Sustainable development of maritime cultural heritage in the Gulf of Maine

Stefan Claesson

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Sustainable development of maritime cultural heritage in the Gulf of Maine

Abstract
In this study the principles of sustainable development and ecosystem-based management are applied to develop a conservation policy for maritime cultural heritage in the Gulf of Maine. This dissertation first examines the effectiveness of existing laws, policies and preservation programs available for the protection and conservation of maritime historical and archaeological resources in the region, and provides an assessment of the diversity and abundance of these resources. Then the principles of sustainability and ecosystem-based management, including inter- and intra-generational equity, precaution, system interconnectedness, and diversity, are applied to form a theoretical framework upon which policies and cultural resource management techniques are developed. To this end, the study identifies the cultural and economic values associated with maritime cultural heritage and the costs and benefits of conservation projects. Finally, policy recommendations are made regarding the governments’ role and responsibility in protecting and managing the public interest in this cultural heritage: government should enact law that asserts public property ownership and protection of all maritime cultural resources in waters under U.S. federal jurisdiction, implement a regional governance structure based on the tenets of ecosystem-based management to manage and develop these resources effectively, and integrate valuation techniques in environmental and historic preservation regulatory procedures. Given these policy developments, governments can make informed decisions about the use of cultural resources, support coastal communities' development efforts, and identify the social and economic benefits of conservation projects.

Keywords
Anthropology, Archaeology, Environmental Sciences

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SUSTAINABLE DEVELOPMENT OF MARITIME CULTURAL HERITAGE
IN THE GULF OF MAINE

BY

STEFAN CLAESSON
B.A., Boston University, 1992
M.A., Texas A&M University, 1998

DISSERTATION

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in
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This dissertation has been examined and approved.

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ABSTRACT

SUSTAINABLE DEVELOPMENT OF MARITIME CULTURAL HERITAGE IN THE GULF OF MAINE

by

Stefan Claesson

University of New Hampshire, May, 2008

In this study the principles of sustainable development and ecosystem-based management are applied to develop a conservation policy for maritime cultural heritage in the Gulf of Maine. This dissertation first examines the effectiveness of existing laws, policies and preservation programs available for the protection and conservation of maritime historical and archaeological resources in the region, and provides an assessment of the diversity and abundance of these resources. Then the principles of sustainability and ecosystem-based management, including inter- and intra-generational equity, precaution, system interconnectedness, and diversity, are applied to form a theoretical framework upon which policies and cultural resource management techniques are developed. To this end, the study identifies the cultural and economic values associated with maritime cultural heritage and the costs and benefits of conservation projects. Finally, policy recommendations are made regarding the governments’ role and responsibility in protecting and managing the public interest in this cultural heritage: government should enact law that asserts public property ownership and protection of all maritime cultural resources in waters under U.S. federal jurisdiction, implement a regional governance structure based on the tenets of ecosystem-based management to manage and develop these resources effectively, and integrate valuation techniques in
environmental and historic preservation regulatory procedures. Given these policy developments, governments can make informed decisions about the use of cultural resources, support coastal communities’ development efforts, and identify the social and economic benefits of conservation projects.
CHAPTER 1

INTRODUCTION

In the United States, the presence of a maritime heritage is perhaps no where more apparent than in the Gulf of Maine. A unique physical environment and a wealth of marine resources have played critical roles in the region’s settlement, economic development, and cultural formation. However, little effort has been made to preserve maritime archaeological sites, such as shipwrecks and historic waterfronts, which are tangible representations of the region’s maritime history. Coastal development, marine construction, and innovations in marine survey technology are resulting in more discoveries of these non-renewable resources than ever before. Without policies, laws and management tools to protect the public’s interest in these historical properties and maritime archaeological resources, future generations will be denied access to this unique maritime heritage.

Sustainable development is an approach that has been used to manage natural resources for nearly 30 years, but rarely has the concept of sustainability been applied to cultural resource management in the United States. This study examines the application of sustainable development and ecosystem-based management principles to the conservation of maritime cultural resources in the Gulf of Maine. Through these principles we can improve protection of maritime heritage, make informed decisions about the preservation and use of cultural resources, support coastal communities’
development efforts, and offer incentives for preservation. By building a sustainable heritage, the maritime past of the Gulf of Maine can be preserved for future generations, keeping citizens connected to the deep-rooted traditions of the region and facilitating the economic growth and development of coastal communities.

This dissertation begins with a description of the history, fundamentals and definitions of maritime archaeology, heritage and cultural resources. Chapter 3 provides an inventory and analysis of the effectiveness of existing laws and policies for the preservation and management of submerged and coastal cultural resources in the Gulf of Maine. Chapter 4 identifies and describes 18 geographical regions within the Gulf of Maine that contain significant and unique representations of maritime history, culture and archaeological resources. Chapter 5 describes how sustainable development principles can be applied to maritime cultural resource management and how ecosystem valuation methods can be used to assess the costs and benefits associated with their conservation. Finally, in Chapter 6, regional policies are proposed and developed that identify the role and responsibility of government in protecting the public interest in cultural heritage, and suggestions are made about how public institutions can ensure that current as well as future generations will benefit from maritime cultural heritage conservation.

Maritime Cultural Heritage of the Gulf of Maine

There are many endangered cultural resources in the United States, both tangible and intangible, that merit preservation and management. However, no cultural resource has received such considerable public interest and simultaneously such limited preservation effort and resource management as submerged and coastal archaeological
sites such as Native American settlements, shipwrecks and historic waterfronts. The presence of maritime cultural resources and a distinct maritime heritage is prominent in the Gulf of Maine. While the hulls of shipwrecks, their fragments and contents are representative of the gulf’s maritime heritage, the waterfronts and shipyards that propelled the construction of ships and facilitated trade and fishing are also a significant part of the maritime cultural landscape, as examples of the land-sea interface. As the rate of growth in marine technology, exploration, and coastal development steadily increases, these resources are being progressively threatened. Government and heritage managers will be forced to make difficult and ill-informed preservation decisions without principles and procedures to guide cultural resource management. If policies for the protection and maintenance of these resources cannot be forged, the inevitable result will be a significant loss to future generations of their heritage in one of America’s most historically significant maritime regions.

**Regional Significance**

The coastal and marine environments of the Gulf of Maine are diverse and highly productive. The gulf is a semi-enclosed sea defined by underwater banks to the south and east, and to the north and west by the coastlines of Massachusetts, New Hampshire, Maine, and the Canadian provinces of New Brunswick and Nova Scotia (FIG. 1). The current coastline is a result of glacial retreat, via isostatic rebound and eustatic sea level rise, which began approximately 15,000 years ago. The gulf now consists of some 36,000 square miles of ocean and 7,500 miles of shoreline (GoMOOS 2003). The coast is punctuated further with approximately 5,000 islands. Its coastal morphology ranges from
shallow estuaries and broad, sandy beaches to deep, penetrating rivers and high-cliffed shorelines (Shipp et al. 1985). The underwater landscape of the gulf is as variable as its uplands, consisting of a variety of submerged banks, basins, and ridges. The gulf has a maximum water depth of approximately 500 m (1500 ft). Historically, its waters are home to an abundance of fish species including cod, haddock, mackerel, herring, salmon, and lobster, and marine mammals such as baleen whales and harbor and gray seals.
The wide-ranging environments and resources of the gulf have also resulted in an equally wide-ranging number of technological innovations used by people to settle along the coast and harness its natural resources. The initial peopling of the Gulf of Maine began approximately 12,000 years ago. It is only in the last 500 years, however, that the region witnessed extensive coastal settlement and development, and massive exploitation of its natural resources. The Gulf of Maine was first noted by European explorers in the 16th and 17th centuries for its extensive forests, fine farming land, great fishing banks, protected harbors, and penetrating rivers. In the centuries following its initial discovery by foreign explorers, ships would be used to facilitate extensive New World colonization from Europe, to fish, and to exploit the region’s vast terrestrial natural resources, and to conduct productive local and long-distance trade. Due to the galleons, shallops, sloops, and schooners that plied its waters, and the resulting maritime culture that developed on its shores, the Gulf of Maine has inherited one of the greatest maritime histories of the United States.

Resource exploitation and maritime trade in the region, however, is not limited to the gulf’s coastal inhabitants. Foreign ships sailed for thousands of miles to reach the rich fishing grounds of the gulf and to trade in commodities such as furs and timber. For centuries, New Englanders traded with Europe and the Caribbean, transporting raw materials to these regions in exchange for manufactured and exotic goods. Ships were abandoned, lost to storms, naval engagements, and even to piracy. Therefore, the region also contains the vestiges of seafaring and the maritime heritage of nations located far from its shores.
Threatened Resource

Coastal settlement for centuries along the shores of the gulf, however, has resulted in a declining marine and terrestrial resource base and simultaneously wiped clean many of the earlier tangible remains of the region’s maritime past from the landscape. For a society still engaged in maritime industries, little effort has been made to maintain and study the historic structures on which these industries are built. Conservation of maritime cultural resources is doubly important now in a region where marine resources as well as ancient livelihoods, such as fishing, are endangered. Shipbuilding, lumbering, and fishing, in particular, in the Gulf of Maine are activities that have characterized the region and played a pivotal role in the formation of America and its cultural identity. Through the study and conservation of prehistoric landscapes and archaeological sites, historic shipwrecks and waterfronts, the people of the Gulf of Maine can promote heritage tourism and research, and maintain their cultural identity and connection to a maritime past.

Regulation and management of cultural resources in the United States is reasonably effective, but predominately implemented for land-based heritage. The laws and practices in place imply a level of sustainable development and offer a variety of incentives and disincentives for preservation of standing architecture. However, there is an urgent need for an integrated and sustainable policy to manage and preserve coastal and underwater archaeological resources, particularly in the northeastern United States. The handful of historic shipwrecks and waterfronts that have been preserved to date in the Gulf of Maine are hardly representative of the region’s rich maritime heritage. Furthermore, the potential presence for submerged prehistoric archaeological sites in the
region is uncertain. Without a preservation plan and laws to adequately protect maritime
cultural resources from coastal development and environmental forces, the region’s finite
and non-renewable maritime cultural resources will be lost.

The collective number of shipwrecks reported in the cultural resource inventories
of Maine, New Hampshire, and Massachusetts is nearly 3,000. Of these wrecks, the
locations of only 120 are known. To date, only two historic vessels have undergone
systematic and complete archaeological analysis in Maine waters: Defence, an American
privateer from the Revolutionary War found in Penobscot Bay and excavated in 1975
(Bass 1988: 155-159); and Annabella, a 19th-century transport schooner derelict in the
Cape Neddick River and excavated in 1995 (Claesson 1998). The Salamander Point
Wreck is the only ship to be excavated by archaeologists in New Hampshire, and the
coast of Massachusetts has not witnessed a single shipwreck or derelict vessel
examination by professional archaeologists.

In addition, there have been few intensive studies of historic waterfronts in New
England. The only excavated wharf sites are at the Derby and Central Wharves in Salem,
Massachusetts (Garman et al. 1998), and an investigation of the working waterfront at
Strawbery Banke in Portsmouth, New Hampshire. The data from both these excavations
has not yet been thoroughly analyzed or published, and there is insubstantial comparative
architecture to interpret the relative significance of these sites. Although historic
waterfronts investigations have occurred at other sites in Massachusetts including Long
Wharf and Mill Pond in Boston (Seasholes 2003: 31, 75), and Gunnison’s Wharf in
Newburyport (Faulkner et al. 1978), these investigations have provided limited
information for understanding the technologies and efforts that propelled their
construction. Only the Derby and Central wharves, now part of the Salem Maritime National Historic Site, have been reconstructed in a somewhat historical fashion, with sustainable economic development in mind.

Real estate development along the Gulf of Maine coast has damaged many of the historic waterfronts and shipwrecks that lie in shallow tidal waters. As land development has increased, infrastructure needs have also grown. Archeological sites are constantly under threat by sprawl and the construction of new transportation and utility corridors. In addition, human-made coastal structures such as seawalls and jetties to protect private and public lands from wind, waves, rising sea levels, and erosion, contribute significantly to the loss of maritime archaeological sites. Environmental processes, particularly erosion, also contribute directly to the loss of coastal archaeological sites.

New marine survey technologies in the last decade have resulted in a significant increase in the number of underwater discoveries. New generations of sonar technology are capable of providing detailed and accurate bathymetric maps of the seafloor. Underwater mapping of sites by archaeologists, which in the past required months and even years to document, is now possible within a few days or even hours because of sonar surveying technology. New technologies are also capable of documenting archaeological sites at greater depths than before, revealing that deep-water shipwreck sites not only exist but are in a remarkable state of preservation. While archaeologists welcome new and more efficient tools to document archaeological sites, the burgeoning marine technology will undoubtedly result in a rate of discoveries in shipwreck and submerged prehistoric sites never seen before. Moreover, as the technology develops and becomes more affordable, there will always be unscrupulous individuals who will use it
to detect and plunder archaeological sites for their own interest and benefit. As discoveries and threats grow, who will manage these resources, determine their significance, and ensure that the maritime heritage is preserved without compromising the ability of future generations to meet their own needs?

**Sustainable Development**

This dissertation explores the application of sustainable development principles to existing regulatory regimes and government structures. In order to mitigate or stop deterioration of maritime cultural heritage sites, as well as make certain that decisions regarding their condition, abundance and diversity are made consistent with future and present needs, a fundamental shift in management principles is needed. Sustainability, or sustainable development, is a management philosophy that can assist coastal communities of the Gulf of Maine to “meet the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987: 8).

Specifically, a precautionary approach to management, which is grounded in sustainable development theory, provides a significant departure from current maritime cultural resource management practices. Instead of approving proposed actions when the presence of archaeological resources or historic properties is uncertain or unknown, this approach favors treating uncertainty with extreme caution. Taking early measures to prevent damage or loss of potential cultural resources, even when there is a lack of full scientific certainty, avoids actions that might result in irreversible change to the human
environment, and ensures that the needs of future as well as current generations are considered.

Numerous federal government reports and national ocean research initiatives published over the last decade have acknowledged deficiencies in cultural resource management as well as the importance of their conservation in promoting human well-being. The U.S. Commission on Ocean Policy in 2004 reported that:

> efforts to understand the social, cultural, and economic dimensions of ocean issues have received surprisingly little support. Because of this, studies of humans and their behavior – so critical to virtually every ecosystem – deserve special attention. (67)

Stewardship of cultural resources was also identified as an ocean research priority by the Joint Subcommittee on Ocean Science and Technology (JSOST 2007). The subcommittee, in their research priorities plan and implementation strategy, report that the "ocean preserves a record of the nation’s cultural past,” and:

> Healthy ocean and coastal natural and cultural resources provide the foundation for a huge coastal tourism and recreation industry that is the fastest growing area of the ocean economy. Prehistoric landscapes, shipwrecks, and historic and living waterfronts along the nation’s coasts and Great Lakes all contribute to the national cultural heritage. (JSOST 2007: 13)

Cultural resources have significant potential economic benefits for coastal and maritime communities in the Gulf of Maine, but their use (e.g., tourism and recreation) must also be balanced to mitigate negative social and cultural, as well as broader ecosystem or environmental impacts. The Millennium Ecosystem Assessment (MEA) synthesis report, *Ecosystems and Human Well-Being*, which provides an analysis of the
world’s ecosystem trends and conditions notes that “although the use of cultural services has continued to grow, the capability of ecosystems to provide cultural benefits has been significantly diminished in the past century” (MEA 2005: 46). Deterioration of marine environments, habitats and resources presents significant threats to cultural health and diversity in the Gulf of Maine. For example, the loss of fish populations to overfishing, and loss of marine habitats to coastal tourism and development, may lead to economic and cultural decline of the region’s maritime-based communities, and “can contribute to social disruptions and societal marginalization” (MEA 2005: 46). The policy recommendations of JSOST, MEA, and the U.S. Commission on Ocean Policy are in agreement regarding the need for research into issues of resource uses. JSOST has specifically recommended that:

Research into issues of resource development, use, and extraction . . . . will help society prevent major impacts to ecosystems, promote sound development and use of resources, preserve cultural sites, and support management efforts to restore depleted populations to healthy and sustainable levels. (JSOST 2007: 14).

