Office of Long Island Sound Programs, and the Army Corps of Engineers, per the requirements of sections 22a-359 to 22a-363f, inclusive. When used for Blue Plan purposes, original source material was clipped to the Blue Plan Planning boundary. As a result, it is possible that not all original source locations are reflected.

Draft Significant Human Use Area Map: Aquaculture Sites (NY)

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

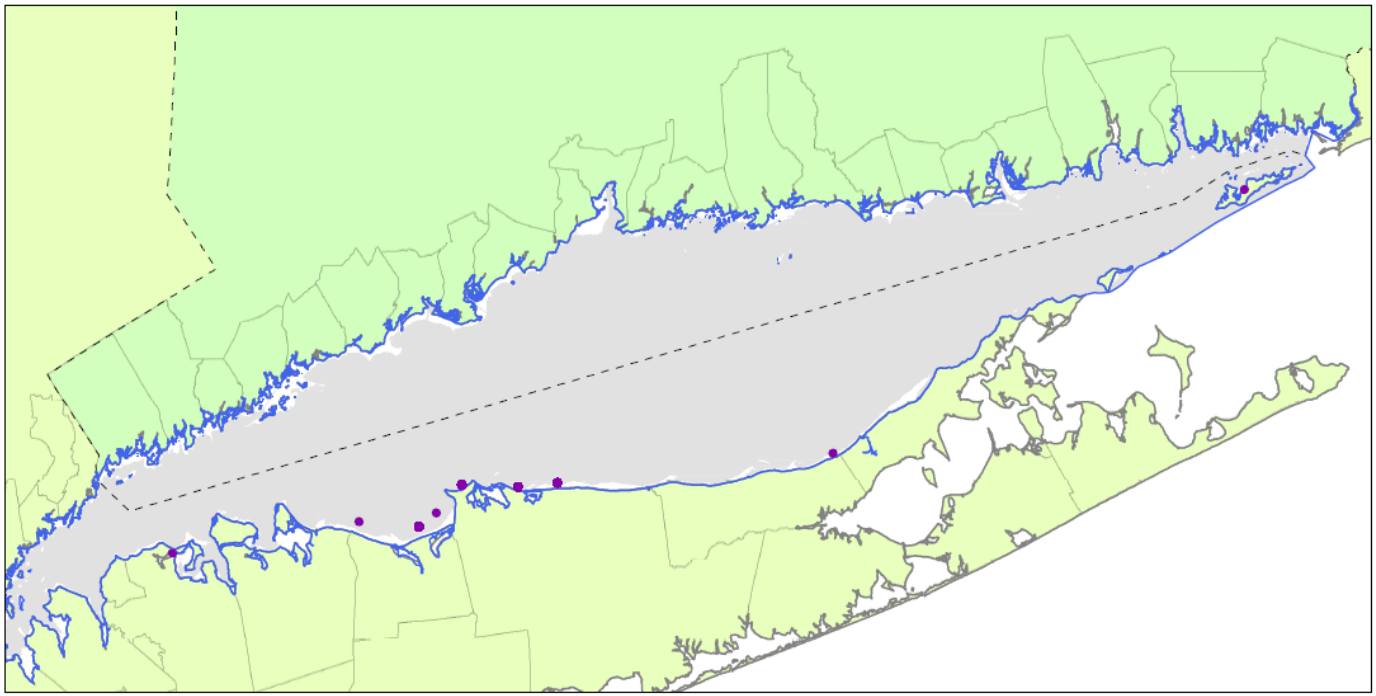


Figure 3a-46 Final SHUA map of aquaculture sites (NY), under the commercial aquaculture locations criteria.

NY Aquaculture Sites

Table 3a-48 Data construction table for NY Aquaculture sites.

SHUA Criteria	**Areas important to Fishing and Aquaculture**
SHUA Sub-criterion	Commercial Aquaculture Locations
SHUA Sub-criterion Description	Shellfish leases, seaweed leases, gear areas, designated natural beds, and any other type of authorized aquaculture venture in CT and NY as applicable.
Data Source(s)	Information provided from NY Dept of Environmental Conservation on locations for seven Temporary Marine Area Use Assignments (TMAUAs) for aquaculture activities.
Data Extent	The Long Island Sound Blue Plan planning area, as defined in Connecticut Public Act 15-66. To delineate the Blue Plan planning area, CT DEEP data representing the boundaries of CT and NY land and waters were used as a proxy for mean high water (MHW). The approximate boundary limit for all rivers, streams, inlets, bays, harbors, etc., was established by using the first upstream obstruction from the Sound (e.g., roadway, railway, bridge, etc.) Since no firm boundaries specify the extreme Eastern and Western extents, the Plan Development Team used the bridge at Throg's Neck in New York, the CT Rt. 1 bridge across the Pawcatuck River in Rhode Island, and the EPA Long Island Sound Study Ecoregion boundaries in eastern Long Island Sound and Fisher's Island Sound to establish them.
Data Adjustment and Pre-processing	Using information on the center coordinate and total acreage, areas reflecting the aquaculture TMAUAs were generated. Attributes for the assigned NYDEC permit number were also included for reference. Data layer stored in UTM Zone 18N, NAD83.
Data Analysis	No additional analysis was performed.
Data Classification	The data are not classified by any attributes to support the SHUA assessment.
Date Created	October, 2018