Government has a significant role in ensuring that cultural heritage is maintained. However, the effective management of maritime cultural resources by government is currently limited in that 1) the jurisdiction of government agencies and institutions over coastal, territorial, and economic zone waters is problematical and ill-defined, 2) cultural resource managers do not agree on which methodologies or guidelines should be used to manage the maritime heritage, 3) historical contexts and significance statements, as well as cultural or economic value assessments for maritime heritage sites do not exist, 4) the legislative instruments and mechanisms for resource protection are poorly instituted and
often ineffective, 5) maritime cultural resources are rarely included as protected resources in environmental policies and plans, 6) the interstate mechanisms to protect maritime cultural resources are underdeveloped, and 7) there are inefficient technical capabilities and little or no funding for maritime heritage managers to gather data and regulate resources.

**Methods**

To institute an effective, long-term, sustainable heritage management strategy for the maritime cultural resources of the Gulf of Maine, the following questions are addressed: 1) What is maritime archaeology and what is its history in the Gulf of Maine? 2) What are the key policies and laws that affect the preservation of maritime cultural resources? 3) What are the historical themes or contexts of the region, and what maritime archaeological sites are representative of these contexts? 4) What is sustainable development and how can its principles be used to manage cultural resources? 5) What policies should be instituted to improve resource protection and conservation? The answers to these questions will determine who is responsible for managing cultural resources in coastal and submerged lands, identify the potential threats to maritime cultural resources, and determine which archaeological sites are significant to the region and the nation, as well as the international community.

Chapter 2 of this study introduces the field of maritime archaeology, provides terminology and definitions, briefly outlines the development of the discipline, and describes the types of cultural resources that are present in the Gulf of Maine. The
components of maritime archaeology, namely research, preservation and management are defined, and the inter-relationship of these components is illustrated.

There are numerous laws and regulations for heritage preservation; however, there are few legal instruments or government incentives for states or the private sector to preserve the region's submerged and maritime cultural resources. Chapter 3 describes the development of the discipline within the framework of state, federal and international legislation and regulations. This section reviews the relevant preservation policies, highlighting the legislative transformations that accompanied the phases of the discipline's development, and provides an understanding of preservation issues and public interests in maritime heritage. Specifically, chapter 3 reviews the effectiveness of the policies used by each state in the Gulf of Maine to manage and preserve maritime cultural heritage, and their various incentives (e.g., direct funding and tax-based incentives), disincentives (e.g., fines and imprisonment), and regulatory methods (e.g., permitting). Environmental and preservation acts, policies, international treaties, as well as preservation guidelines of state and federal governments are also reviewed. Geographic Information System (GIS) software maps the jurisdiction of state and federal agencies and defines the extent of relevant legislative instruments and international treaties over maritime cultural resources that lie in the coastal and submerged lands of the Gulf of Maine.

Chapter 4, a major component of this study, is comprised of historic contexts or narratives of 18 maritime regions, or sub-regions, situated within the Gulf of Maine. For the purposes of determining the cultural significance of heritage sites, cultural resources must be interpreted in the social, economic, and physical contexts of their time. Without
historic contexts to provide a framework for determining the significance of historic properties and landscapes, the archaeological sites and artifacts of the region’s maritime cultural heritage are no more than curiosities of a bygone era. These contexts inventory the types of maritime heritage sites that exist in the Gulf of Maine, and identify important periods and places in history that will help to establish which types of sites are historically significant and cultural or economically valuable.

Contexts are developed for Native American as well as European and American maritime culture and history. Temporally, the Native American contexts begin as early as the PaleoIndian Tradition (ca. 12,000 BP) and extend to the end of the integration with Euro-American life (ca. 1940). From the European/American historical perspective, contexts are developed for the period of Contact and European exploration (ca. 1500) to the end of the Early Modern Period (ca. 1950). The geographical scope both Native American and European/American contexts include the inshore and offshore waters of Maine, New Hampshire, and Massachusetts. The contexts provide a stock assessment of archaeological sites, document gaps in the archaeological record, and identify significant resources and management needs within each Gulf of Maine sub-region.

Cultural heritage management practices in the United States typically involve the nomination of historic and cultural sites to state and national heritage registers and lists for protection, based on their cultural or historical ‘significance.’ Chapter 5 introduces the principles of sustainable development and valuation techniques for the management of maritime cultural resources. The chapter surveys the few examples of sustainable development principles (e.g., inter- and intra-generational equity, precautionary principle, cultural diversity) and ecological methods that have been applied to assess the ‘value’ of
historic properties or archaeological resources. While contexts help to identify resources that are historically and culturally significant, the social and economic costs and benefits of preservation projects must also be considered. Specifically, the chapter classifies the services or 'service values' that maritime cultural resources provide to individuals, groups, communities and regions, and how sustainable development and economic techniques can be used to not only assess the cultural value of archaeological resources, but also to promote economic development and maintain public investments in cultural heritage stocks and inventories.

In Chapter 6, policy recommendations are proposed to develop a regional governance framework that allows for management and assessment of the significance or value of maritime archaeological sites from a regional or ecosystem perspective. Integration of valuation techniques into existing national regulatory procedures (e.g., National Historic Preservation Act [NHPA]) that consider the potential to answer important research questions, meet National Register criteria for listing on State or National Registers of Historic Places, as well as their potential uses for recreation, tourism, benefit to real estate markets, or marine industrial uses such as fishing or boatbuilding, are proposed. Finally, the chapter provides a discussion of the future role of sustainable development in preserving the cultural heritage of the Gulf of Maine, legislative and policy recommendations to improve protection of submerged cultural resources in Gulf of Maine waters, an inventory of man-made and natural threats to maritime heritage properties, integration of cultural resources management into existing ecosystem-based and regional governance frameworks. Through the application of
sustainable development theory, heritage management in the Gulf of Maine can hopefully be a greater part of the development process, rather than just a marginal aspect.
CHAPTER 2

MARITIME ARCHAEOLOGY

The discipline of maritime archaeology has developed and shifted along similar theoretical lines to that of terrestrial archaeology. As a new underwater world first became accessible via SCUBA during the 1940s, the seabed was explored and artifacts freely taken from submerged archaeological sites out of personal curiosity or sold to discriminating collectors as objet d'art. Following on the Art Historical or Antiquarian phase of maritime archaeology, artifacts recovered from the sea began to raise historical and cultural questions about past societies’ trade, economy, and technological exchange. Closer examination of ancient shipwrecks by archaeologists revealed unusual ship construction methods, and led researchers to ask questions about where and how such ships were built, and by whom. The historical particularist, or culture-historical approach that initially developed out of this questioning was later challenged by processualism or ‘New Archaeology’ in the 1980s. As processualism sought to answer broader questions about human behavior and marine-oriented cultures through the scientific method and hypothesis testing, historical particularists and post-processualists countered that such objectivity in archaeological interpretation is problematic and that hypothesis testing will not question all the cultural material revealed in the archaeological record. Maritime archaeology, lagging perhaps only 10 years behind the theoretical movement of terrestrial archaeology, has now reached the same philosophical plateau known as middle-range
theory – an approach which examines the relationship of human behavior and natural processes through the study of material cultural.

While maritime archaeology has shown dynamic and rapid development in theory and method, management of maritime cultural heritage and resources has remained static. There is little consensus on what constitutes maritime cultural heritage and the role of maritime archaeologists in resource management. Cultural resource management of maritime heritage is not only rudderless, lacking clear definitions for maritime cultural resources and the role of practitioners, but also lacks a well-defined philosophical footing upon which to base management practices. This chapter provides an overview of what constitutes maritime cultural heritage and resources, a review of the development of the field of maritime archaeology, and ends by broadly defining the roles of research, preservation and resource management in maritime archaeology.

**Maritime Cultural Heritage and Resources**

The vestiges of the Gulf of Maine’s maritime history are found in various forms along the coasts, the land-sea interface, and under water. These cultural remnants comprise a unique, finite, and mostly non-renewable group of resources including: 1) coastal and underwater prehistoric and historic archaeological sites, 2) the built heritage, such as historic ships and boats, working waterfronts, and cultural landscapes, 3) and indications of the maritime traditions and lifeways of the past as well as the present (TAB. 1).
1) Shipwrecks
2) Derelict vessels
3) Landings (or landing places)
4) Shipyards (or shipbuilding sites)
5) Dams
6) Coastal defense or fortification sites
7) Lighthouses or beacons
8) Navigational markers
9) Sea defense structures (e.g., seawall and jetties)
10) Quays, moles, piers, and wharves
11) Ferry, portage, and bridge sites
12) Canals
13) Fishing weirs
14) Fish-processing sites (e.g., ‘flakes’, canneries, fish houses, middens)
15) Ballast sites
16) Anchorages
17) Boat houses
18) Harbors and ports
19) Rock carvings
20) Farming and agriculture sites (e.g., aquaculture pens, fish ladders, marsh hay fields, cranberry bogs, sea salt production/manufacturing sites)
21) Sacred, religious, or spiritual landscapes
22) Settlement sites including submerged or inundated historic and prehistoric remains such as structures, middens, hearths, and cultural landscapes

Table 1. Categories of maritime cultural resources present in the Gulf of Maine.

Maritime cultural resources, however, are generally not included in government definitions of ‘cultural resources.’ While there are many definitions of cultural resources or cultural heritage, the definitions of the Secretary of the Interior’s National Park Service (NPS) and the United Nations Educational, Scientific, and Cultural Organization (UNESCO) are particularly relevant because they represent the governing bodies that
manage and preserve cultural resources nationally and internationally. NPS, the federal agency largely responsible for heritage preservation in the United States, defines a cultural resource as:

an aspect of a cultural system that is valued by or significantly representative of a culture or that contains significant information about a culture. A cultural resource may be a tangible entity or a cultural practice. Tangible cultural resources are categorized as districts, sites, buildings, structures, and objects such as archeological resources, cultural landscapes, structures, museum objects, and ethnographic resources. (NPS 1998: app. A)

UNESCO, which promotes cultural heritage conservation globally, does not have a definition for cultural resources per se, but rather defines cultural heritage as:

monuments: architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of outstanding universal value from the point of view of history, art or science; groups of buildings: groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science; sites: works of man or the combined works of nature and man, and areas including archaeological sites which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view. (UNESCO 1972)

Although maritime cultural resources are not explicitly referred to by either institution, they are included under the umbrella of these definitions.

Maritime cultural resources of an archaeological nature are unique in that the underwater and anoxic environments in which they are situated often result in remarkable states of preservation. Numerous shipwrecks have been found completely intact on the bottom of lakes and seas (e.g., War of 1812 American schooners Hamilton and Scourge in Lake Ontario, or the giant coal schooners Frank A. Palmer and Louise B. Crary in
Stellwagen Bank National Marine Sanctuary), and entire prehistoric villages have been found underwater or buried beneath lacustrine, riverine and estuarine silts and clays. The degree of preservation of organic material such as wood and other perishable materials is better than most any cultural resource or cultural heritage site on land (Coles 1988: 7). Although terrestrial archaeological sites leave an accumulated history of occupation patterns and activity, maritime archaeological sites such as shipwrecks provide a much more complete and detailed record of specific moments in time.

**Foundations of Maritime Archaeology**

A relatively new discipline, ‘Maritime Archaeology,’ aims to study, preserve, and manage these unique cultural resources. The field of maritime archaeology, until recently, has overwhelmingly focused on the study of shipwrecks. Indeed, shipwrecks are unique resources that provide a snapshot of the past like no other cultural resource can. However, the field has begun to recognize the significance of tying seaborne technology and activities together with maritime industries, resources, and cultures on land (Westerdahl 2000; Blackman 2000; Ward 2003). Therefore, maritime archaeology is not limited to the study of shipwrecks and now studies a broad spectrum of cultural resources, which includes waterfront structures, coastal settlements, and maritime industrial sites.

The rapidly evolving field of maritime archaeology has never been very sure of what to call itself. Following Jacques Cousteau’s and Emile Gagnan’s invention of the aqualung in 1943 and increased access to the Self Contained Underwater Breathing Apparatus (SCUBA), for several decades the field focused primary on the discovery of shipwrecks under water. Appropriately, it became known as ‘underwater archaeology.’
However, with no clearly-established philosophy for scientific study or methods for documentation, recovery, and conservation, the ensuing underwater exploration not only resulted in remarkable discoveries but also considerable damage to the underwater cultural heritage, particularly to sites in the Mediterranean Sea. Following this 'antiquarian' phase, which focused primarily on the recovery of artifacts for museum display, the detailed documentation and systematic excavation of shipwreck sites beginning in the late 1960s by Peter Throckmorton and George Bass delivered 'nautical archaeology.'

Nautical archaeology, based in historical particularism, involves the meticulous study of ship construction and ship-related artifacts through painstaking recordation, scientific analysis and comparative historical research similar to methods used to record terrestrial archaeological sites. It has contributed significantly to our understanding of shipbuilding technologies, ancient trade systems and economies. An outgrowth of the "British School" of thought, nautical archaeology focuses traditionally on the publication of technical reports and descriptive catalogs of shipwreck finds (e.g., *International Journal of Nautical Archaeology*) (Lenihan 1983: 43). One of the first field investigations in the U.S. to follow the nascent discipline of nautical archaeology was the excavation of the scuttled Revolutionary War privateer *Defence* in Penobscot Bay, Maine (Switzer 1976). No accurate plan of the ship's hull was ever drawn, however, and the first publication about the wreck was not a meticulous scholarly report but rather a children's 'pop-up' book (Ford and Switzer 1982).

By the late 1970s and early 1980s, the 'historical particularist' approach of nautical archaeology was sharply criticized for its lack of hypothetico-deductive
reasoning, or inability to build hypotheses for scientific testing. Processual or ‘New Archaeology’ claimed that the inductive, revisionist, linear approach of nautical archaeology missed the core goals of archaeology, which should be to identify broad patterns or establish universal laws about human behavior through the study of material culture (Gould 1983: 4). Nautical archaeologists, notably Bass, rejected the processual approach, claiming that it did not consider the randomness of cultural material found on shipwreck sites, and that hypothesis building will only satisfy the questions posed and potentially overlook other questions exposited by the archaeological record (Bass 1983: 91-104).

In 1978, the British archaeologist Keith Muckelroy offered his own definition of ‘maritime archaeology’ (Muckelroy 1978). Although strongly influenced by New Archaeology, Muckelroy’s theoretical work was closer to what archaeologists now refer to as ‘middle-range theory’ (Binford 1977); a combination of both inductive and deductive investigative approaches through which hypotheses are tested as well as new questions derived and posited from the minutiae of cultural material analyses and the study of site formation processes (Gibbins and Adams 2001: 284). Middle-range theory, which is tied to the post-processual movement, draws from a variety of social and natural sciences to look at artifacts not only for the sake of documenting technological achievement, but also considers what the use of material remains can tell us about the societies that created them (Flatman 2003: 143). Maritime archaeology has matured to consider a diversity of perspectives and ideas such as the symbolic nature of ships (see e.g., Crumlin-Pedersen and Thye 1995; McGrail 2001), and the notion of a “maritime cultural landscape,” a term which expanded the scope of the discipline to recognize the
inherent connection between sea and land activities (Westerdahl 1992). The post-processual era of the maritime archaeology discipline emerged primarily out of northern Europe, and especially the United Kingdom, Scandinavia and the Netherlands. It is not limited to the documentation of shipbuilding technology, trade, and economy; it now incorporates the study of all tangible and intangible aspects of cultural resources that have resulted from human interaction with the sea or the marine environment.

The French Annales School has also figured prominently in European maritime archaeology. This school of thought, established in the late 1920s by the socio-geographers Marc Bloch and Lucien Febvre, rejects the traditional historiographical regime of focusing on specific political events (what is termed événement) to explain history. The Annales school historian, Fernand Braudel, who wrote a monumental and defining work on the post-medieval history of Europe, instead focuses on identifying underlying socio-economic structures in order to explain social and cultural change over the long-term (i.e., la longue durée) (Braudel 1979). Braudel showed that these changes were constrained by environmental conditions and geography, and that change is evident in material culture. The Annaliste model influenced Westerdahl’s conception of the maritime cultural landscape, now widely accepted by archaeology (1992, 1994, 2000). In addition, the model has been applied in the study of material culture from shipwrecks such as the Mary Rose and Vasa (Adams and Rönby 1996).