2. Data “Roll-Up” Maps Organized by Concentrations of All Uses, Major Criteria, and Impact Area

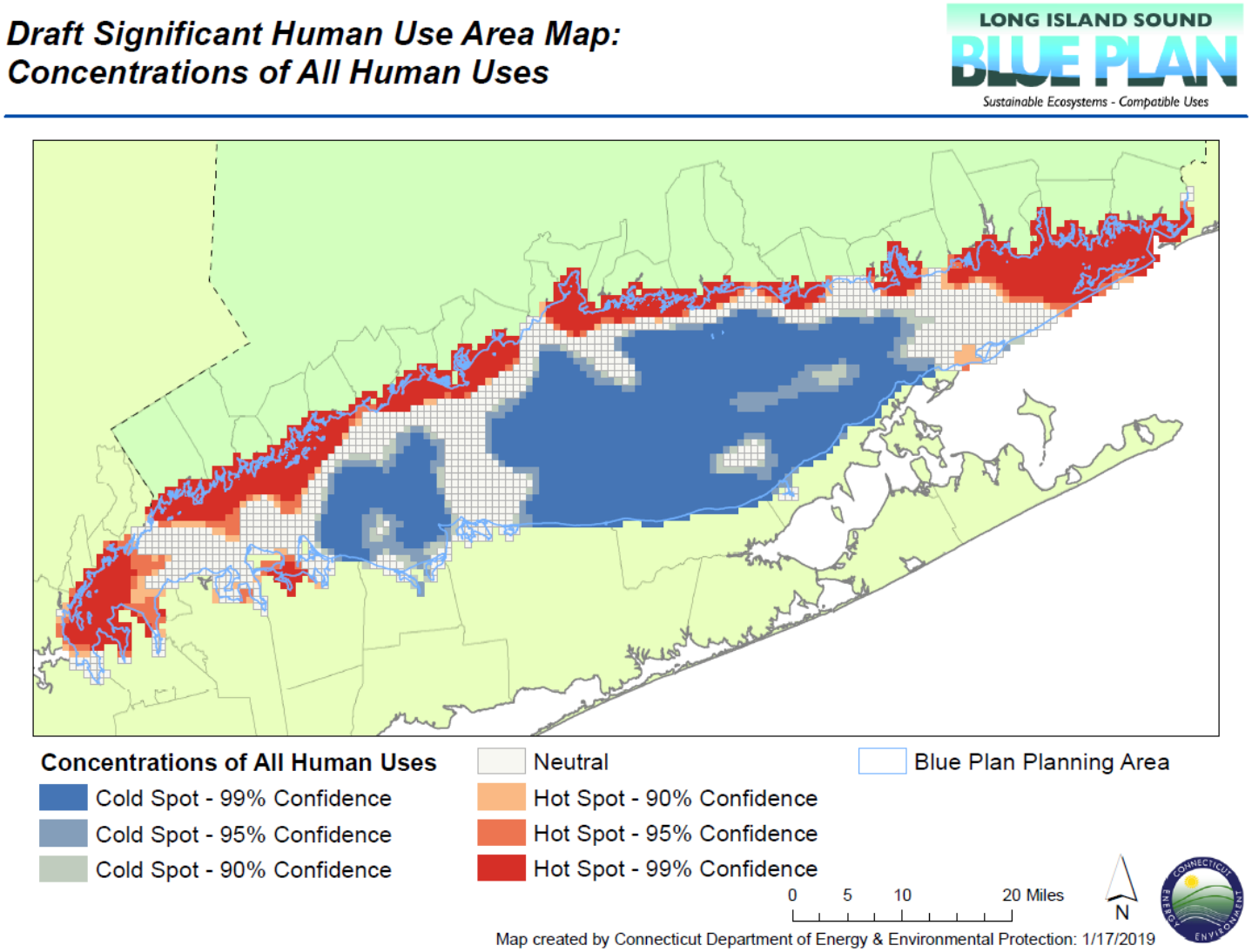


Figure 3a-47 Final concentrations of all Significant Human Uses in Long Island Sound.

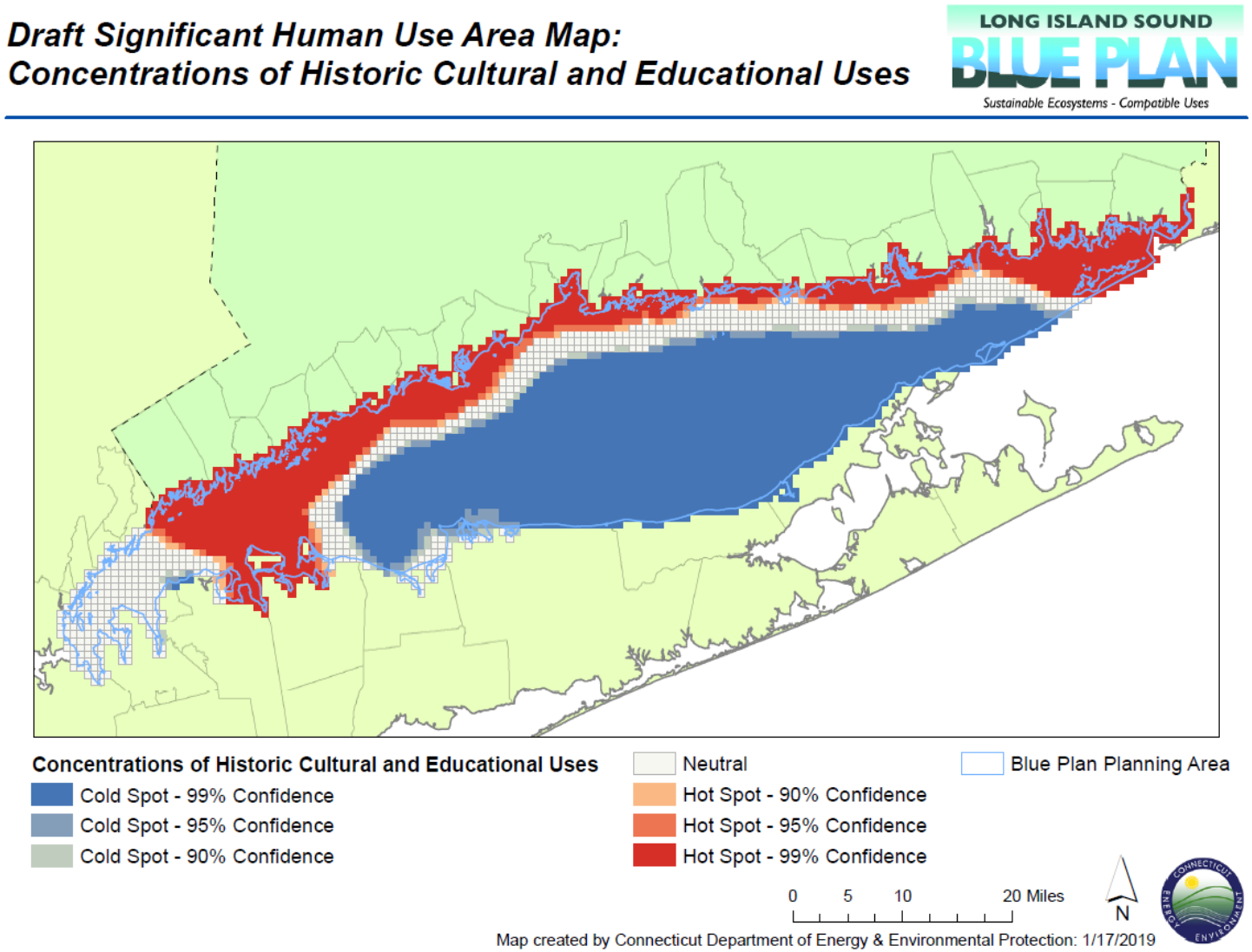


Figure 3a-48 Final concentrations of Significant Historical, Cultural, and Educational Uses in LIS.

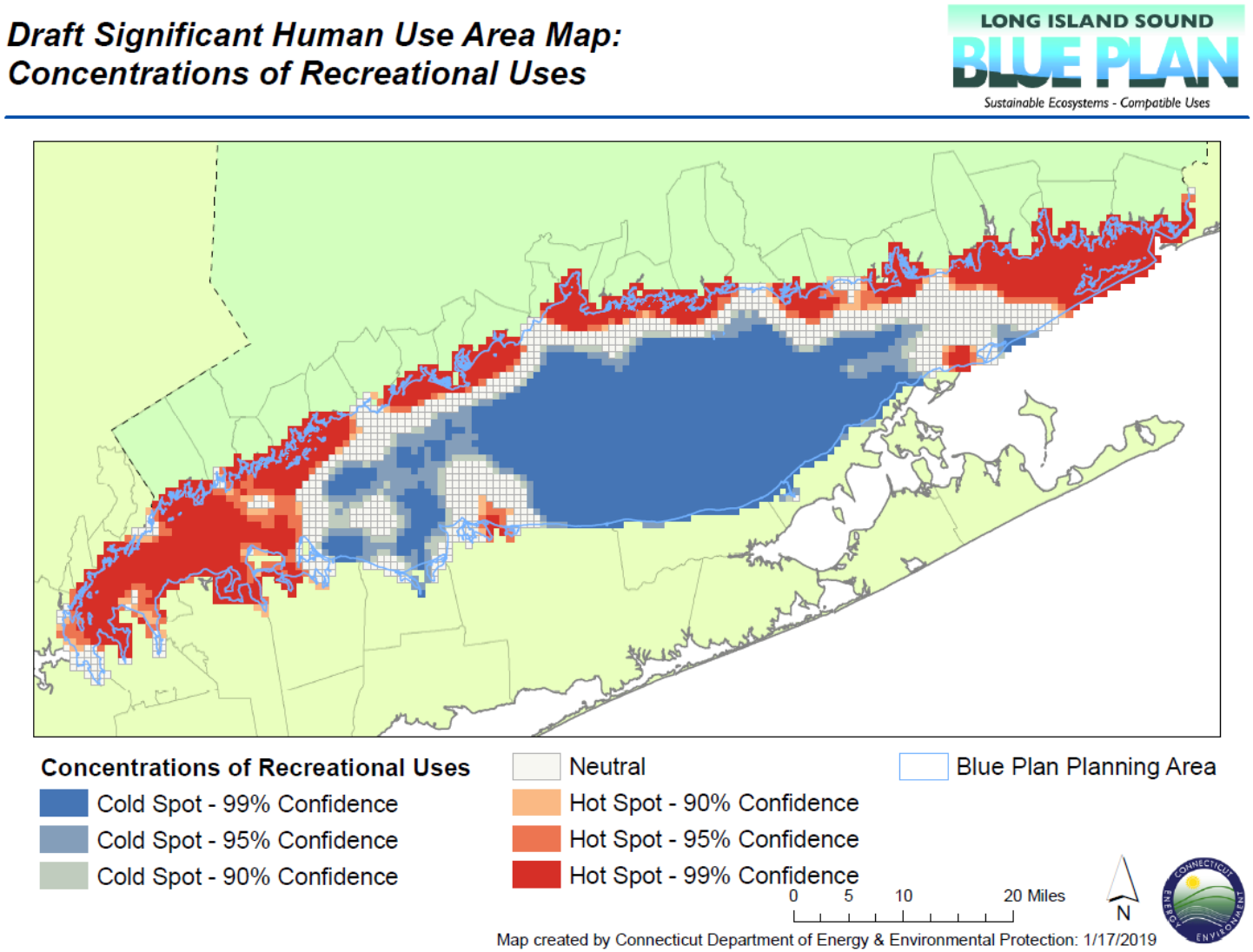


Figure 3a-49 Final concentrations of all Recreational Uses in LIS.