Although the term ‘marine archaeology’ was first formally introduced in 1971 at a Colston Research Society Symposium, it never took hold and only in recent years has it come back into use (Blackman 1973). Marine archaeology invokes an association with marine environmental science, and is now the preferred terminology for resource
managers, legal advocates, and notable deep-sea oceanographers and explorers such as Robert Ballard (of the Institute for Exploration), and other scientists in marine-related fields (e.g., marine biology). Its invocation is perhaps best explained as an attempt to integrate maritime archaeology within marine science, marine resource management and environmental law. It is commonly referred to by NOAA’s National Marine Sanctuaries Program, which mandates that NOAA manage cultural resources alongside other natural marine resources. English Heritage, however, the agency responsible for cultural resource management in Britain uses marine and maritime archaeology interchangeably under its new policy (i.e., National Heritage Act) to manage submerged cultural resources (Roberts and Trow 2002). As a general rule, marine archaeology is used primarily in reference to marine environmental research and exploration, resource management, and preservation law. Typically, it does not address the study of maritime culture and history.

**Maritime Archaeology Defined**

Maritime archaeology is a discipline that involves much more than the process of extracting artifacts from the seabed for future museum display. A recent international convention for the protection of underwater cultural heritage confronted this antiquated notion by calling for the study of shipwreck remains *in situ* (UNESCO 2001). While this is perhaps not the best approach in providing the public with a *vis-à-vis* experience with the past (except for divers), it does shift the focus of maritime archaeological research from a predominantly extractive or recovery-based activity to translation and interpretation of submerged cultural resources. In light of the high degree of preservation and associated high costs presently involved with artifact conservation from wet
environments, *in situ* study and preservation is an ethically responsible directive. However, maritime archaeologists are also tasked with educating the public about the past. In this age of virtual technologies and realities, archaeologists can digitally reconstruct ancient cultures and environments in order to inform or create an idea about the past. No virtual reality, however, likely ever will be capable of invoking memories of the past like those summoned by tangible artifacts, built heritage, archaeological sites and cultural landscapes, which allow communities to interact (passively or actively) with the past on a daily basis. Through the conservation of built heritage and ancient landscapes people realize (consciously or subconsciously) a sense of the past and their place within history as well as the environment.

Maritime archaeology is the study of cultural remnants and traditions, which are a result of human interaction with the marine environment. Maritime archaeology is interdisciplinary; it is a combination of archaeological research, preservation activities, and cultural resource management (FIG. 2). Management is a key component of maritime archaeology upon which research and preservation is dependent. Figure 2 illustrates the typical workflow and process of a maritime archaeological project. Projects begin with research, lead to preservation, and ultimately produce resources and data that require long-term care and management. Management is a key component for supporting future research and preservation efforts. In addition, research directly provides information needed to improve management and decision-making capabilities. Without management to ensure long-term protection and sustainability of cultural resources, little progress will be made toward interpreting history, educating the public, and ensuring that future generations have the possibility to engage with their past on their own terms.
Maritime archaeology is also multi-disciplinary; it examines the archaeological record and material culture through a variety of natural and social sciences. Through a multidisciplinary approach, maritime archaeology proffers a broad range of perspectives of ancient as well as living cultural systems and physical environments. Specifically, the discipline examines the material culture and built heritage that results from human efforts to adapt to marine ecosystems, exploit and hunt marine resources, explore and communicate, and settle and live. It uncovers the environmental characteristics and
processes that shape society, examines how human activities impact marine ecosystems, and explores the natural and human consequences of this dynamic interaction. Maritime archaeology seeks to deconstruct material culture to reveal intangible properties – the symbolic, religious, political, and spiritual meanings inherent in objects and that humans create as a product of our relations with the sea. To this end, archaeology challenges the stereotypes and ideologies about the past that are present within today’s societies. Maritime archaeology also provides a unique record of the past offering communities a face-to-face experience with humanity’s ingenuity, its successes and tragedies. The experiences, images, and stories evoked by cultural resources are imprinted upon our subconscious, shape how we view ourselves, our sense of place and time in the world, and influence our future actions.
CHAPTER 3

CULTURAL RESOURCE LEGISLATION AND MANAGEMENT

Numerous laws and guidelines protect and promote preservation of cultural heritage in the United States; however, there are few legislative instruments or government incentives for the public to study or preserve maritime heritage. This chapter surveys the policies currently used by the federal government and states to protect, preserve and manage maritime cultural resources such as shipwrecks, historic waterfronts and shipyards, and submerged prehistoric archaeological sites in the Gulf of Maine. Examined are the laws governing state heritage management agencies, and the economic incentives (e.g., direct funding), disincentives (e.g., fines and imprisonment), and methods and decision-making schemes (e.g., permitting) available and how these tools are used to protect cultural resources and encourage their conservation. The application of emerging national ocean policies and international conventions for the conservation of wetland, coastal and underwater heritage resources is also discussed as possible means to develop new regional policies for maritime cultural resource management in the Gulf of Maine.

Thousands of ships have been lost to storms, coastlines, wars and accidents in the Gulf of Maine, but the exact number is uncertain. As of 2004, the collective number of shipwrecks reported in the cultural resource inventories of Maine, New Hampshire, and Massachusetts is nearly 3,000. Of these wrecks, the locations of 120 are known. At least
an equal if not greater number of maritime-related archaeological sites, comprised of submerged prehistoric settlements and historic waterfront sites (e.g., wharves, piers, landings, dry docks, seawalls, etc.), lie beneath the water or at the land-sea interface in the Gulf of Maine. The legislative responses by state and federal government to protect and manage these resources range from stringent control of activities and no-access to archaeological sites in federal marine sanctuary waters to open promotion of casual artifact collecting in state waters. This chapter addresses the following questions: What are the state, federal, and international laws and policies that govern maritime cultural resource management and preservation in the Gulf of Maine? Why do they differ so drastically? How is government organized to implement its existing laws and policies? How effective are preservation plans and policies, and ultimately, how can the region effectively manage its maritime cultural heritage?

**Government Organization**

During the 1960s, the efforts of the burgeoning community-based preservation movement, with the aid of archaeologists and architectural historians, resulted in a national historic preservation program. Congress enacted the National Historic Preservation Act in 1966 (NHPA). The federal government, acknowledging the need to protect the human and natural environment, also passed the National Environmental Policy Act (NEPA) in 1969. NHPA and NEPA form the foundation of heritage preservation today and require that federal agencies 1) consider the effects of all their actions on cultural resources, 2) inventory, evaluate, and nominate all significant cultural resources under their jurisdiction to the National Register of Historic Places (NRHP), and
3) mitigate adverse effects upon significant cultural resources (Hardesty and Little 2000: 8).

The legislative umbrella of NHPA, in particular, shapes how state and federal governments interact, and how state and federal agencies are funded for the management of cultural resources (FIG. 3). NHPA mandates that State Historic Preservation Officers (SHPOs) administer the national historic preservation program at the state level. The states provide matching funds and designate a state office to promote and administer preservation activities. The National Park Service (NPS) provides funding, technical support and tools for SHPOs to develop statewide preservation programs. Through Sections 106 and 110 of NHPA (16 U.S.C. § 470 et seq.), all federal agencies and SHPO offices are mandated to consider the impacts of government activities upon historic and cultural resources and to manage historic properties (FIG. 4a, 4b & 4c).

As NHPA was concerned originally with the protection and preservation of terrestrial-based heritage, maritime archaeological resources are largely absent from its definitions of historic properties and cultural resources. Consequently, the jurisdiction and responsibility of state and federal governments over submerged cultural resources remains somewhat ambiguous. Shipwrecks, however, are specifically addressed in the Abandoned Shipwreck Act of 1987 (ASA).
Figure 3. Primary federal institutions engaged in heritage preservation and cultural resource management in the U.S.
Figure 4a. Organization of cultural resource management officials and institutions in New Hampshire (2004).
Figure 4b. Organization of cultural resource management officials and institutions in Massachusetts (2004).
Figure 4c. Organization of cultural resource management officials and institutions in Maine (2004).
The Antiquities Act of 1906 and the Archaeological Resources Protection Act of 1979 (ARPA) have also been used with limited success in protecting shipwrecks from salvage on federal submerged lands (Phelan and Forsyth 2004: 128). Although the United Nations Education, Scientific and Cultural Organization’s (UNESCO) Convention on the Protection of the Underwater Cultural Heritage, drafted in 2001, provides protection to shipwrecks to the limit of the continental shelf or Exclusive Economic Zone (EEZ), the U.S. has not ratified the convention. Shipwrecks in these areas are unprotected. Currently, there is no single standard, guideline, or legislative doctrine by which the U.S. addresses submerged cultural resources in public planning and decision-making processes.

There are also differences in the management of intertidal and sub-tidal cultural resources, which is in part due to the complicated patchwork of varying local, state, federal, and international marine jurisdictions. States typically maintain varying statutes and regulations for coastal land management, and ancient local and regional laws regarding ownership of coastal lands are continually debated (see e.g., Bell v. Town of Wells [1989]; Eaton v. Town of Wells [2000]). Beyond tidal lands, however, the Submerged Lands Act of 1953 (SLA) and the Coastal Zone Management Act of 1972 (CZMA) grant coastal states jurisdiction rights and title to natural resources (but not explicitly cultural resources) out to three nautical miles, thereby defining the marine boundaries between individual states and the federal government (FIG. 5). The United Nations Law of the Sea of 1982 (UNCLOS), as well as political agreements between Canada and the U.S., delineate the international marine boundaries in the Gulf of Maine (Schneider 1985; Courtney and Wiggin 2002). The U.S. is not yet an official signatory of
UNCLOS even though in practice its actions are consistent with the international convention. Further complicating jurisdiction in the gulf are the more than 100 state and federal Marine Protected Areas (MPAs), which separate the region into numerous discrete management units that preserve a wide array of marine resources.
Figure 5. Jurisdiction of submerged lands in the Gulf of Maine according to Submerged Lands Act of 1953 and the 1982 United National Convention on the Law of the Sea.
Federal Legislation and Management Programs

This section focuses specifically on a discussion of existing federal laws pertaining to maritime cultural resource management and preservation in the Gulf of Maine (APP. A). The deeply embedded maritime tradition surrounding shipwreck salvage in the U.S. has kept treasure salvor claims within federal district and admiralty courts, leaving submerged cultural resources vulnerable to the Law of Finds and the Law of Salvage (Dromgoole 1999). In addition, not until recently have maritime cultural resources been considered on an equal footing with natural resources in ocean policy and planning (e.g., National Research Council 2003; U.S. Commission on Ocean Policy 2004). In the past, U.S. federal and international marine laws (e.g., Outer Continental Shelf Lands Act of 1953, UNCLOS) have limited states’ jurisdiction and rights to protect cultural resources on the continental shelf beyond three nautical miles. The lack of explicit policies and protection for cultural resources in the marine environment has resulted in numerous lengthy and costly ownership disputes between states and private citizens (e.g., Treasure Salvors v. The Unidentified Wrecked and Abandoned Sailing Vessel [the ‘Atocha’]) as well as nations (e.g., U.S. and France concerning possession of the Confederate warship C.S.S. Alabama [CSS Alabama Wreck Protection Agreement (1989)]). The legal case history pertaining to underwater salvage of cultural heritage is extensive, and has been treated comprehensively elsewhere (e.g., see Dromgoole 1999; Richman and Forsyth 2004).
**National Marine Sanctuaries Act (1972)**

The legislation providing the most comprehensive protection for maritime cultural resources in the U.S. is the National Marine Sanctuaries Act of 1972 (NMSA) (16 U.S.C. § 1431 et seq.). NMSA authorizes the Secretary of Commerce and the National Oceanic and Atmospheric Administration (NOAA) to establish discrete areas of the marine environment, out to 200 nautical miles or the Exclusive Economic Zone (EEZ), as sanctuaries which "possess conservation, recreational, ecological, historical, scientific, educational, cultural, archaeological, or esthetic qualities which give them special national, and in some cases international, significance" (Section 301). Currently, there are 13 national marine sanctuaries in the U.S. The NMSA places equal emphasis on natural and cultural resources; its purpose is to "enhance public awareness, understanding, appreciation and wise and sustainable use of the marine environment, and the natural, historical, cultural, and archaeological resources of the national Marine Sanctuary System" (Section 301). Two of the 14 sanctuaries (USS Monitor National Marine Sanctuary and Thunder Bay National Marine Sanctuary) are predominately concerned with the protection and management of submerged cultural resources.

NMSA provides broad protection for cultural resources located within sanctuary boundaries. The act excludes the application of Admiralty and salvage law to claim title to or remove cultural resources from the seabed. To date, the NMSA has buffered all Admiralty law and salvage claims (Varmer and Blanco 1999: 215-218). Except in the incidental case of a vessel anchoring, traditional fishing operations, or the installation of navigational aids, activities that are prohibited by the sanctuaries include the removal or injury to historical resources and alteration of the seabed without sanctuary permission.
The act provides the Secretary of Commerce and NOAA with enforcement powers to apply significant criminal (up to 10 years imprisonment) and civil penalties (up to $100,000 per incident) for violation of prohibited or unauthorized activities.

NMSA regulations mandate NOAA to "support, promote, and coordinate research on, and the conservation, curation, and public display of, the cultural, archaeological, and historical resources of national marine sanctuaries" (Section 309). To this end, the Secretary of Commerce and NOAA also promote coordination among state and federal agencies, and comply with existing cultural resource legislative authorities, guidelines and procedures. Activities affecting cultural resources in the marine sanctuaries are in keeping with Federal Archaeology Program laws such as the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation, the ASA Guidelines, the Antiquities Act, and Sections 106 and 110 of NHPA. In 2002, NOAA established the Maritime Archaeology Program (MAP), as an initiative of the National Marine Sanctuary Program. The primary goal of MAP is to assist sanctuaries with the protection and management of archaeological resources within sanctuary boundaries, but it also hopes to provide assistance and consultation to state and other federal agencies charged with managing submerged cultural resources (NOAA 2002).
Figure 6. Gerry E. Studds/Stellwagen Bank National Marine Sanctuary (SBNMS).
Stellwagen Bank National Marine Sanctuary (SBNMS) is the only marine sanctuary in the Gulf of Maine (FIG. 6). It is in a formative stage of developing its submerged cultural resource management plan and has issued a “Draft SBNMS Heritage Resource Action Plan” for public comment. The plan, which is a result of consultation with resource managers and preservation specialists as well as meetings with various underwater cultural resource stakeholders (i.e., fishermen, recreational divers, private cultural resource and preservation management companies), has outlined strategies to: 1) establish a heritage resource program, 2) inventory, assess, and characterize heritage resources, 3) protect and manage heritage resources, 4) implement a heritage resource outreach and education program, and 5) assess shipwrecks and other submerged objects for potential hazards (SBNMS 2004). A significant aspect of the management plan is the establishment of a multi-tiered resource evaluation program whereby heritage resources are assigned a status of Discovery, Level 1, or Level 2. Increased site protection is provided at each subsequent status level. While NMSA unequivocally allows public access to heritage resources, a Level 2 status determination will limit public access to sites except by authorization of a special use permit. A “heritage preserve” (an area of one square nautical mile), as is the case for the shipwreck site of the 19th-century steamship Portland, can also be used to protect a Level 2 status site. The SBNMS management plan will be coordinated with NOAA’s National Maritime Heritage Program (SBNMS 2004: 3); however, this latter program’s policies have not yet been realized or released to the public.
Coastal Zone Management Act (1972) and Coastal Zone Protection Act (1996)

The Coastal Zone Protection Act of 1996 reauthorizes the 1972 Coastal Zone Management Act (CZMA) (16 U.S.C. § 1451 et seq.). CZMA recognizes that “important ecological, cultural, historic, and esthetic values in the coastal zone which are essential to the well-being of all citizens are being irretrievably damaged or lost” (Section 302). Therefore, the CZMA authorizes and supports the “development and implementation of [state] management programs to achieve wise use of the land and water resources of the coastal zone, giving full consideration to ecological, cultural, historic, and esthetic values as well as the needs for compatible economic development” (Section 303). In addition, it asserts that these programs should at least provide assistance for “the redevelopment of deteriorating urban waterfronts and ports, and sensitive preservation and restoration of historic, cultural, and esthetic coastal features” (Section 303).

The CZMA is administered through NOAA’s Coastal Program Divisions and the Coastal Zone Management Program. The program authorizes federal and state government to protect coastal resources through the designation of MPAs such as critical conservation areas or National Estuarine Research Reserves (FIG. 7, APP. B). Under the CZMA, there are now three national reserves in the Gulf of Maine: Waquoit Bay, Massachusetts; Great Bay, New Hampshire; and Wells, Maine. A survey of the Wells Estuarine Reserve has revealed the presence of numerous maritime cultural resources and historic landscapes within the reserve’s wetlands and intertidal zone (Claesson 2000). CZMA appropriated funds were not used in the survey of the Wells Reserve and are rarely used to support coastal cultural resource surveys and management programs. Yet, the ASA guidelines recommend that resource surveys, management policies and
procedures be executed and funded through the CZMA. Specifically, the guidelines reference Sections 306, 306A, 307, and 309, which can be used to appropriate funds for the development and implementation of state maritime cultural resource management programs. Massachusetts is the only Gulf of Maine state to integrate its maritime cultural resource management agency, Massachusetts Board of Underwater Archaeological Resources (MBUAR), into its Coastal Zone Management program office (Mastone 2002: 51). As stated, Section 303 indicates that CZMA could also grant support for the adaptive re-use and preservation of historic waterfronts.

Figure 7. Federal and Indian lands along the Gulf of Maine coast (Stellwagen Bank National Marine Sanctuary not shown).
Abandoned Shipwreck Act (1987)

According to the ASA, the U.S. asserts title to abandoned shipwrecks embedded in state submerged lands, and transfers all federal property interests in abandoned shipwrecks to individual states (43 U.S.C. §§ 2101-2106). However, on the principal of sovereign immunity, U.S. warships and shipwrecks on public United States (e.g., national parks) or Indian lands remain in the custody of the federal government. The act also specifies that Admiralty laws (i.e., laws of finds and salvage) do not apply to shipwrecks covered by the act, if they are in fact determined to be “abandoned” (Phelan and Forsyth 2004: 129). By placing the title of abandoned shipwrecks located in “lands beneath navigable waters” (as defined in section 2 of the Submerged Lands Act [43 U.S.C. § 1301]) in the hands of state government, Congress hoped to improve upon the protection and management of submerged cultural resources (FIG. 8). However, numerous litigations have shown that the protection afforded by the ASA is inadequate (Varmer and Blanco 1999: 206-213). Specifically, if it is uncertain that a shipwreck has been ‘abandoned,’ or if its NRHP eligibility is questionable, then courts may determine the proper claimant based upon the law of salvage.

The “Abandoned Shipwreck Act Guidelines” were issued by NPS in 1989 in order to achieve a level of uniformity between state and federal shipwreck management programs. However, the soft legislation of the ASA leaves it up to states to decide how best to protect and manage their underwater cultural heritage. The passing of this unfunded mandate by Congress, while providing some protection against unscrupulous treasure salvors, has resulted in a range of inconsistent legislative and management responses by Maine, New Hampshire, and Massachusetts (policies and programs are
described in *State Legislation and Management Programs*). Generally, the New England states have developed shipwreck management plans and maintain shipwreck databases either through the SHPO or Coastal Zone Management Office. With little or no financial support from the federal government, however, those states have yet to implement their plans or fully adhere to the ASA guidelines and recommendations of the Secretary of the Interior and NPS.
Figure 8. The Abandoned Shipwreck Act (ASA) affirms the federal government’s title to ownership of all abandoned shipwrecks within 3 nautical miles of the shoreline.
The National Maritime Heritage Act of 1994 (NMHA) recognizes that maritime heritage is an important component of American culture and society (16 U.S.C. § 5401). The act states that the "preservation of this irreplaceable maritime heritage is in the public interest so that its vital legacy of cultural, educational, aesthetic, inspirational, and economic benefits will be maintained and enriched for future generations of Americans."

The act calls for the establishment of a national maritime heritage policy, and addresses the imminent need for a coordinated national preservation program. A federal grants program was established in 1998 to finance the study of maritime history, archaeology and architecture projects relating to preservation of the nation’s maritime heritage. In 1998, 39 out of 342 grant proposals were awarded a total of $652,616 under the first and only round of the Maritime Heritage Grants Program. A total of $147,916 or approximately 23% of grant funds were awarded for preservation and education projects in the Gulf of Maine (FIG. 9). Funds for the grant program were generated from the sale and scrapping of the U. S. National Defense Reserve Fleet (16 U.S.C. § 5405); however, environmental restrictions on the export of de-accessioned U.S. vessels sidelined the grants program.
Figure 9. Gulf of Maine projects supported by grants through the National Maritime Heritage Act in 1998.

NMHA recognizes that existing preservation programs are “inadequate to ensure future generations a genuine opportunity to appreciate and enjoy the rich maritime heritage of our Nation,” and that if this heritage is lost, it cannot be replaced. Although the views and objectives expressed by Congress with the passing of NMHA remain technically in effect, the federal government has yet to implement the called-for national
program or any national maritime heritage policy. The act has not resulted in the development of any legal authorities and procedures, rules and penalties, management plans, or relationships with other state and federal preservation programs or legislative authorities. Until the NMHA objectives are implemented and the grants program reinstated, the Maritime Heritage Program (established in 1987 as the National Maritime Initiative) will remain in an indeterminate state under the NPS Park History Program, a branch of the National Center for Cultural Resources Stewardship and Partnerships.

**U.S. Department of the Navy, Warships and Military Aircraft**

The Naval Historical Center (NHC) estimates that there are approximately 3,000 U.S. Navy shipwrecks and 12,000 downed naval aircraft worldwide (Neyland 2002: 766, 769). The Gulf of Maine has witnessed numerous naval battles and lost warships (APP. C). The Navy’s most significant loss occurred in Penobscot Bay, Maine, where 34 ships were scuttled to prevent capture by the British in 1783 (Hunter 2004). Sunken warships and military aircraft are largely excluded from U.S. and international heritage and preservation laws, as well as the laws of finds and salvage. The U.S. Navy retains custody of these ships under the principle of “sovereign immunity” unless the government makes an explicit statement of abandonment. Therefore, the laws of salvage do not apply to warships and military aircraft. U.S. sovereignty over its warships and military aircraft is recognized first and foremost in the U.S. Constitution (art. IV, § 3, cl. 2), but also in the ASA as well as international maritime laws and conventions such as UNCLOS and the UNESCO Convention on the Protection of the Underwater Cultural Heritage (Neyland 2002: 766; UNESCO 2001).
In 1980, in an effort to protect war memorials and U.S. property, a letter to the U.S. Department of Transportation’s Maritime Administration by the U.S. Department of State affirmed that:

"salvors should not presume that sunken warships have been abandoned by the United States. Permission must be granted by the United States to salvage sunken U.S. warships, and as a matter of policy, the U.S. Government does not grant such permission with respect to ships that contain the remains of deceased servicemen." (U.S. Department of State 1980; O'Keefe 1999: 234)

Not all of the U.S. armed forces are in agreement on the disposition of lost vessels, however. The U.S. Air Force has explicitly abandoned aircraft that crashed before November 19, 1961 (Neyland 2002: 773). It makes an exception in cases where human remains are discovered; salvage should not commence until the remains have been removed by United States experts. Contrary to this stance, in recent years the U.S. Navy and the NHC has worked diligently to preserve the nation’s sunken warships and naval aircraft. In 1996, the NHC established an underwater archaeology branch and maintains a staff of conservation specialists to perform large, complex composite conservation of recovered vessels and artifacts (e.g., conservation of the Civil War submarine H.L. Hunley). The Navy and NHC comply with the procedures of NHPA Section 106, and assume responsibility for preservation of their historic warships and aircraft under Section 110 of NHPA (Neyland 2002: 774). The NHC has also led the way in aircraft preservation with the publication of a National Register Bulletin, Guidelines for Evaluating and Documenting Historic Aircraft Properties (Millebrooke et al. 1998).

In 2005, as part of the Ronald W. Reagan National Defense Authorization Act (2005), the Sunken Military Craft Act was passed (H.R. 4200; Title 14, § 1401-1408),
which protects sunken U.S. military vessels, aircraft, and spacecraft, as well as the remains and personal effects of their crews from salvage, recovery, or other disturbance. The act clarifies the circumstances under which sunken military craft, which are entitled to sovereign immunity when they sank, remain the property of the flag state until they are officially and explicitly abandoned by the flag state. Additionally, the law of finds and salvage do not apply to any U.S. sunken military craft (wherever located) or any foreign sunken military craft located in U.S. waters. The act provides military departments with a mandate to issue and enforce permits for activities directed at sunken U.S. military craft, including contract salvage. In the U.S., the law is applicable to internal water, the territorial sea, and the contiguous zone (0-24 nm). Civil penalties in violation of the act are severe. Although a penalty cannot be more than $100,000 for a violation, each day of unauthorized disturbance to a sunken military craft constitutes a separate violation. Any vessel or property used to violate the title is liable to seizure. Enforcement costs include not only damages from disturbance, removal, or injury, but also the costs of any storage, restoration, care, maintenance, conservation, curation, as well as the costs of retrieving information of an archaeological, historical, or cultural nature from a disturbed or injured military craft.

**Federal Archaeology Program Laws**

Federal agencies that own or control submerged lands in the Gulf of Maine should comply with Sections 106 and 110 of NHPA. Numerous agencies, but most notably the U.S. Fish and Wildlife Service (FWS) and NPS, control thousands of acres of intertidal lands in the Gulf of Maine. Archaeological surveys of intertidal lands in Maine confirm
the presence of numerous archaeological site types (including shipwrecks) within the intertidal zone (Riess and Dean 1992, Claesson 2002, 2001, 2000, 1998). According to ASA guidelines and Section 110 of NHPA, federal agencies must assume responsibility for preservation of historic shipwrecks under their jurisdiction (NPS 1989: § II, cl. 1). Fifteen years after it issued the ASA Guidelines, NPS (which also maintains the Submerged Resources Center) has yet to “take steps to preserve historic shipwreck sites under its ownership or control (such as stabilizing and preserving historic shipwrecks in place, or recording and recovering sites when preservation in place is not feasible)” in the Gulf of Maine where environmental and coastal processes threaten shipwreck sites on its property (e.g., Cape Cod National Seashore and Acadia National Park).

Although they generally do not own or control submerged lands, the U.S. Army Corps of Engineers (USACE), Federal Highway Administration (FHWA), and Department of Transportation (DOT), are bound by Sections 106 and 110 to take into account the effect of any proposed federal, federally assisted, or federally licensed “undertaking” on a maritime historic property that is eligible for the National Register of Historic Places. Specifically, section 4(f) of the Department of Transportation Act of 1966 requires that the DOT preserve historic sites (49 U.S.C. § 303). NEPA also necessitates that federal agencies consider the effects of their actions on cultural resources (42 U.S.C. § 4321 et seq.). Such actions include USACE-licensed projects such as dredging and seawall construction, or DOT bridge construction, and waterfront maintenance and development projects. These projects usually impact the near-shore, intertidal and shallow-water marine environments. Historically, however, NHPA and NEPA review of impacts to historic properties by state and federal agencies often do not
extend to the marine zone. Consequently, marine and coastal development projects have significantly damaged a largely unrecognized group of archaeological sites in the intertidal zone and wetlands (Claesson 2001).

Through NHPA, New England states are responsible for review of federal activities that impact coastal archaeological sites. States have also asserted their title to shipwrecks in their waters, but which federal agencies manage the territorial sea and the outer continental shelf? Which preservation laws are applicable for submerged cultural resources protection and management in these offshore marine regions? How are submerged prehistoric sites treated under the law? The answers to these questions remain somewhat ambiguous. Litigation between treasure salvors and the U.S. government has revealed loopholes and problematical definitions within preservation law (Phelan and Forsyth 2004; Varmer and Blanco 1999; Aubry 1992). For example, in 1978 the landmark case *Treasure Salvors v. The Unidentified Wrecked and Abandoned Sailing Vessel*, determined that the Antiquities Act of 1906 (16 U.S.C. § 431 et seq.) could not be used in conjunction with Outer Continental Shelf Lands Act of 1953 (OSCLA) to assert ownership of historic vessels sited on federally-controlled submerged lands. Following this ruling, the federal government stated that it will adhere to NHPA review and compliance procedures in order to assess the impact to cultural resources from federally approved offshore activities (Irion 2002: 7).

The OCSLA authorizes further the Secretary of the Interior, through the Minerals Management Service (MMS) the rights to explore and remove minerals, oil, and gas from the seafloor on the outer continental shelf (43 U.S.C. § 1331-1343), and MMS is required through Section 110 to NHPA to review the impacts of oil, gas, and mineral projects
upon cultural resources (FIG. 10). MMS has issued regulations that stipulate lessees should not “unnecessarily jeopardize or harm a cultural resource which has been identified or is believed to exist” (30 C.F.R. 250). Furthermore, it provides guidelines to oil and gas lessees for conducting archaeological resource field surveys and producing archaeological resource reports (MMS 2002). Because there are now no oil and gas leases in existence off the Atlantic Coast, the management of cultural resources by MMS has been limited to the Gulf of Mexico OCS Region. However, Gulf of Maine lease blocks may be available for petroleum extraction beginning in 2012. Although there currently is no lease activity in the Gulf of Maine, the MMS maintains its responsibility of minimizing impacts to cultural resources (as per section 110 of NHPA) from any oil or mineral extraction and exploration on the outer continental shelf. Wells were drilled in the ‘Hydrographer Canyon” block of Georges Bank to detect oil in the early 1980s; however, no field surveys were performed to detect cultural resources on Georges Bank prior to drilling.
Figure 10. The Official Protrrated Diagram (OPD) and lease blocks for oil and mineral exploration in the Gulf of Maine, as managed by the Minerals Management Service (MMS).
The applicability of federal preservation laws to the marine environment is complex (FIG. 11). Beyond the territorial sea, there is no umbrella legislation that provides protection (through civil and criminal penalties), incentives, or management of submerged cultural resources. Furthermore, litigation over ownership of submerged cultural resources has limited the effectiveness of such cultural resource legislation as the Abandoned Shipwreck Act to protect and conserve underwater cultural resources. Presently, there are no federal archaeology program laws that explicitly protect and manage shipwrecks located beyond territorial waters. Archaeological sites (i.e.,
shipwrecks and submerged prehistoric sites) that are at least 100 years of age are protected by the ASA and ARPA (16 U.S.C. §§ 470aa et seq.). ARPA utilizes a permitting process to ensure that any investigation or recovery work is conducted by qualified archaeologists, and authorizes the government to impose penalties up to $100,000 and imprisonment for violations under the statute. Because ARPA expressly excludes the outer continental shelf in its definition of public lands, the act only applies to federally-owned or Indian lands from the coast out to 3 nautical miles. The Antiquities Act provides protection to underwater cultural heritage on federally-controlled lands (i.e., territorial sea [0-12 nm]) through a permitting system; however, its definitions have been declared unconstitutionally vague in some courts, limiting its application primarily to marine protected areas such as the Cape Cod National Seashore or national marine sanctuaries (Aubry 1992: 20). The Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) also requires agencies to consult with Indian tribes in cases where seafloor development projects and activities may disturb submerged prehistoric remains (25 U.S.C. § 3001 et seq.).