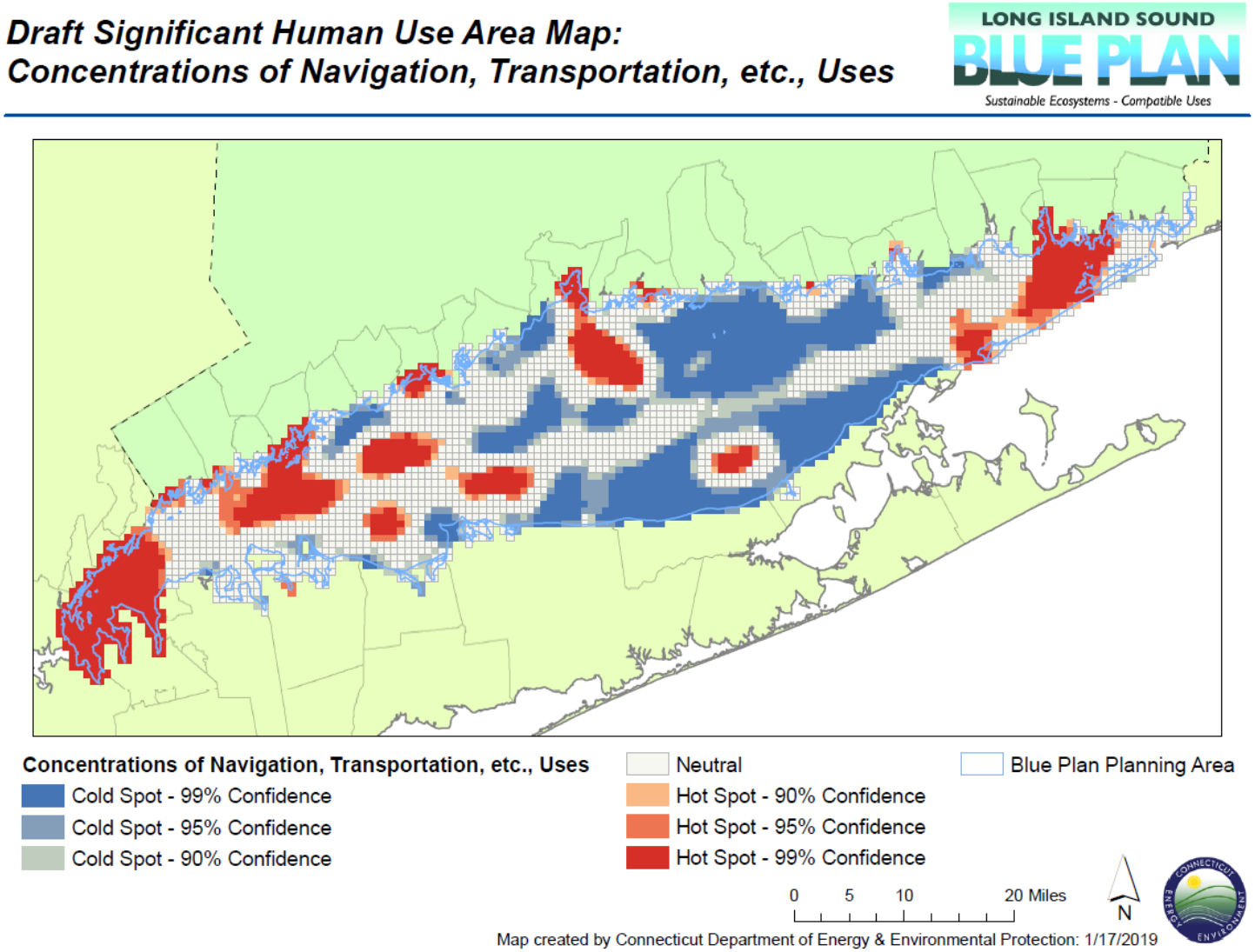


Figure 3a-50 Final concentration of all Navigation, Transportation, and Commerce activities in LIS.

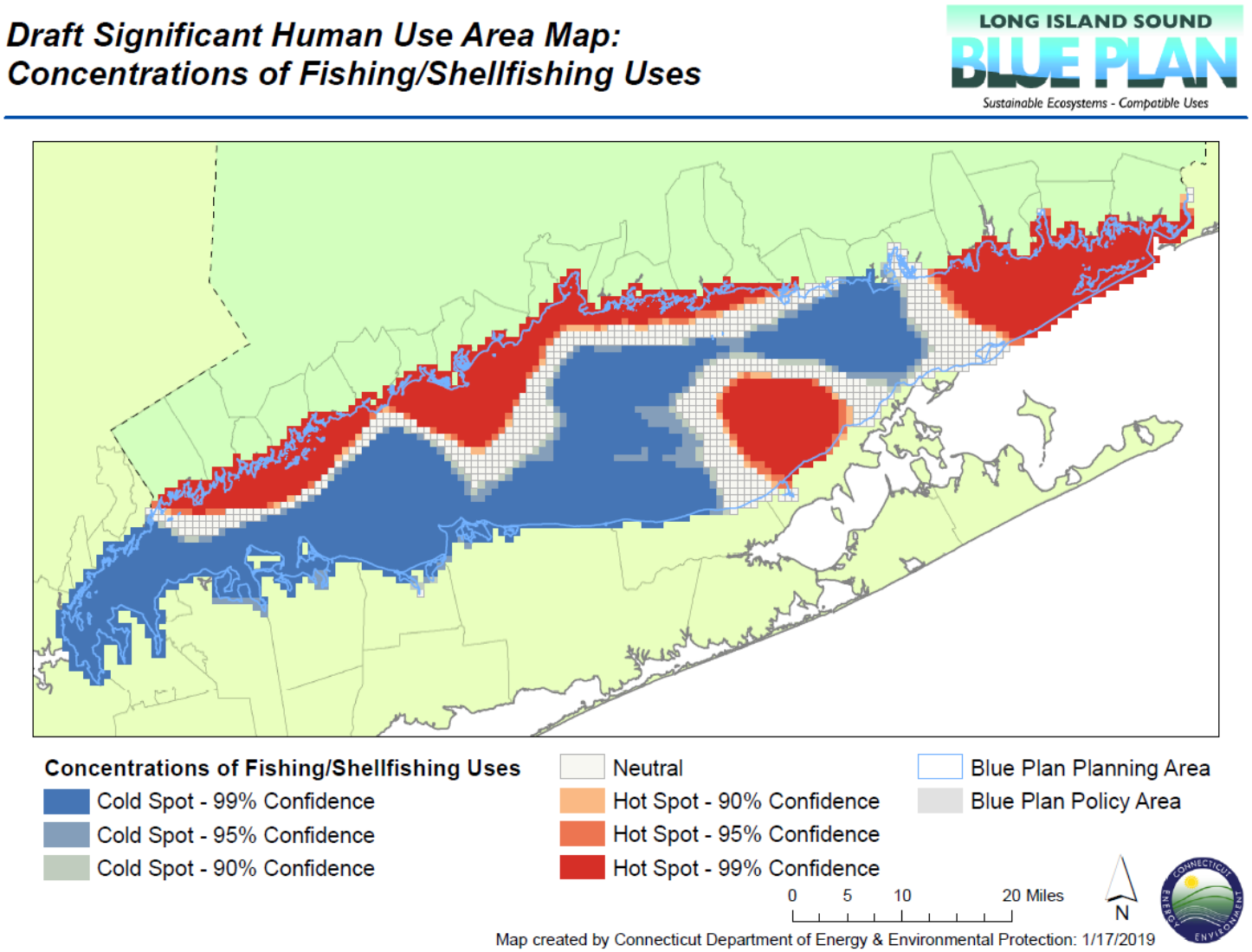


Figure 3a-51 Final concentrations of fish and shellfish uses in LIS.