Federal agencies are mandated to consider the effects of their activities on cultural resources out to the Exclusive Economic Zone (EEZ), but there is no national policy or independent governmental body to review federal action and manage submerged cultural resources from the State/Federal boundary out to the EEZ. Furthermore, the U.S. may have a potential claim under Article 76 of the United Nations Law of the Sea, which would extend federal control over submerged lands beyond the EEZ. If jurisdiction is extended further offshore, federal activities in this area will also have to comply with the regulations of NEPA and NHPA. Additionally, the UNESCO Convention on the
Protection of Underwater Heritage (2001) may have to be amended to address jurisdiction of resources that lie within any Article 76 extended claims.

**State Legislation and Management Programs**

The New England states have enacted statutes and regulations concerning the protection and management of underwater cultural resources decades before the ASA asserted the federal government’s ownership of abandoned shipwrecks in 1987 (APP. D). Maine claimed state jurisdiction over archaeological sites situated on or in state submerged lands as early as 1969, and Massachusetts established its Board of Underwater Archaeological Resources (MBUAR) in 1973. In 1981, New Hampshire drafted preservation legislation concerning the protection and management of archaeological sites and artifacts located on or beneath state-owned waters. Following the transfer of title of shipwrecks from federal to state jurisdiction in 1987 (as defined by the ASA and SLA), the New England states were prompted to re-consider their management schemes in light of recommendations proposed in the ASA guidelines (NPS 1990). With the enactment of the ASA, shipwrecks appeared safe from treasure salvors, and education and outreach programs, shipwreck inventories, and state shipwreck management plans were being implemented, but ownership of shipwrecks and submerged lands, and how these resources are defined (i.e., “abandoned”), remain contentious issues (Giesecke 2002). However, the ASA’s enactment has led to increased recognition that shipwrecks are fragile and non-renewable resource whose study and preservation enhance our understanding of the past and benefit posterity.
Soon after enactment of the ASA, states expended time and funds (without financial support from the federal government) to develop regulations and improve management plans for submerged cultural resources. Nationwide surveys of state submerged cultural resource programs in 1988 and 1992 seemed to show that the implementation strategy outlined in the ASA guidelines was having a positive impact on shipwreck preservation (Tarler et al. 1995). Resource protection and public education certainly improved, but review and compliance of federal activities, as outlined in NHPA remain inconsistent, and there are few maritime preservation and research projects in the Gulf of Maine region. Beyond maintaining archaeological site inventories, which are the primary tools used by SHPOs to determine whether sites may be impacted by federal or federally-permitted activities, compliance with NHPA in Maine, Massachusetts, and New Hampshire have been minimal. Up until 2002, the Maine and New Hampshire SHPOs issued only three requests for underwater surveys of cultural resources, and there has been no mitigation of underwater archaeological sites in either state (Riess 2002: 40).

**Maine**

*An Act Relating to Preserving Historical Materials by the State Museum* was the first preservation act to be passed by the State of Maine in 1969. The law was expanded and revised in 1979 to become *An Act to Preserve Maine’s Archaeological Heritage*. These founding preservation acts in Maine asserted the state’s ownership to all artifacts on and in state-controlled lands, including submerged lands below the mean lower low-water mark to the seaward boundary of coastal waters (defined by SLA) and land beneath ponds and lakes that are 10 or more acres in size.
In Maine, New Hampshire and Massachusetts, land between the Mean High Water (MHW) and the Mean Lower Low Water (MLLW) is privately owned. For example, in Boston Harbor alone, over 7000 acres (ca. 2800 hectares) of intertidal lands are privately held (FIG. 12). Government does not hold title to nor does it have jurisdiction over these lands, unless government is the owner of abutting supratidal public lands. However, any federal or federally permitted activity within this zone requires compliance with environmental laws such as NHPA and NEPA. In the Gulf of Maine, fewer than five intertidal archaeological surveys have been issued by government agencies since these federal laws were enacted. Although the majority of maritime
cultural resources are located within the intertidal zone, the effects of waterfront development and dredging projects upon cultural resources are rarely reviewed.

Maine established its interest in maritime archaeology in 1973, when a group from the Massachusetts Institute of Technology surveyed and located the Revolutionary War privateer *Defence*. Beginning with the discovery of *Defence*, the Maine Historic Preservation Commission (MHPC) sponsored numerous underwater surveys through the 1970s. However, federal funding in the early 1980s was reduced by ninety percent, all but ending shipwreck surveys for nearly a decade (Bradley 1990: 4). Following the enactment of ASA in 1987 and shortly after the release of NPS guidelines for shipwreck management in 1989, Maine drafted its first “Shipwreck Management Plan” (Bradley 1990).

The ASA asserted Maine’s ownership over shipwrecks and NHPA instituted the necessary procedural law that allowed for the review of federal activities that may impact shipwreck sites. The Maine shipwreck management plan went a step further to propose the formation of a Maine Shipwrecks Committee comprised of the MHPC, Maine State Museum, University of Maine, and members of the sport diving community. The plan also laid out the necessary budget for an effective shipwreck management program. The plan has not materialized, and with the exception of a growing Maine Shipwrecks Inventory (1,334 records as of 2004), resource management has not improved since the early 1980s. However, unlike New Hampshire and Massachusetts, Maine strictly forbids the disturbance or casual collection of artifacts from state waters without a permit. The Maine State Museum holds title to all artifacts on or in submerged lands (27 M.R.S.A. c. 13, § 372). Maritime archaeological investigations require a permit approved by both the
MHPC and Maine State Museum, and archaeological work must be consistent with Federal Archaeology Program laws and standards. Minimally, unlawful excavation will result in a fine of $250 and imprisonment up to one year; moreover, every day of unlawful excavation constitutes a separate violation (27 M.R.S.A. c. 13, § 372). In addition, the state maintains a list of archaeologists approved by the MHPC to work within the state. Currently, two maritime archaeologists are certified to work in Maine.

Maritime archaeology is at present considered an “ancillary” activity to land archaeology by the MHPC in preservation planning (MHPC 2001: 77). Consequently, state resource managers rarely consider the impact of federal actions, in compliance with NHPA 1966, to resources in intertidal or marine areas. Because of uncertainty, the MHPC has thus far rejected the notion that Section 106 NHPA project reviews should consider the potential for submerged prehistoric sites (MHPC 2001), even though coastal prehistoric sites and artifacts have been recovered from both inland and coastal marine environments in Maine (Crock et al. 1993, Peterson et al. 1994, Sanger 1988, Bourque 1976). While maritime cultural resource management is considered secondary to its ongoing activities, it also remains the MHPC’s “most important unfunded mandate” (MHPC 2001: 77).

**New Hampshire**

New Hampshire’s SHPO was established as the Division of Historical Resources (DHR) in 1974. In 1981, New Hampshire reserved title to ownership of all historic resources on or from lands owned or controlled by the state and its institutions, as well as “the bottom of navigable waters in the state, great ponds and 3 miles seaward from the
New Hampshire shore in the territorial tidal waters of the state” (19 R.S.A. § 227-C: 6). Any discoverer of a previously unknown historical site may apply for a permit to “investigate” an archaeological site. Generally, the discoverer of a site, whether on land or water, is entitled to 25% of the recovered material (19 R.S.A. § 227-C: 7). However, the work must be performed according to the professional qualifications set by the commissioner of the Department of Cultural Resources (which adheres to Federal Archaeology Program laws and regulations [i.e., 36 C.F.R. 61]). Additionally, there are a number of conditions regarding the division, conservation and curation, and sale of any cultural material retained by the permit holder (19 R.S.A. § 227-C: 8). New Hampshire law endorses the collection of isolated finds, provided that the finds are first brought to the DHR for identification. State rules (19 R.S.A. § 227-C: 8a-8g) and federal laws (e.g., NAGPRA) apply in the case of the discovery of human remains in a marine environment.

Although New Hampshire’s coastline is comparatively short, its seacoast (which includes the Piscataqua River and Great Bay estuarine system) and inland lakes (e.g., Lake Winnipesauke) are important marine environments that played a key role in the Gulf of Maine’s prehistory, as well as in the European exploration, initial settlement, maritime trade, and cultural development of the region. However, the state does not employ a state maritime archaeologist or historian, nor does it have an active maritime archaeology program. In 1989, the Division of Historical Resources published a shipwreck preservation guide for the public. The brochure promotes the reporting of wrecks by sport divers and fishermen, claiming that “with a comprehensive inventory the DHR can work for shipwreck preservation by arguing against activities that could damage known shipwreck sites” (DHR 1989). Currently, no shipwrecks, including three
excavated by archaeologists in New Hampshire state waters (see e.g., Switzer 1991), are included in the DHR archaeological inventory. Submerged prehistoric sites and other maritime archaeological sites such as wharves, piers, landings, and shipyards are also largely absent from the state’s archaeological inventory.

**Massachusetts**

Boston, Massachusetts is one of, if not the most historically-important seaports in America’s history. Boston Harbor’s unique drumlin-formed islands were also home to prehistoric peoples for millennia. The fishing and merchant ports of Massachusetts, namely Gloucester, Salem and Marblehead on the North Shore, and the whaling ports on the South Shore and Cape Cod also speak to the abundance of the state’s maritime heritage. By conservative estimates, there are 3,000 shipwrecks located in Massachusetts waters, and countless other maritime-related terrestrial sites along its coasts, islands, and banks of the numerous navigable rivers and lakes (Mastone 2002: 45). The widely recognized underwater cultural heritage of the state resulted in the formation of the Massachusetts Board of Underwater Archaeological Resources (MBUAR) in 1973.

The objectives of the board are “to encourage the discovery and reporting of and to protect and preserve historical, scientific and archaeological information about underwater archaeological resources located within the inland and coastal waters of the commonwealth” (M.G.L. c. 6, § 180). The nine-member MBUAR, under the Executive Office of Environmental Affairs (EOEA), consists of representatives from the Massachusetts Historical Commission (MHC), various state environmental agency staff, and an appointed marine archaeologist and two individuals from the sport diving
community. Thus far, MBUAR has met its objectives of encouraging interest in heritage resources through a variety of program initiatives such as the creation of underwater archaeological preserves, presentations at archaeological conferences and for the general public, and the creation of a List of Exempt Shipwrecks that recreational divers can freely visit. It protects underwater resources through education but also through a permitting process that establishes minimum documentation and qualification standards needed for investigation of archaeological sites. The board maintains a shipwreck inventory or database to assist the SHPO and environment department in NEPA and NHPA reviews, and has formed programmatic agreements with state and federal agencies to study and protect maritime cultural resources.

The ASA guidelines for state management of maritime archaeological sites went largely unheeded by MBUAR. Established over 15 years before ASA guidelines were issued, MBUAR did not re-address its resource management legislation and regulations. Nevertheless, it is consistent with some aspects of the guideline’s management schemes. For example, MBUAR is organized and funded through the state’s Coastal Zone Management program, and Massachusetts is the only Gulf of Maine state with an office dedicated to managing underwater cultural heritage. While the board’s affiliation with the EOE has increased the agency’s awareness of coastal and submerged cultural resources, the board’s administrative capabilities are limited. The MBUAR director provides comments to the environment department and the SHPO in NEPA and NHPA project reviews, but the director does not have any power to issue requests for archaeological site surveys or site mitigation.
MBUAR generally regulates the activities of treasure salvors rather than archaeologists. Although it has provided permits for scholarly and historical enterprise, most of the board’s regulatory effort has focused on limiting the exploitation of the state’s underwater heritage by treasure salvors through permitting procedures. Permits are required for excavation but also for reconnaissance surveys. The MBUAR permitting, however, is separate from the SHPO’s and Massachusetts Historical Commission (MHC’s) issuance of permits to perform archaeological work in Massachusetts. Although the MBUAR archaeological standards are considerably lesser than the MHC’s permit requirements for archaeological investigations, the board requests details on the methods for survey and recovery of cultural material from the seabed. Unlike terrestrial archaeological investigations, MBUAR permittees may retain seventy-five percent of the value of recovered cultural materials (M.G.L. c. 91, § 63). Violations of the board’s regulations are considered misdemeanors and may result in fines up to $1,000 and 6 months imprisonment.
Figure 13. Locations of 38 shipwrecks in Massachusetts waters on the MBUAR “List of Exempt Shipwrecks.”

The board has improved education and awareness of shipwrecks through the creation of a “List of Exempt Shipwrecks.” There are currently 38 shipwrecks on the list, which includes 3 Navy ships (FIG. 13). MBUAR hopes the program will improve public
awareness and appreciation of these underwater resources. Antithetical to these goals, however, is the program’s endorsement of casual collection and removal of artifacts from the wreck sites. Although no formal nomination process for “exempt shipwrecks” has occurred, these wreck sites are deemed by the board as ineligible for the NRHP and can be visited by divers without a permit. Casual artifact collection is expressly sanctioned by the board at these sites. Recovery of isolated finds in state waters is also permitted, provided that an ‘Isolated Find’ application and site location information are submitted to the board. The board may also designate underwater archaeological preserves to recognize historically-important resources. While public access to preserves is guaranteed, the designation allows the state to formally protect and retain possession of underwater sites for the people of Massachusetts (M.G.L. c. 6, § 180). To date, no underwater archaeological preserve has been designated in Massachusetts.

The preservation doctrine of the board is problematic. It positively engages the public and recreational divers in maritime archaeology, but encourages underwater “pot-hunting” and largely serves the treasure-salvor community. For its surprisingly early start and longevity in maritime cultural resource management, the state has not witnessed a single excavation and peer-reviewed publication of an underwater or shipwreck investigation by qualified archaeologists. In comparison to Maine and New Hampshire, Massachusetts offers the least level of legislative protection for its maritime cultural resources.
International Conventions

Jurisdiction over cultural resources beyond the territorial sea in the Gulf of Maine is unresolved. Nevertheless, ownership, protection, and management of these resources in the Contiguous and Exclusive Economic Zones (EEZ) have been addressed in international law beginning in the 1950s (APP. E). A draft of the Convention on the Continental Shelf from 1956 states that rights to the continental shelf do not include shipwrecks, and that archaeological sites and ship cargoes are not "resources" (O'Keefe 2002: 224). In the United Nations Convention on the Law of the Sea of 1982 (UNCLOS), however, underwater cultural heritage is addressed in Articles 149 and 303. UNCLOS acknowledges that preservation of cultural heritage is "for the benefit of mankind as a whole," (Art. 149) and states as one of its objectives "to protect objects of an archaeological and historical nature found at sea" (Art. 303[1]). Although the U.S. generally abides by UNCLOS provisions, it is not a signatory to the convention nor has it exercised its rights to protect cultural heritage in the Contiguous Zone and EEZ.

Although MMS is committed to follow its obligation under Section 110 of NHPA and minimize impacts to cultural resources during oil and mineral exploration on the continental shelf, archaeological sites remain largely unprotected from undersea developments such as the laying of cables and pipelines (i.e., UNCLOS, Art. 76). Deep-sea technologies and cultural resources on the continental shelf are also becoming increasingly accessible, and archaeological sites are therefore increasingly susceptible to damage from treasure salvors capable of exploring these waters and claiming title to shipwrecks in Admiralty courts. However, undersea development and natural resource
extraction on the outer continental shelf is perhaps a far greater and unrecognized threat to these resources.

There are now international conventions and inter-state agreements that purposely address the protection, preservation, and management of offshore submerged cultural resources. The United Nations’ *Convention on the Protection of the Underwater Cultural Heritage* (2001) provides the most comprehensive and global protection for these resources. The ICOMOS “International Charter on the Protection and Management of Underwater Cultural Heritage” (1997), an annex to the convention, also sets forth the standards and guidelines for the treatment of maritime archaeological resources. Although the U.S. has not ratified it, the main principles of this convention are discussed in this section. The authorities of the World Heritage Convention (1972) and Ramsar Convention on Wetlands (1971) also pertain to the preservation and management of the Gulf of Maine’s heritage resources; therefore, the potential contributions of these conventions toward maritime cultural resource management in the region are also considered.

**Convention Concerning the Protection of the World Cultural and Natural Heritage (1972)**

Also known as the “World Heritage Convention,” (WHC) this renowned UNESCO treaty “seeks to encourage the identification, protection and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity” (UNESCO 2000). The convention encourages states to nominate sites to the World Heritage List, and it encourages states further to support participation in
conservation and education of heritage sites locally, nationally, and internationally. A number of advisory bodies provide technical support and advice to the World Heritage Committee. The International Council on Monuments and Sites (ICOMOS) and the World Conservation Union (IUCN) provide evaluations of sites nominated to the heritage list. The International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM) provide training and expertise in monument restoration. ICOMOS played a significant role in developing the annex to the *Convention on the Protection of the Underwater Cultural Heritage* (2001), which contains the guidelines and standards for maritime cultural resource conservation and management.