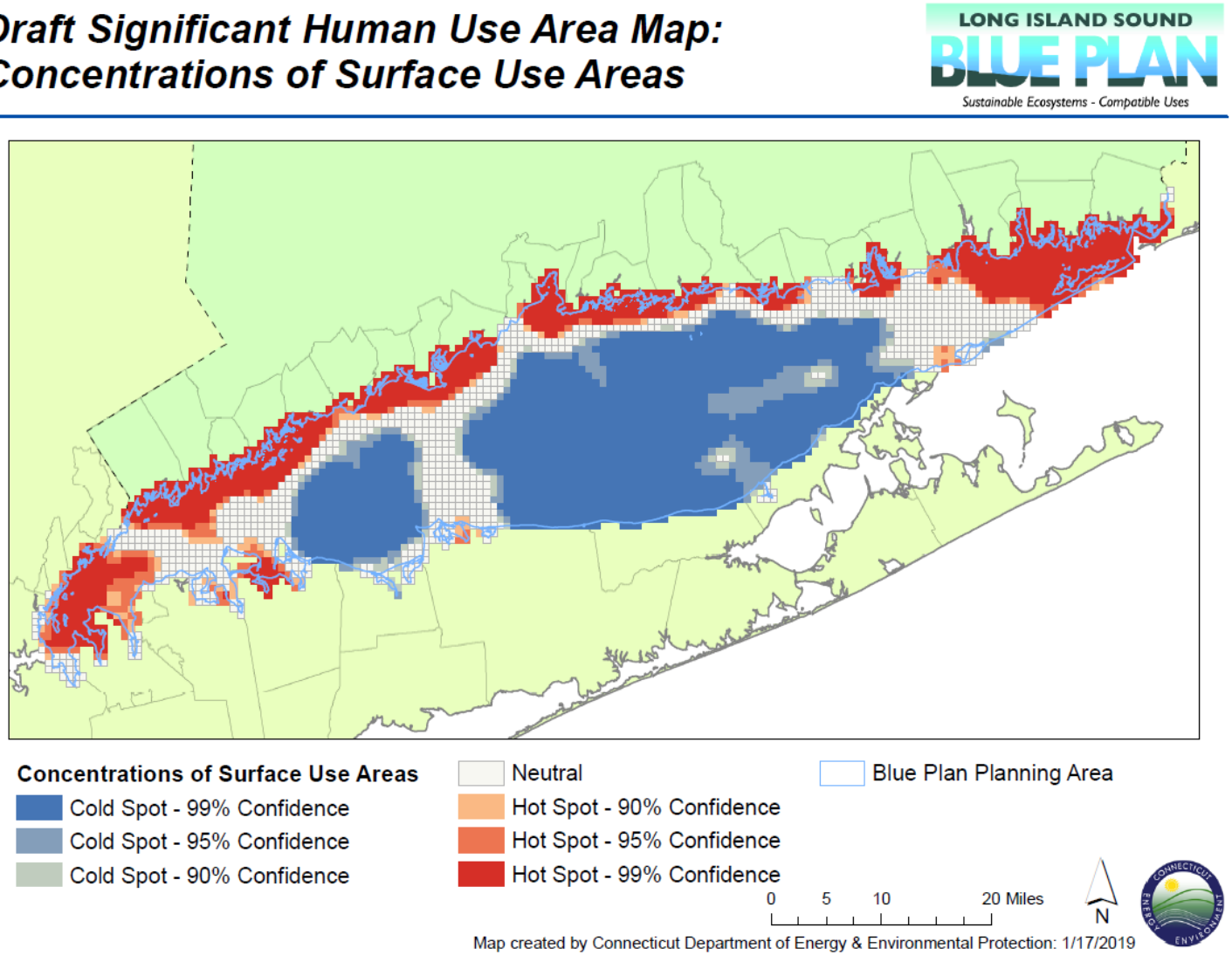


Figure 3a-52 Final concentrations of surface uses and activities in LIS.

Draft Significant Human Use Area Map: Concentrations of Water Column Use Areas

LONG ISLAND SOUND BLUE PLAN
Sustainable Ecosystems - Compatible Uses

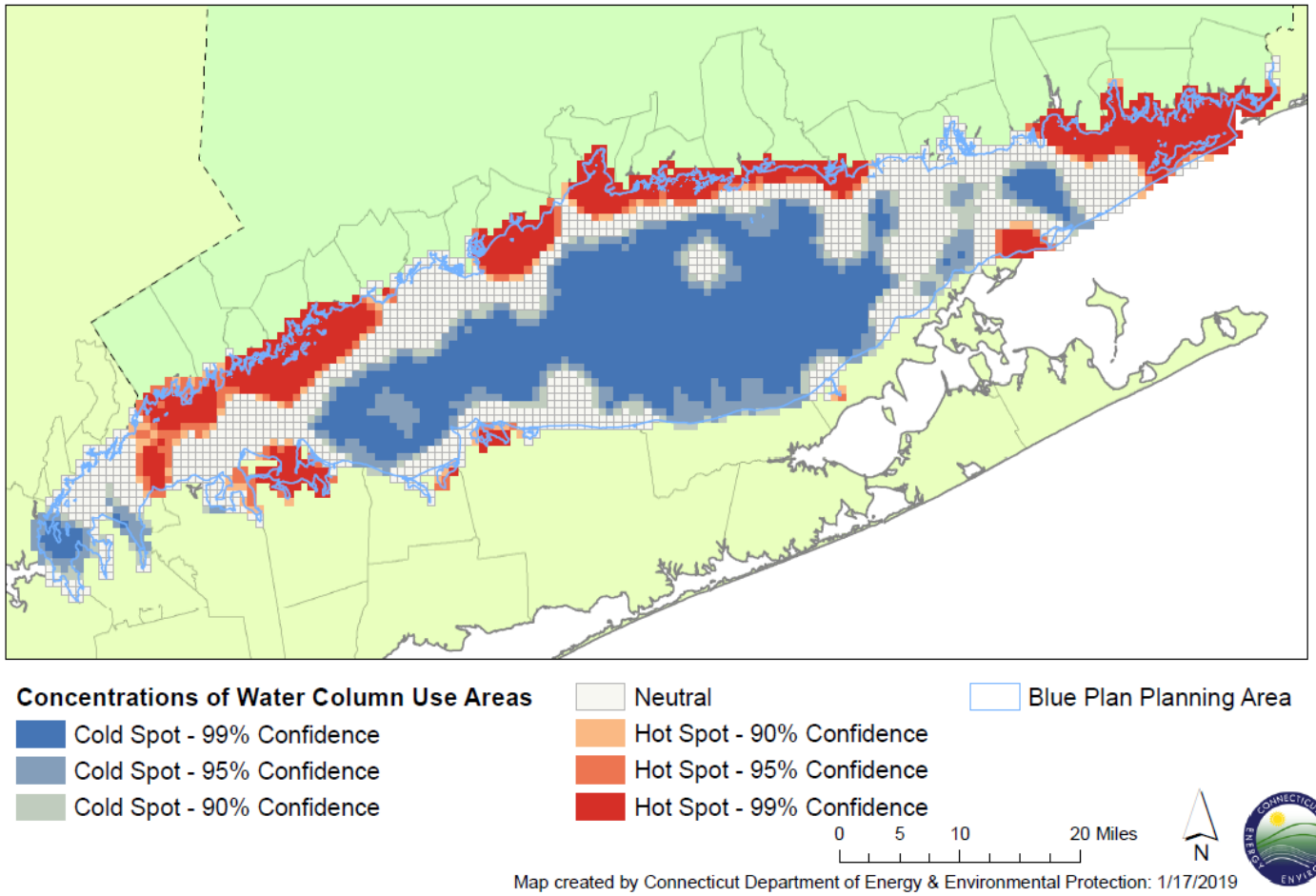


Figure 3a-53 Final concentrations of water column uses and activities in LIS.