Although a number of maritime-related sites (e.g., dockyards, naval facilities, coastal villages) are included on the World Heritage List, no *in situ* underwater sites (natural or cultural), or recovered shipwrecks (e.g., *Mary Rose, Wasa, USS Monitor*) have been nominated to the list. The U.S. ratified the WHC in 1973. Eight sites are now listed in the U.S.; none are located in the Gulf of Maine. However, there are cultural landscapes, archaeological sites, and maritime sites in the Gulf that potentially meet the convention’s heritage site listing criteria. The benefits of listing have shown considerable impacts for improved conservation and community development through increased public awareness, international recognition and significant economic benefits through heritage tourism.
The Ramsar Convention on Wetlands was one of the first international treaties recognizing the value of wetlands to the human environment. The primary mission of the Ramsar Convention is "the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution toward achieving sustainable development throughout the world." (Ramsar 2004: 6) The treaty was adopted in Ramsar, Iran in 1971 and entered into force in 1975. As of 2004, there are 138 states party to the Convention. The U.S. became a signatory of the Wetlands Convention on April 18, 1987.

In addition to recognizing the natural importance and economic benefits of wetland preservation, a special session at the Convention’s eighth meeting in 2002 on "Wetlands: water, life, and culture" acknowledged that “wetlands have special attributes as part of the cultural heritage of humanity – they are related to religious and cosmological beliefs and spiritual values, constitute a source of aesthetic and artistic inspiration, yield invaluable archaeological evidence from the remote past, provide wildlife sanctuaries, and form the basis of important local social, economic, and cultural traditions” (Ramsar 2004: 8; Ramsar 2002). The European Archaeological Council (EAC) has also taken a leading part in providing Ramsar members with technical advice on wetlands archaeology. Through its partnership with Ramsar and UNESCO’s World Heritage Convention, as well as archaeological workshops and publications such as The Heritage Management of Wetlands in Europe (Coles and Olivier 2001), the EAC has
helped to inform resource managers of the importance of socio-cultural aspects in the sustainable development of wetland resources.

Although the U.S. already has numerous federal and state laws regarding wetland protection and conservation, the Ramsar Convention provides additional ‘checks and balances’ through which the U.S. shows its responsibility and commitment to wetland conservation on an international level. Presently, 19 wetland sites throughout the continental U.S. are designated by Ramsar to have international importance. These wetlands comprise a total surface area of 1,192,730 hectares or 2,947,300 acres. No Gulf of Maine wetlands are currently recognized by the Ramsar Convention. As wetland and intertidal cultural resource management is at present minimal in the Gulf of Maine, the management objectives of Ramsar and supporting publications of the EAC may help to provide a framework for conservation and management of wetland cultural resources in the region. The anaerobic conditions found in wetland areas provide excellent preservation conditions for archaeological sites and artifacts, particularly organic materials. Consequently, wetlands have a high probability for the presence of archaeological resources as well as paleo-environmental or ecological information. These wetlands represent approximately 250,000 acres of land in the Gulf of Maine (FIG. 14).
Figure 14. National Wetlands Inventory (NWI) of marine, estuarine and tidal riverine wetlands in the Gulf of Maine (NWI wetland mapping is incomplete for the southwest coast of Massachusetts and the north shore of Buzzards Bay) (2005).

Convention on the Protection of the Underwater Cultural Heritage (2001)

In the 1990s, it was widely recognized that UNCLOS did not provide sufficient protection for underwater cultural heritage, leading UNESCO and the International Law Association (ILA) to draft a separate international convention to protect this heritage. In 1994, a draft of the convention was adopted by UNESCO, and in 1996 ICOMOS submitted the "International Charter on the Protection and Management of Underwater Cultural Heritage." The charter is now an annex to the convention, which establishes the rules and procedural guidelines for submerged cultural resource investigations. The
convention was officially adopted in 2001. Although the convention was overwhelmingly accepted with 87 votes in favor of its adoption, only Bulgaria and Panama (2003) are presently signatories to the convention. The signatures of 20 states are required to bring the convention into force.

The key principles of the convention state that: 1) underwater cultural heritage is not subject to the law of finds or salvage, 2) nations are authorized to regulate all activities affecting underwater cultural heritage on the continental shelf and the EEZ, and 3) public awareness of the value and significance of underwater cultural heritage should be raised. Under the convention, warships and military aircraft remain protected under the principle of sovereign immunity. The charter, or annex to the convention, stipulates how archaeological resources should be investigated and managed. The charter strongly promotes *in situ* preservation and documentation in lieu of recovery. It affirms that states shall not use cultural heritage for commercial exploitation and specifies that archaeological investigations should adhere closely to a project design, as outlined by the convention’s annex. Furthermore, all archaeological investigations should ensure that adequate funding sources are secured before a project begins. The convention’s rules also encourage information sharing, transfer of technology, and international cooperation. Finally, it states that activities (archaeological and commercial) should avoid disturbance of human remains or venerated sites.

The convention, if it comes into force, will also provide protection and management standards for archaeological resources located in the intertidal zone, as the convention’s definition of underwater cultural heritage includes “all traces of human existence having a cultural, historical or archaeological character which have been
partially or totally under water, periodically or continuously, for at least 100 years”
(ICOMOS, Art. 1). The lack of explicit definitions has plagued maritime cultural heritage
laws in the past (e.g., ASA) and resulted in legal loopholes (Forrest 2002); therefore, the
convention definitions are not only inclusive of numerous types of maritime resources but
also specific enough to limit future legal and semantic ambiguities. The U.S. has been
reluctant to be a party to the convention. In fact, several U.S. administrations have
objected to its declarations. The U.S. did not accede to the convention “because of
objections to several key provisions relating to jurisdiction, the reporting scheme,
warships, and the relationship of the convention to UNCLOS," and "as a matter of
international law and with particular reference to Article 311(3) of UNCLOS, the
convention's provisions apply only among Parties to it" (Maritime Law Association
2002).

The U.S. is not yet a signatory to UNCLOS (however, it is now a member of
UNESCO), but it is currently researching the potential that “implementation of Article 76
could confer jurisdiction and management authority over large (and potentially resource-
rich) areas of the seabed beyond our current 200 nautical mile limit,” which “has renewed
interest in the potential for a U.S. claim” (Mayer et al. 2002: 6). The results of an Article
76 claim could extend jurisdiction beyond the base of the continental slope (out to 350
nautical miles), and consequently will affect federal control over underwater cultural
heritage, particularly if the convention is adopted by the U.S. (FIG. 15). A formula line
for identification of an extended claim is problematic and controversial, as it requires a
determination of the foot of the continental slope. The UNESCO Convention on the
Protection of Underwater Heritage (2001) does not address cultural resources located within an Article 76 claim.

Figure 15. A claim through Article 76 of the United Nations Law of the Sea (UNCLOS) would extend federal jurisdiction as far as 350 nautical miles from shore.

**Summary**

The protection and management of maritime cultural resources in the Gulf of Maine is relatively poor. There are only a handful of maritime archaeologists working in the region, but there are ample research topics and archaeological sites that require protection, management, and study. In addition, there are no consistent funding sources
or infrastructure to support research, preservation and outreach programs. Stellwagen Bank marine sanctuary excluded, there are no university programs, government agencies (state or federal), or museums that maintain an active maritime archaeological research program in the Gulf of Maine. Research, preservation, and education in the Gulf of Maine are conducted by individuals and non-profit organizations.

Today, cultural resource management in the Gulf of Maine ends at the water’s edge. Land archaeologists and resource managers have avoided getting their feet wet for a number of reasons, but the most significant is probably financial. While offering moderate protection to underwater cultural resources and recognizing the significance of maritime sites such as shipwrecks, unfunded mandates such as the ASA have offered no incentives and only disincentives for public and private institutions to engage in the study and preservation of shipwrecks. Unwilling to share limited budgets and resources, terrestrial archaeologists have neglected maritime archaeology in the Gulf of Maine. Consequently, coastal and maritime cultural resources are not an integral part of the government’s resource management strategy. Cultural resource managers often dismiss the potential contribution of maritime archaeological research to history, anthropology and environmental studies (e.g., King 1998). Maritime archaeology is usually excluded (and at best considered secondary) to land archaeology in SHPO preservation planning (MHPC 2001: 77). Consequently, cultural resources managers rarely consider the impact of federal actions, in compliance with historic preservation law (e.g., NHPA) to resources in intertidal or marine areas.

In 2000, Congress enacted the Oceans Act of 2000 (33 U.S.C. 857-19), which authorized the formation of the U.S. Commission on Ocean Policy, an independent
agency that hopes to redefine ocean use and management for both inshore and offshore waters (U.S. Commission on Ocean Policy 2004). The commission seeks to move away from the current fragmented system to a regional, ecosystem-based management regime. The commission’s report recognizes that “there are no federal laws that assert ownership of cultural resources outside of state waters,” and that any new “management regime should incorporate a comprehensive policy on submerged cultural resources, including shipwreck sites” (U.S. Commission on Ocean Policy 2004: 69). Disturbing for archaeologists, preservationists, and the concerned public is that the report considers “financial returns through salvage” a possible and legitimate use of underwater cultural resources (U.S. Commission on Ocean Policy 2004: 69). However, the report does clearly acknowledge the need to incorporate a national policy for the use and protection of submerged cultural resources within its management regime. Additionally, in its definition of “ocean and coastal resources,” the Oceans Act diverges from other encompassing ocean management regimes such as UNCLOS, defining these resources as “any living or non-living natural, historic, or cultural resource found in the marine environment” (33 U.S.C. 857-19).

The National Research Council in its recent report, *Exploration of the Seas: Voyage Into the Unknown* (2003), considers “marine archaeology” as a promising research area having broad international interest, and acknowledges that federal government funding for this archaeology is largely unavailable. The major funding sources, the National Science Foundation and the National Endowment for the Humanities, in recent years have not supported archaeological exploration and survey projects. However, in recent years NOAA’s Office of Exploration has provided some
funding for exploratory maritime archaeology projects, but NOAA limited funding in 2004-2005 for these projects to merely four percent of the $5,000,000 grants budget. The Pew Oceans Commission report, *America’s Living Oceans: Charting a Course for Sea Change* (2003), is not as explicit in its definitions nor does it specifically address cultural heritage. It does, however, consider the significance of maritime heritage in providing economic and social benefits to coastal communities (Pew Oceans Commission 2003: 55).

International, federal, and state protection and management measures vary considerably, each addressing maritime cultural resources in part, but not as a whole. Today’s piecemeal legislation suffers from a lack of the following conditions: clear management objectives, uniform resource protection, well-defined jurisdictions, regular procedures for decision-making, guidelines and standards for conducting research, coordination among various authorities, and funding for research, management, and education. Legislative efforts have addressed at least one of these conditions, but none has done so comprehensively. The exception is perhaps the UNESCO *Convention on the Protection of Underwater Cultural Heritage*, but it leaves individual states responsible for providing the funds needed to implement the convention. Furthermore, there is renewed interest in revising ocean management and policy by the federal government, as exemplified by U.S. Commission on Ocean Policy and the formation of the U.S. Committee on Ocean Policy in 2004.

As we move toward the establishment of a national maritime heritage policy and program in the United States, it will be important to identify conflicting legislation, jurisdictions, and philosophies in the methods and treatments of maritime heritage
resources (i.e., salvage, heritage preservation, and archaeology). The interpretive strategies we develop to foster public appreciation of maritime heritage, whether it is in the form of underwater parks, preserves, exhibits, floating museums, or reconstructed waterfronts, will depend largely on how various stakeholders 'value' heritage. A policy with clear objectives and procedures to assess the historic worth of maritime cultural resources as well as identify the costs and flow of benefits of preservation projects to society is needed. Finally, without adequate funding for submerged cultural resources protection, preservation, management and education at the federal and state levels, the status quo or worse should be expected. The integration of maritime archaeology into a regional or ecosystem-based management scheme and policy, as proposed by the U.S. Commission on Ocean Policy may be the answer. Such a policy, if based on the sustainable development of ocean and coastal resources, which is outlined in chapters 5 and 6, will help to ensure that future generations will have the option to know about and preserve their own past. Decision- and policy-makers, and resource managers will need all available lawmaking tools at hand not only to untangle the existing legislative web but also to reach the comprehensive national policy for maritime cultural resources called for in the now decade-old NMHA of 1994.
CHAPTER 4

MARITIME CULTURAL HERITAGE SURVEY OF THE GULF OF MAINE

This chapter provides a regional survey that identifies and describes areas in the Gulf of Maine where the interaction of people and the marine environment over time have produced unique maritime landscapes with significant aesthetic, historical, cultural, social, economic, or ecological value. In order to protect, manage, use and develop these areas, local and state planners must be aware of the historical themes, regional histories, and known archaeological sites and historic properties present. To this end, this regional assessment develops an approach that describes maritime themes in the Gulf of Maine, identifies the types of properties and places that are significant representations of these themes, and delineates areas (or sub-regions) within the Gulf of Maine where these themes are prominent and historic properties are located.

Numerous gaps exist in the representation of maritime cultural heritage in the U.S., particularly in the Gulf of Maine. In 1988, the National Historic Landmarks (NHL) Program commenced a National Historic Landmarks Theme Study, "The Maritime Heritage of the United States," which categorized maritime heritage largely according to site type (APP. F). Unfortunately, properties lacking significant cultural material or monumental architectural, such as Native American coastal settlements and historic fishing-industry related sites, are under- and even unrepresented in that thematic study. Furthermore, methodologies and guidelines for conducting regional assessments of
cultural resources are lacking. Other regional preservation or conservation approaches such as designations of National Heritage Areas (NHAs) and Marine Protected Areas (MPAs) provide criteria for regional or area assessments, but lack explicit procedures in the selection and identification of heritage and protected areas. A report to the General Accounting Office in 2004 regarding NHA designations states that “no systematic process currently exists for identifying qualified sites and designating them as national heritage areas” (Hill 2004). In addition, a 2003 report to the National Marine Protected Areas (MPA) Center claims that “MPAs in the United States today are generally not the result of a systematic effort to design and implement MPAs” (Kessler 2003: 5). While the selection process for national MPAs as well as NHAs do consider cultural, historical, as well as ecological factors for broader regional or areal selection and designation (APP. F), these areas are typically created or designated out of situational crisis, opportunity, or political and public pressure.

Lacking a systematic and established methodology for identification of maritime heritage areas or regions, I define a set of themes related to Gulf of Maine maritime cultural heritage, which recognize broader social and cultural activities and patterns within the region’s history (TAB. 2). This approach is based in part on the revised thematic framework methodology established by the National Park Service (NPS 1999: 15-20). In addition, I use the National Register of Historic Places (NRHP) listing of properties, sites, and districts as a baseline to determine where and which maritime ‘themes’ described in Table 2 are found and represented in various regions throughout the Gulf of Maine. The identification of maritime properties and archaeological sites in the NHRP is a first and necessary step that is used in this study to identify gaps in the
historical and archaeological record as well as a region's potential for development of maritime cultural heritage.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native American Culture and Society</td>
<td>Coastal settlements, food procurement and processing sites, watercraft, cultural landscape</td>
</tr>
<tr>
<td>Exploration and Settlement</td>
<td>European exploration and early settlement site, trading outpost, first landing and contact site, watercraft</td>
</tr>
<tr>
<td>Fishing and Whaling</td>
<td>Station, flake, try yard, processing, warehouse, watercraft</td>
</tr>
<tr>
<td>Shipbuilding</td>
<td>Shipyards, boatyards, marine railways, sail lofts, shipbuilder residences</td>
</tr>
<tr>
<td>Navigation</td>
<td>Lighthouse and station, lightship, aids and markers</td>
</tr>
<tr>
<td>Industry and Energy</td>
<td>Power-generating station, tidal dam, mill, quarry, kiln, brickyard, watercraft, pipeline</td>
</tr>
<tr>
<td>Commerce and Trade</td>
<td>Shipwrecks and derelict watercraft employed in trade of raw and finished goods as well as passengers; customhouses, markets, merchant facilities, warehouses</td>
</tr>
<tr>
<td>Military, Navy and Coastal Defense</td>
<td>Coastal fortification, naval battles and engagements, sovereign watercraft</td>
</tr>
<tr>
<td>Race and Ethnicity</td>
<td>Ethnic, racial and religious history and diversity in maritime trades and lifeways</td>
</tr>
<tr>
<td>Marine Research and Science</td>
<td>Research or education facilities and vessels in marine science and education</td>
</tr>
<tr>
<td>Waterfront and Sea Defense</td>
<td>Seawall, landing, jetty, quay, breakwater, wharf and pier</td>
</tr>
<tr>
<td>Communication</td>
<td>Coastal telegraph, radio or satellite station, underwater cable</td>
</tr>
<tr>
<td>Maritime Landscape</td>
<td>Canals, bridges, spiritual/memorial landscape, marine agricultural landscape</td>
</tr>
</tbody>
</table>

Table 2. Gulf of Maine maritime cultural heritage themes.