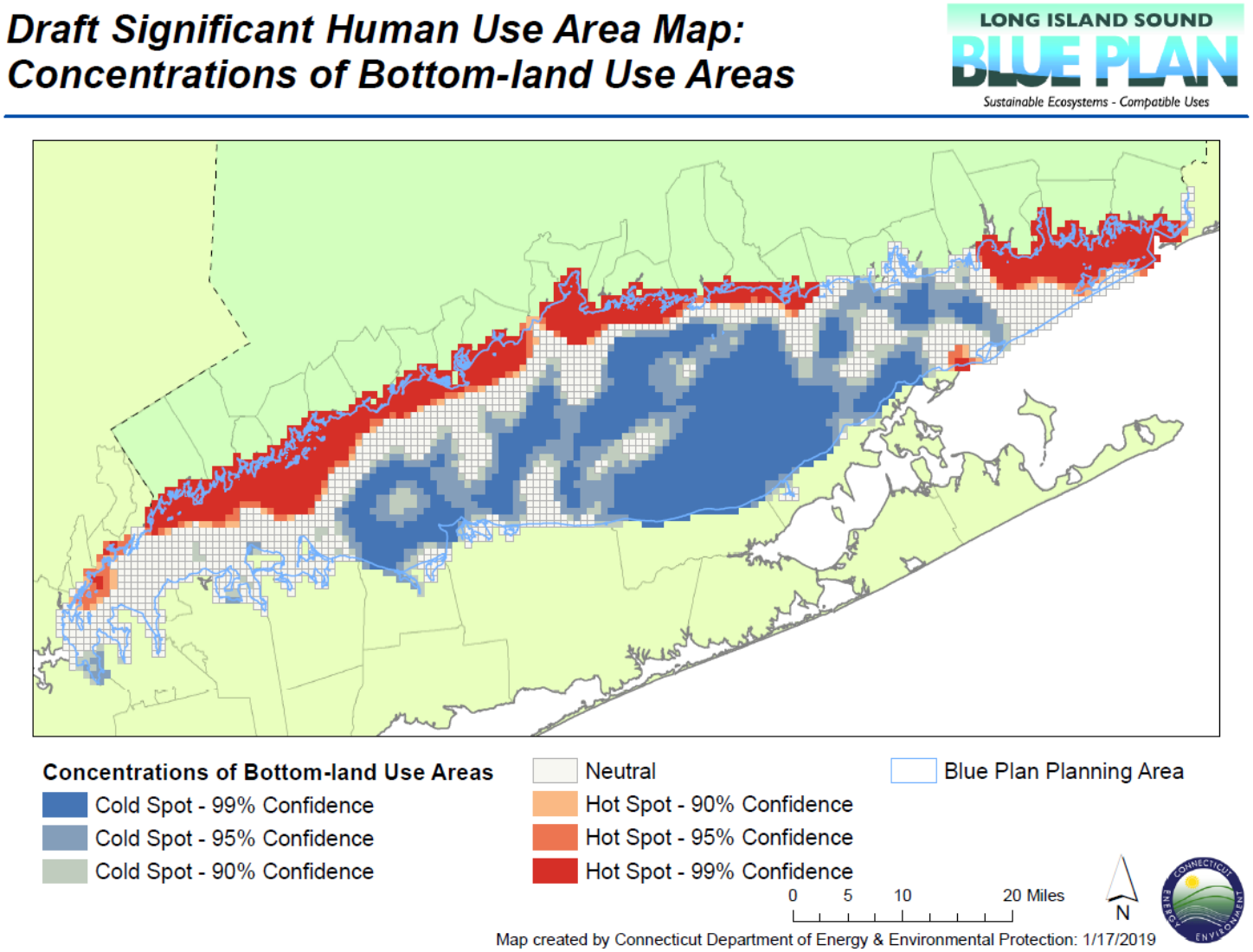


Figure 3a-54 Final concentrations of bottom-land uses and activities of LIS.

Appendix 4. Conflict and Compatibility Matrices

Within this appendix are a series of conflict and compatibility matrices considering the natural resources and human uses of Long Island Sound. They are meant to assist the user in identifying where their proposal or project will likely have conflict and where it will likely be compatible.

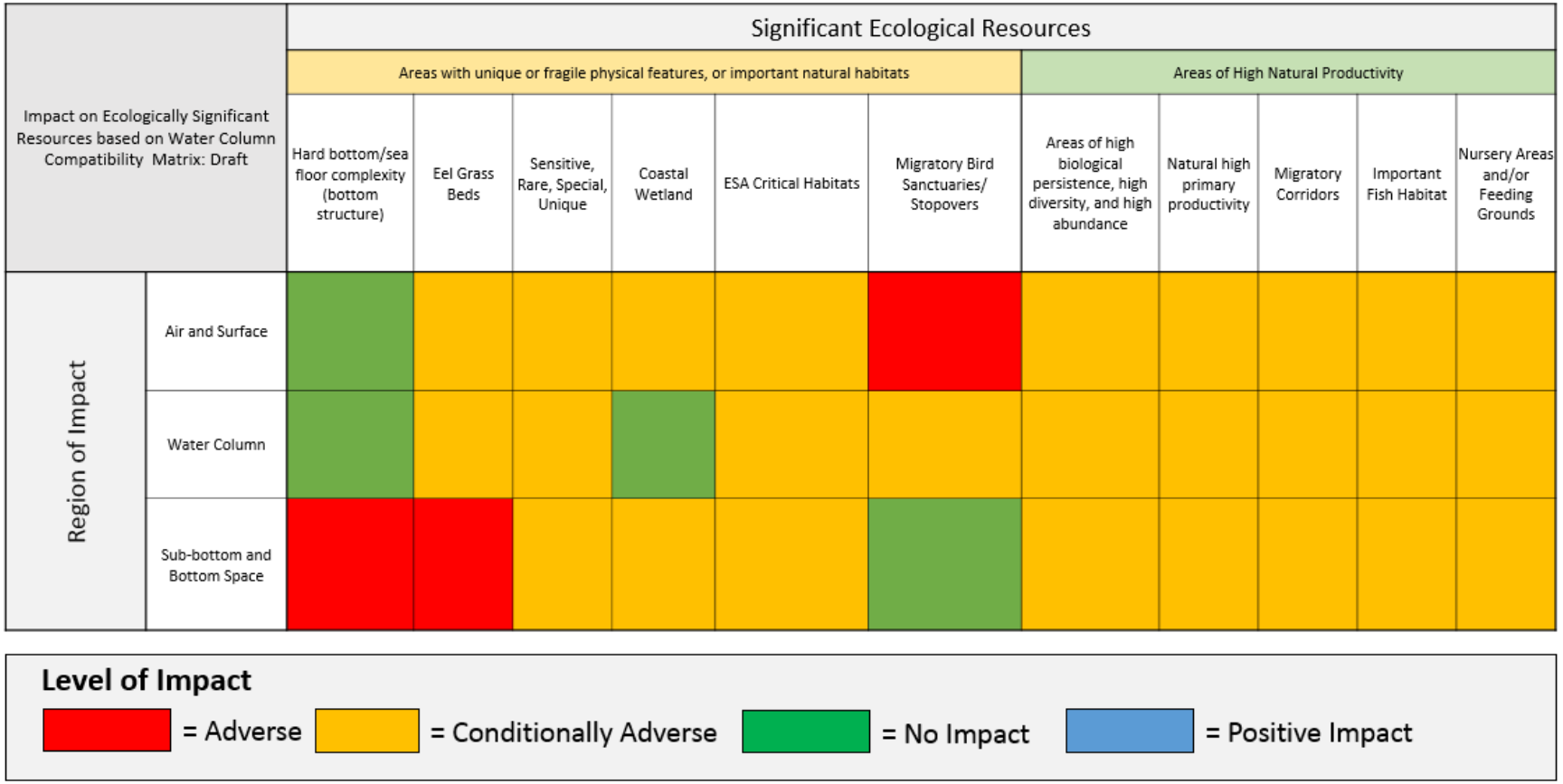


Figure 4a-1 Conflict/Compatibility Matrix associated with Ecologically Significant Areas (ESAs) and region of impact.

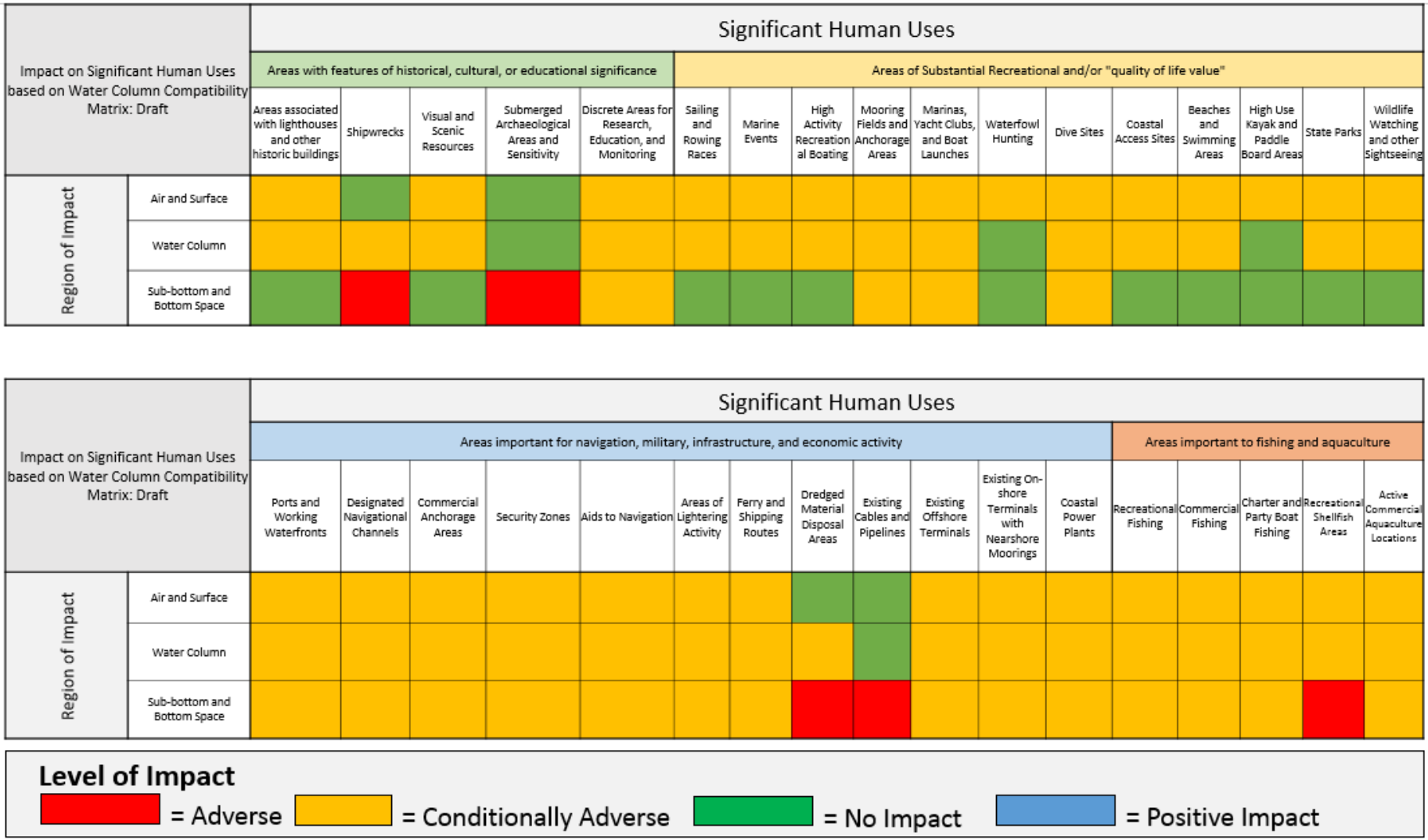


Figure 4a-2 Conflict/Compatibility Matrix associated with Significant Human Use Areas (SHUAs) and region of impact.