The NRHP eligibility criteria and their application are the nationally accepted method to determine the 'significance' of individual archaeological sites and landscapes (APP. F). While the ambiguity of the term 'significance' and approaches to assessing it in regards to archaeological sites and those properties eligible for the National Register are continually debated (Hardesty and Little 2000), the NRHP site assessment approach has shown its effectiveness with nearly 80,000 historic and archaeological properties nominated, listed, and protected nationwide (<http://www.cr.nps.gov/nr/about.htm>).
Specific guidelines have also been published by the National Park Service (NPS) for nominating shipwreck sites to the National Register (APP. F) (Delgado 1987). The NRHP is used here to provide a measure of the abundance and diversity of maritime cultural heritage in the Gulf of Maine, and potentially where improvements in conservation of maritime-related properties are needed. It is important to note that in this present study National Register properties may represent multiple maritime themes. For example, the early 20th-century schooners *Frank A. Palmer* and *Louise B. Crary*, shipwrecked on Stellwagen Bank, represent both ‘Industry and Energy’ and ‘Commerce and Trade’ themes due to their cargo of and trade in coal that was used to fuel industry and manufacturing or milling operations.

In selecting or designating sub-regions in the Gulf of Maine, this study also draws from the objectives and methods established in the UNESCO World Heritage program as well as European regional, maritime cultural resource surveys. The *Operational Guidelines for the Implementation of the World Heritage Convention* (2005) considers both natural and cultural factors in site, landscape, and region selection and World Heritage List designation (APP. F). Heritage studies specific to the coastal zone and maritime cultural resources that have influenced this survey include *England’s Coastal Heritage* (Fulford et al. 1997) in the United Kingdom, *Atlas Over Fyns Kyst* (Binderup et al. 1996) in Denmark, and *Landscape and Cultural Heritage in the Wadden Sea Region* (Vollmer et al. 2001) – a region shared among Denmark, Germany, and Netherlands. These studies have similar methodologies: they define and describe coastal morphology with a focus on sea level change, provide a typology of cultural resources, outline a historic context to explain the presence and value of cultural resources, and determine the
preservation potential of certain cultural resources located within specific marine environments. Each of these studies also used GIS to varying degrees to build an atlas of the maritime cultural landscape with the purpose of utilizing spatial information to support research and management.

The sources used in establishing boundaries for sub-regions in the Gulf of Maine are based primarily upon surveys of regional archaeological resources and historical literature including state and federal cultural resource databases and inventories (e.g., NHRP), journal articles, and archaeological survey reports. Because human environments are typically a reflection of their unique natural setting and diversity of resources, boundary delineation of each area is also determined by the physical boundary features of ecosystems or hydrographic factors such as the maximum reach of tidal waters. As areas for human settlement were often chosen because of their proximity to abundant and diverse natural resources, or selected for strategic purposes such as communication, trade, and defense, boundaries are also determined by historical and cultural uses, and resource exploitation and activities within a particular area. Eighteen maritime areas or sub-regions within the Gulf of Maine, as seen through the historical and archaeological record, are identified (FIG. 16).
Figure 16. Maritime heritage regions of the Gulf of Maine.
A historic context or narrative outlines the maritime history and development of each sub-region, which is based primarily on secondary sources such as syntheses of regional maritime history, local histories, archaeological survey reports, state and federal inventories of cultural heritage sites, and coastal archaeological surveys I conducted from 1995 to 2006 (see e.g., Claesson 1997; Claesson 2001). The chronological range of study is primarily 1600-1950; however, the presence of prehistoric sites in the coastal environment and the potential for their existence in offshore, submerged landscapes in study areas is also discussed. The survey provides a baseline description of past and current marine environmental uses and activities, as well as a basic description of each region’s habitats, ecosystems, physical features, and natural resources. The survey identifies the types and characteristics of maritime archaeological and extant coastal architectural sites and features that are present or known historically to have existed within each maritime area or region.

The sub-regional historic contexts in this chapter are presented by no means as traditional, primary source historical or anthropological scholarship. Rather, this survey of maritime historical and archaeological resources and identification of resource-sensitive areas is intended to assist management by flagging federal and federally-approved development projects within these areas for review and compliance under NHPA and NEPA. The survey information may also be used to identify threats as well as prioritize conservation of maritime sites and features, determine treatments for their preservation, and propose management schemes. In the final section of this chapter, a comparative analysis examines whether the National Register listings sufficiently reflect the maritime heritage and history of each region, and collectively that of the entire Gulf.
of Maine. Specific assessment techniques and management applications are discussed in the following chapters.

Despite the encompassing approach of this survey, all significant maritime historic and archaeological sites, places, features, and landscapes cannot be accounted for here. In fact, many individual sites of historic importance may lie outside of the identified and surveyed regions. This is particularly the case for movable culture in the form of ships and boats, whose remains are often found far from any terrestrial and marine areas of historic or cultural significance. Additionally, the inherent nature of archaeology is that new discoveries will occur and reshape interpretations of the past. Therefore, this maritime heritage survey is a dynamic record that is not cast in stone. As new discoveries are made and previous archaeological excavations and historical studies re-interpreted, this survey document should also evolve.

**Maritime Heritage Areas**

**Fall River**

Fall River is situated at the mouth of the Taunton River on the east side of Mount Hope Bay. The city is approximately 40 km from the Atlantic Ocean, which is accessible by sea via Narragansett Bay, or the shallower Sakonnet River. Fall River has a deep water harbor; however, until expansive land filling occurred in the 19th century, the natural waterfront landscape was comprised of tidal wetlands and flats (Smith 1944: 9). Known as Troy until 1834, Fall River was likely named for the Quequechan River (meaning “falling waters” to the Wampanoag), which flows through the center of the city down a steep slope – approximately 40 m over half a kilometer into Mount Hope Bay.
This granite-lined river, supplied by the spring-fed natural reservoirs of North and South Watuppa Ponds, was the foundation for the city’s rapid growth beginning in the mid 19th century. The waterfront city is a unique place because of its massive granite mill buildings and waterfront architecture. It is also exemplary of a general shift in New England from the maritime-agricultural economy of the Antebellum period to the manufacturing base of the post-Civil War era.

European settlement of the Taunton River began in the mid-17th century. Towns along the river permitted settlers to land easily as well as ship agricultural, timber and fish products to New England coastal markets and trading posts. Fall River, however, was not densely settled in the colonial era. The exposed eastern shore of Mount Hope Bay, poor soil for farming, and a large pond system that limited inland travel, perhaps explain why the area was initially unattractive to early settlers. In the early 18th century, saw and grist mills were established on the banks of the Quequechan River, but there were still fewer than 100 inhabitants in 1800 (Smith 1944: 1). Within 30 years, however, the textile industry exploded and the population swelled to 9,000. By 1875, Fall River with a population of nearly 30,000 was a leading textile manufacturing center in the country, employing approximately 16,000 workers. Between 1870 and 1890 the population more than doubled, reaching 74,000 in 1890 (Smith 1944: 8).

Shortly after the War of 1812, large-scale manufacturing was established in New England, particularly along high-volume rivers such as the Merrimac and Connecticut in Massachusetts, Salmon Falls in New Hampshire, and the Saco and Androscoggin in Maine. Although Fall River lacked the high-water volume of these rivers, the steep flow of water and granite bed was an ideal foundation for building mills. In addition, the ponds
at the river head provided a steady, regulated water source, and simultaneously limited any chances for major floods. The first cotton mills on the river were erected in 1813, and in the early 1820s, the enterprising families of Fall River – namely the Bordens (ancestors of the infamous Lizzie Borden), Durfees, and Bowens built large water-powered, granite and brick mill buildings to lease to textile and weaving industrialists. An iron works was also established on the lower falls of the river. Initially, the works were developed to support shipbuilding in the area, as stands of white oak and pine were abundant here. However, shipbuilding was a minor industry at Fall River compared to other New England areas. Essential to the “textile complex” of Fall River, the iron works supplied the mills with machinery as well as invented new technologies to improve textile production (Smith 1944: 57).

The wetlands at the foot of the Quequechan River and falls were a significant natural impediment to navigation in the early 1800s. Because Fall River’s waterfront was not a naturally good landing site, Steep Brook to the north of Fall River was the pre-eminent landing site at this time. However, in the 1830s, when investments in wharves, roads, bridges, and the filling-in of coastal wetlands occurred, Fall River became a leading port and the site of the region’s customs house.

Mill cities such as Lowell on the Merrimac River retained a slight lead in production over Fall River in the 1840s and 50s because of greater water supply – the Quequechan River’s supply was maximized by 1850. At this same time, steam technology developed in Europe, which Fall River families were quick to invest in and adopt, in an attempt to compete with other New England mills. The advantage and efficiency of coal-powered steam over water-power mills was that high-volume water
sources were unnecessary. But this also meant that large tracts of flat land were needed to accommodate the steam plants that drove thousands of cotton spindles; moreover, expansive landings and warehouses were necessary to store cotton and coal. Subsequently, the reclamation and seaward extension of land into deeper water allowed for the landing of colliers and steamers and the building of mill and storage sites on flat land close to the waterfront. It is likely that numerous derelict and abandoned vessels were used as landfill during reclamation projects and now lie buried beneath the city’s industrial waterfront. Additionally, there was significant maritime trade and commerce through Mt. Hope Bay and the Taunton River in the 19th century, and consequently, at least 10 ships are known to have foundered off the shores of Fall River during this period (Riess 1998: 7).

A critical step in Fall River’s industrial growth was the linking together of Fall River and Boston by rail. The Fall River Railroad, completed in 1847, not only linked these two cities but it also extended transportation by steamship from Fall River to the cities of New York and Philadelphia. With waterfront facilities in place and rail and marine transport connected, Fall River was an important link in a network that regularly transferred passengers and cargo (e.g., coal, iron, grain, sugar, and salt) between Boston and southern markets. The Fall River steamships, including the *Bristol, Providence, Puritan, Pilgrim, Priscilla*, and *Commonwealth*, were renowned for their rapid transit as well as opulence. Toward the end of the 19th century the steamers also began to service summer resorts on Cape Cod. The Fall River Line, known as the “Boat Train,” served as a principal corridor between Boston and New York for 90 years, and was one of the longest lasting train line in U.S. history (Harlow 1946: 219).
Fall River maintained its dominance in the textile industries throughout the latter half of the 19th century. The city’s coastal location allowed for lower transportation costs for coal and cotton than northerly mill cities, and proximity to New York, Boston, and Philadelphia made it attractive to industrialists. Until the rail network in the northeast became more efficient in the 1880s, the marine-rail transportation network favored Fall River. Furthermore, the city’s location near the ocean produced high relative humidity and less variable temperatures, which were natural conditions advantageous to the manufacture of yarns (Smith 1944: 57-62).

The city’s rapid growth in this period meant that a large labor pool was needed to operate the industry, attracting foreign immigrants. By 1890, nearly half of Fall River’s 74,000 residents were foreign born. Most were English, Irish and French-Canadian, but in the 1880s the city was inhabited as well by Portuguese, Azoreans, and Cape Verdeans, and to a lesser extent Syrians, Poles, and Russian Jews (Coelho 1980: 7). The textile boon in Fall River would last only a few more decades, however. The rise of textile manufacturing in the south, and the advent of steam technology and efficient rail networks, reduced Fall River’s growth and industry dominance. Only one mill was built in the city after 1912 and after 1922 there were significant declines in employment and numerous mill closings (Smith 1944: 124). Fall River never regained its foothold as a leading textile producer, but the industry left an indelible imprint on the culture and economy of New England, which is still represented in the architecture of the waterfront landscape and mills of Fall River.
<table>
<thead>
<tr>
<th><strong>Native American Culture and Society</strong></th>
<th><strong>Exploration and Settlement</strong></th>
<th><strong>Fishing and Whaling</strong></th>
<th><strong>Shipbuilding</strong></th>
<th><strong>Navigation</strong></th>
<th><strong>Industry and Energy</strong></th>
<th><strong>Commerce and Trade</strong></th>
<th><strong>Military, Navy and Coastal Defense</strong></th>
<th><strong>Race and Ethnicity</strong></th>
<th><strong>Marine Research and Science</strong></th>
<th><strong>Waterfront and Sea Defense</strong></th>
<th><strong>Communication</strong></th>
<th><strong>Maritime Landscape</strong></th>
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Table 3. Maritime districts, building and sites of the Fall River region on the National Register of Historic Places.
Table 3 continued. Maritime districts, building and sites of the Fall River region on the National Register of Historic Places.

**Cape Cod**

Cape Cod is a peninsula in eastern Massachusetts that curls out into the Gulf of Maine. East and north of the Cape is the open Atlantic Ocean. Cape Cod Bay lies to the west, and to the south, Nantucket Sound. This study area is an ecologically distinct landform that is commonly referred to as the “Lower Cape” or “Outer Cape.” The region was formed primarily by Wisconsinan-period glaciations. Glacial moraines make up the southern portion of the Cape, while the extending arm of the Lower Cape consists mostly of outwash plain deposits. Sea level rise has sculpted the Cape’s soft sandy soils by erosion, and longshore transport of these sediments has helped to form barrier beaches and salt marshes. In addition, wind has shaped the sandy soils of the Cape into massive parabolic dunes (Strahler 1966: 82). Numerous kettle ponds and kame fields also dot the landscape (Oldale 1992: 63). There are no high-volume fresh water courses on Cape Cod; only small streams and tidal rivers exist. These streams and rivers, and interior fresh water ponds, serve as critical spawning sites and habitats for anadromous and catadromous fish.

The Cape is the most dynamic coastal region in the Gulf of Maine. Although offshore and Cape Cod Bay topography is comprised mostly of featureless sandy plains and
tidal flats, the thousands of shipwrecks along the Atlantic Cape coast are a testament to continual coastal alterations and processes that have wreaked havoc upon mariners for centuries. The movement and recession of the Atlantic coast shoreline by erosion has been extensive at places such as Cape Cod Light and Chatham (Gatto 1978). The predominantly sandy soils of the Cape also caused problems for early European agriculturalists, as the nutrients of the Cape’s thin soils were quickly exhausted. Consequently, most early European settlements at places such as Chatham, Wellfleet, Truro, Orleans, Eastham, and Provincetown, increasingly relied on the sea’s bounty for survival (Yentsch 1988).

Archaeological evidence is scant for a human presence on Cape Cod in the Paleo-Indian Period (10,000-12,000 BP) (Holmes et al. 1998: 18-19). Middle Archaic Period (8,000-6,500 BP) archaeological sites are more prevalent, particularly along the Cape Cod Bay shore near salt marshes and ponds (Mahlstedt 1987: 28-29). A predominantly maritime subsistence base was apparent by the Late Archaic Period (6,500-3,000 BP) – represented in the archaeological record by shell and fin fish midden deposits. Exploitation of marine resources was the principal subsistence pattern for several thousand years on the Cape. However, there is limited evidence of sedentism and horticultural activity on the Outer Cape in the Late Woodland Period (1,200-400 BP) (Bradley et al. 1987: 44-45). As of 2005, more than 600 prehistoric sites have been identified on the Outer Cape (Pers. Comm., Leparto 2006).