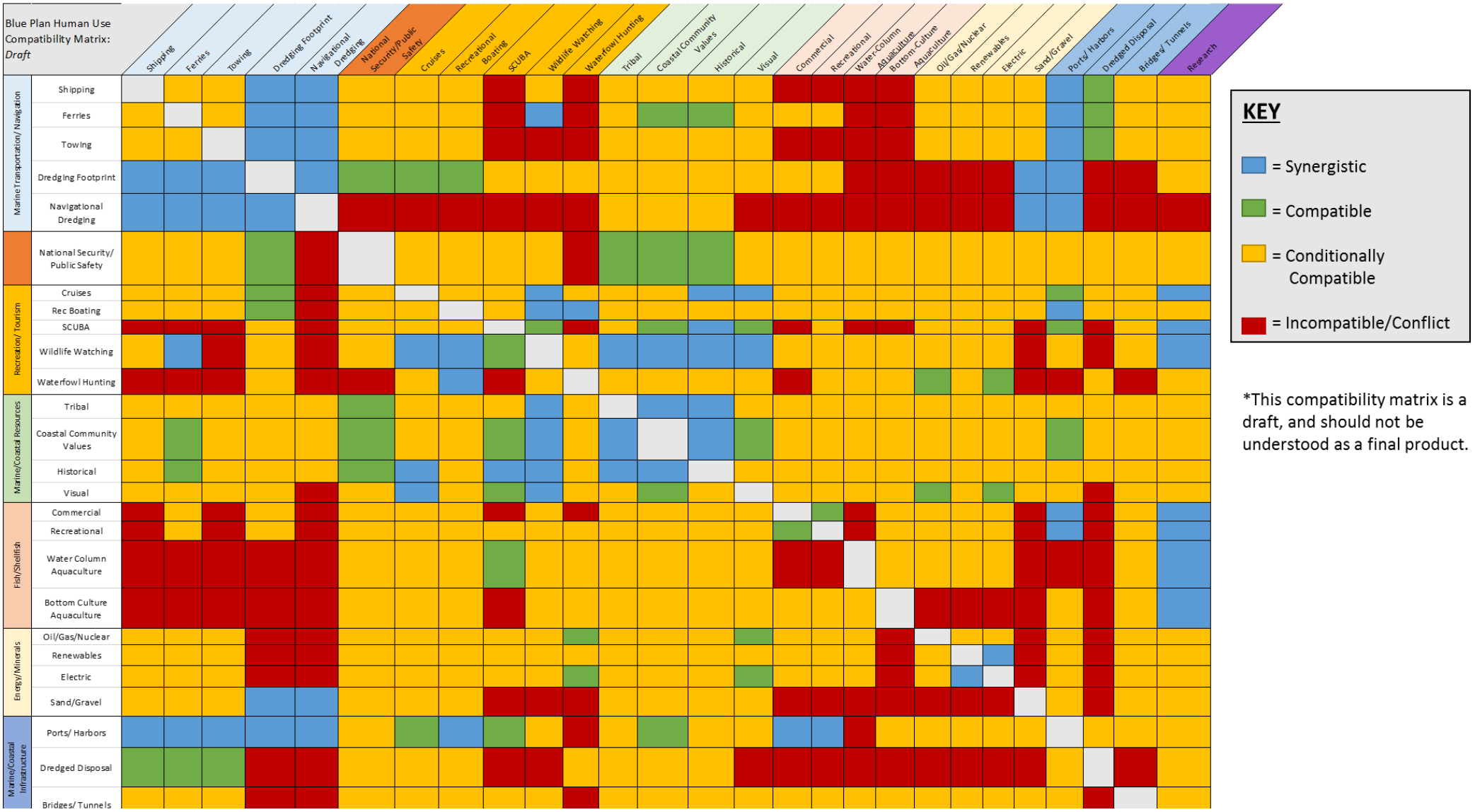


Figure 4a-3 Conflict/Compatibility Matrix: Human Uses vs Human Uses

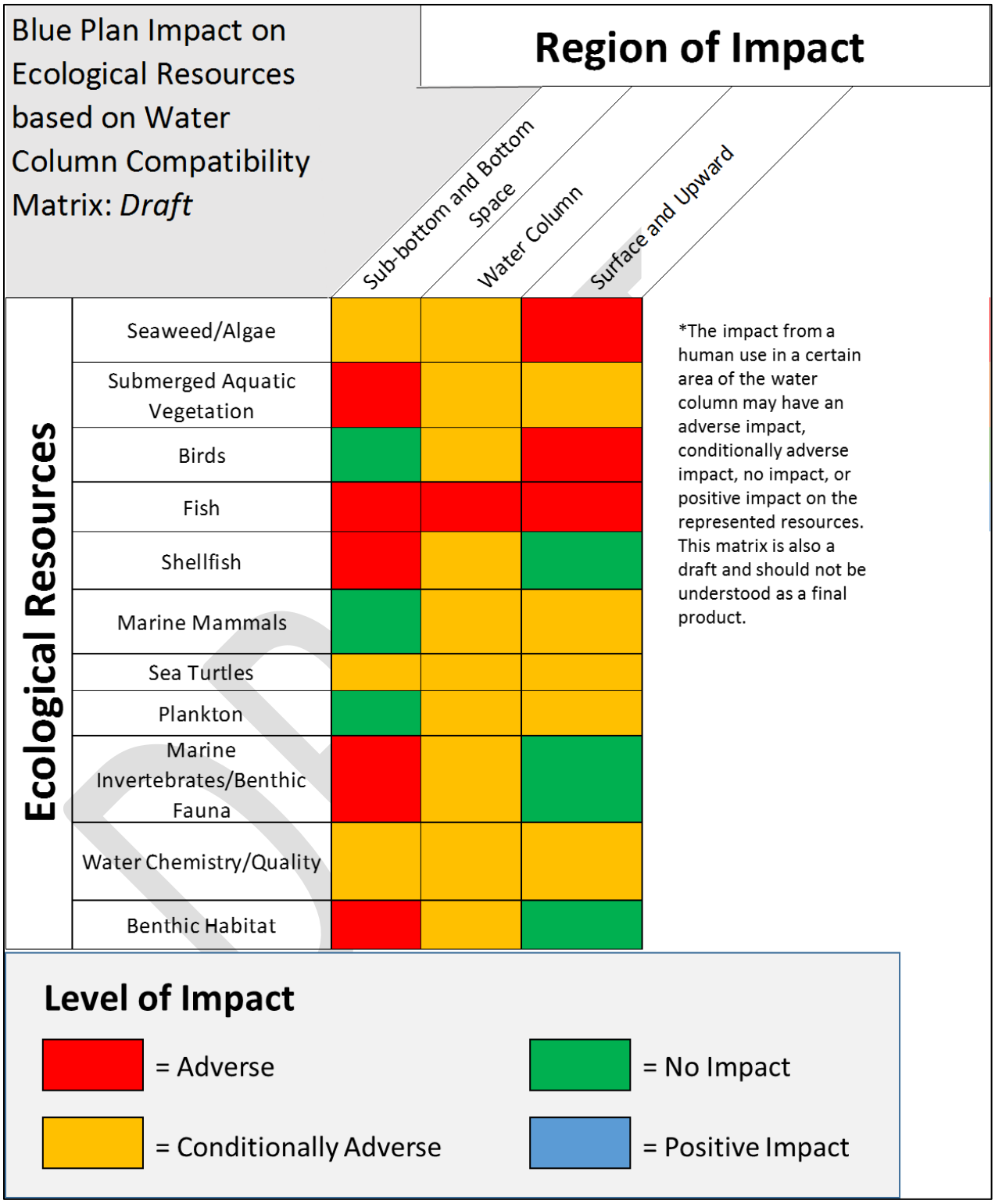


Figure 4a-4 Conflict/Compatibility Matrix: Human Uses vs. Natural Resources