The later history of Native Americans in this region is not well documented, but some important information is derived from accounts of European explorers and settlers. In addition, Contact Period archaeological sites have been excavated at Wellfleet, Truro,
Eastham and Orleans providing information about Native American activities, appearances, customs, as well as their methods of marine exploitation (Holmes et al. 1998: 22). Because the Cape was often the first land sighted off New England by explorers and settlers, early historical accounts also provide descriptions of the region’s coastal landforms, the marine environment, and diversity and abundance of natural resources. Explorers of the Cape include Giovanni de Verrazano (1524), Esteban Gomez (1525), Bartholomew Gosnold (1602), Martin Pring (1603), Samuel de Champlain (1605), and John Smith (1614). Champlain and Smith, in particular, provide rich accounts of encounters and interactions with Native Americans and descriptions of the marine environment, often making careful note of the location of shoal areas and strong currents. During Champlain’s expedition, a map of Nauset Harbor was carefully drawn and depicts a Native American fish and eel trap strung across a tidal inlet, and descriptions of the region’s people, flora and fauna are provided. Early settler descriptions, such as William Wood’s New England’s Prospect (1634), also give detailed descriptions of the abundance of sturgeon and other marine life around Cape Cod.

The Cape’s coastal communities lacked the industrial growth and history of other Massachusetts regions due in part to their remoteness. Although significant as an initial landing site for early English and French explorers as well as the Pilgrims (who would forego the Cape and instead settle Plymouth), Plymouth colonists did not begin to settle the Cape until the 1630s and 40s. On the Atlantic coast, Nauset (now Orleans and Eastham) was settled by Plymouth colonists in 1640, and soon to follow were the towns of Chatham, Truro, Wellfleet, and eventually Provincetown. The “large extent of open country along the shore before reaching the woods”, described by Champlain in 1605 was
likely attractive to settlers, as little forest clearing was requiring for farming and raising livestock (Holmes et al. 1998: 23). The lack of rivers and streams was an impediment to development, but it did not deter colonists from utilizing the winds and tides to power saw and grist mills.

The soils of the Cape, highly susceptible to erosion, and the limited timber supply, which was remarked upon as early as the 17th century, limited agricultural expansion in the region (Holmes et al. 1998: 26; Yentsch 1988: 138-139). Probably out of necessity, at the turn of the 17th century, the inhabitants of Cape Cod shifted to a maritime subsistence and economy. Pilot whales and North Atlantic right whales were hunted and driven ashore, try yards were constructed to process whales for oil and food, and weirs were erected on tidal rivers to capture eels and herrings. Clams, quahogs and oysters were harvested, and saltworks were established to produce salt for curing hides and preserving fish.

Shore and deep-sea whaling has its origins on the Cape, well before the rise of the whaling at Nantucket and New Bedford. Deep-sea whaling expeditions were launched from Provincetown to the Davis Straits as early as 1737 (Stott 1987: 258). Although whaling mostly vanished from the Cape by the American Revolution because inshore stocks of whales were hunted to commercial extinction, the industry left an indelible mark on the Cape’s maritime landscape, economy and culture, which is visible in both the historical, architectural and archaeological record. In addition to the numerous try works and shipyards that lined the protective Cape Cod Bay harbors, there were the waterfront piers, wharves and landings, and taverns where whalers congregated. For example, the Wellfleet Tavern on Great Island, studied by archaeologists in the late
1960s and early 70s, brought to light the culture and activities associated with shore whaling on Cape Cod (Ekholm and Deetz 1971). The abandonment of the tavern ca. 1740 also coincided with the reported “disappearance” of whales from Cape Cod Bay 10 years earlier (Ekholm and Deetz 1971: 53).

Wharves were constructed in Wellfleet and other Cape harbors beginning in the 1750s in order to facilitate the larger whaling vessels needed to go further out to sea. Before the Revolution, approximately 30 vessels and 420 men were whaling out of Wellfleet, but British blockades and the diffusion of labor to rebellion and privateering disrupted whaling expeditions (Starbuck 1964: I: 57). Wellfleet and other Cape towns never returned to their former level of whaling following the Revolution, and Nantucket would become the 19th-century world’s penultimate whaling port, until losing industry dominance to New Bedford in the 1830s. Whaling had all but disappeared from the Cape by the last quarter of the 19th century, except at Provincetown. Try works there were still used to process blackfish oil, which was regarded as superior lubricating oil. The Cape Cod Oil Works at Long Point and Nickerson’s Whale and Menhaden Oil Work near Race Point continued oil production into the early 20th century (Holmes et al. 1998: 96).

Whaling was not the only maritime activity on the Cape by the 17th and 18th centuries. The oysters of Wellfleet were recognized as an important food source in the 17th century, and in 1674 laws were established to prevent non-residents from harvesting them (Holmes et al. 1998: 75). Continual exploitation for over a century led to a noticeable decline in harvests and by 1775 the Billingsgate oyster beds had succumbed to disease and extinction (Kochiss 1974: 39). By 1800 these beds were transplanted with approximately 60,000 oysters from Wareham Harbor, the Taunton River, and
Chesapeake Bay (Holmes et al. 1998: 75). The tradition of transplanting seed oysters continued into the 19th century, but with oysters primarily from Virginia’s Potomac River and Chesapeake Bay (Kochiss 1974: 42; Stott 1987: 276). With new and more efficient oyster dredging technology and motorized oyster boats in the late 19th and early 20th centuries, there was a significant increase in the harvesting of oysters. Oyster houses were built on stilts near the shore to store and process oysters and to serve them to tourists. But the new methods of harvesting increased the yield only temporarily – the empty shells that were needed for seeding new beds were removed and used for lime and fertilizer. That, combined with general over-harvesting, limited the oyster beds’ ability to replenish naturally.

In the 18th century, there was a brisk dried fish trade with West Indian colonists who in turn provided Cape settlers with molasses, rum, sugar, and cotton. However, the offshore fishing industry that supported this trade was generally impeded in the early 1800s – first by Thomas Jefferson’s Embargo of 1807 and then by the War of 1812. Fishermen were forced to work inshore grounds at that time. The federal government’s offer of bounties beginning in the 1790s, however, helped to carry the Cape fishing industry into the turn of the century. Shore facilities and marine infrastructure were built to improve the processing and transportation of fish products to markets. Although some facilities were already in place, there was a boon in shipbuilding and the outfitting of fishing vessels, and the construction of flake yards for processing fish, warehouses for storage, piers and wharves for landing cod and mackerel catches, try works for manufacturing cod liver oil, and evaporation pans or works to produce salt.
Salt works, in particular, were ubiquitous along the Cape coast by the early 19th century. The growth of the salt industry was driven in large part by government bounties that had been granted for salt production in support of the New England fisheries.

Initially, in the 17th century, salt water was boiled in huge iron and copper cauldrons to produce salt, but with the high cost and scarcity of wood fuel, solar evaporation was adopted in 1776 as a viable alternative method. Windmills were constructed on top of salt-work sheds, which ran pumps that brought sea water to large, shallow rectangular wooden or metal vats. Two types of salt were produced by the evaporative process: course Glauber or Epsom salts used for tanning and medicinal purposes, and finer sodium chlorides for salting fish or for use as table salt.

By 1800, salt works were in place along the entire coast of Cape Cod Bay as well as on the Atlantic coast in harbors and estuaries. The standing remains of Enoch Harding's salt works in Chatham (ca. 1830), which were documented by the federal government's Historic American Building Survey (HABS) program in the mid-1930s, are an example of the layout and footprint of a typical salt facility (HABS 1936). In 1802, 136 Cape salt works produced ca. 40,000 bushels of salt and 182,000 bushels of Glauber or Epsom salts (Holmes et al. 1998: 92). The number of works more than tripled during the War of 1812 when imported salt prices rose and bounties were issued for salt production. By 1831 there were 881 works on Cape Cod (Stott 1987: 292). The industry peaked at this time, but the government salt bounties ended in 1834, the imported salt tariff was removed in 1842, there was increased demand for fresh fish, and rail networks to inland mines and springs limited the need for labor-intensive evaporative salt works.
Salt was produced by evaporation on the coast until the 1870s, but a few works, such as Enoch Harding’s, produced sea salt in to the early 1900s (Holmes et al. 1998: 92).

Although an ancient regional method of fishing, weir and trap fishing was a burgeoning industry on the Lower Cape in the late 19th century. Menhaden were captured in weirs, as were shad and herrings which were used as bait fish. Menhaden were also processed for their oil, which was used for a variety of purposes including fertilizer, medicine, and in curing leather. Of the 30 million pounds of fish landed in Massachusetts in 1935, 20 million came from the weirs and traps of Cape Cod (Ackerman 1941: 167, 224). Weir fisheries in the late 19th and early to mid 20th centuries were primarily corporate enterprises. For example, in 1942 the Atlantic Coast Fisheries Co. owned 40 of the 50-60 weirs located between Wellfleet and Provincetown (Vorse et al. 1991). Fish canneries and ice houses also developed along the Bay coast at this time.

Provincetown and Chatham were two towns that prospered from the deep-sea or offshore fishing industry after the Civil War. Aided by a massive influx of Portuguese immigrants, the Provincetown fin fishing industry expanded. In 1880, Provincetown had approximately 40 wharves with numerous shore facilities and outfitting firms such as sail and rigger lofts, block maker shops, fish houses, flake yards, and marine railways on its harbor and waterfront. From 1870 to 1890 Provincetown was only second to Gloucester in cod fishing. However, the number of fishing vessels in Provincetown declined precipitously at the turn of the century from 114 fishing schooners in 1885 to 14 in 1914 (Stott 1987: 273).
Contributing to this decline as well as making significant changes to the Cape landscape and economy was the construction of the Cape Cod Railroad, which reached Provincetown in 1873. By improving access to the Cape, it was expected that there would be growth in manufacturing, which did occur in the form of small textile, boot and shoe manufacturing companies. The railway also brought wealth and economic growth to the Cape in the form of tourism. However, the railway competed directly with the well-established packet transportation system, which brought passengers and cargoes to and from Massachusetts Bay ports and markets. The decline in packet transportation resulted in a corresponding decline in related maritime industries and the collapse of the region’s maritime economy and culture. In addition, rail beds choked off access to some harbor and river landing and fishing places. By the early 20th century, many of the wharves and piers of Cape ports and harbors were abandoned.

The sandy peninsula of Cape Cod has claimed more ships than any other place in the Gulf of Maine. Until the Cape Cod Canal was built in 1914, the Cape had to be circumvented to reach Boston. It is also the first landfall for ships on the trans-Atlantic route to Boston from New York and points south. Consequently, the Cape with its shallow sandy plains and barrier beaches interspersed with rocky shoals, and swirling currents, can lay claim to the unenviable title of ship graveyard of the Gulf of Maine. Based on lighthouse keeper logbooks, government records, and databases of historical organizations as well as the Massachusetts Board of Underwater Archaeological Resources, a conservative estimate of shipwrecks on this coast is ca. 2,000. Of these shipwrecks, only Whydah, pirate ship of Samuel Bellamy, which wrecked in 1717 near Eastham, has received any archaeological documentation (Hamilton 1992).
In an effort to counteract these maritime disasters the government and private citizens erected numerous lighthouses and lifesaving stations, particularly along the Atlantic Cape coast. The first lighthouse on the Cape was Highland or Cape Cod Light, which was built in Truro in 1796 (Holmes et al. 1998: 76). A light at Race Point was built in 1816 to help guide ships into Provincetown Harbor, yet between 1816 and 1946, 100 ships wrecked near the point, including the U.S. submarine S-4, which collided with a Coast Guard vessel in 1927. Because of the constant threat of the sea and continual erosion, most Cape Cod light stations have been destroyed, rebuilt, or set back from their original position.

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Table 4 continued. Maritime districts, building and sites of the Cape Cod region on the National Register of Historic Places.

Buzzards Bay

Buzzards Bay, once known as Manomet Bay, is a body of ocean water bounded by the Elizabeth Islands to the south and mainland Massachusetts to the north, west, and east. The bay is ca. 550 km² in area, 45 km in length, 12 km in width, and averages 11 m in depth (Howes and Goehringer 1996: 7-8). The northwest shore consists of elongated inlets and numerous peninsula, tidal and freshwater rivers, wetlands, and protected harbors. The relatively low and smooth topography of the bay’s southeastern shore is part of a recessional moraine – a remnant of Wisconsinan-period glaciations. The low elevation of the far eastern end of the bay, now the site of the Cape Cod Canal, was a critical portage and trading post for early settlers of Plymouth and Barnstable, providing a trade route to other southern English and Dutch colonies such as New Amsterdam and Jamestown.
The towns along the northeastern portion of Buzzards Bay, including Wareham, Mattapoisett, Rochester, and Marion, were occupied by English settlers in the early 17th century. The protective rivers and harbors to the west were settled and developed into the legendary whaling ports of Acushnet, Dartmouth, New Bedford, and Fairhaven. Before Europeans arrived, however, this jagged northern bay coast was heavily occupied by Wampanoag (Peters 2006: 41; De Paoli and Farkas 1985: 34). On the southern coast of the bay, with a very different history, are the towns of Bourne, Falmouth, and Woods Hole. Woods Hole in particular is unique because of its development as a marine science industrial complex.

**New Bedford**

The historical development of Buzzards Bay is based largely around the growth of New Bedford and the whaling and textile industries. New Bedford is located on the western bank of the tidal Acushnet River. Directly across from New Bedford is Fairhaven, which was also an important whaling port in the 18th and 19th centuries. The large and protective harbor of New Bedford extends south to Clarks Point on the west side and to Wilbur Point on the east side of the river. The harbor is protected further by a hurricane barrier constructed by the Army Corps of Engineers in 1966. Nearly 5.6 km in length and standing approximately 8 m above mean high water, the barrier is the largest stone structure on the east coast (Wiegel 1993).

The rapid growth of New Bedford was not based solely on the favorable natural characteristics afforded by the Acushnet River, such as deep water for harboring deep-drafted whale ships and gently sloping riverbanks and wetlands that permitted
unobstructed waterfront development. The merchant elite and Quaker culture also had a significant influence on the city’s settlement history and in shaping the maritime cultural landscape. In 1652, a small group of Plymouth Colony Quakers purchased a tract of land they called the township of Old Dartmouth, which encompassed the villages of Dartmouth, Westport, New Bedford, and Fairhaven. The catalyst that spurred the rapid growth of New Bedford did not occur until 1765, however. In this year, Joseph Rotch, a Quaker and Nantucket whaling merchant, moved to Old Dartmouth. Having outgrown the port and production capabilities of Nantucket, he transferred his company, Joseph Rotch & Son to the shores of Acushnet River in 1769. By 1775, close to 75 vessels and 1,000 seamen were whaling out of New Bedford on voyages to the West Indies, Gulf of Mexico, and northeast South America (Arato and Eleey 1998: 8). At least 6 wharves lined the waterfront of New Bedford at this time, and numerous try houses, candle works, warehouses, rope works, blacksmiths, cooperages, and sail lofts were built alongshore to support the whaling industry (McDevitt 1986: 142-151). These manufactories also began to spring up in towns such as Sippican (Marion), Rochester, Mattapoisett, and Wareham.

Initially, these towns were critical transit points and landing places for ships bringing goods from the south to Barnstable, Plymouth, and Boston. The rivers and ponds of these smaller towns were also rich in natural resources and fishery habitats such as cranberry and iron bogs, and rivers, streams and brooks with abundant trout, eel, herring and alewife. In particular, the Weweantet, Agawame, Woonkinco, and Merry Meeting Rivers and upriver ponds were hosts to productive runs of eels, alewives and herrings (Bliss 1900: 197). For centuries, local laws ensured that fish caught in weirs and traps were available at low prices to local communities and individuals (Goode Vol. 1, Sec. V,
The ample fresh-water power also allowed for the building of iron works, and saw and grist mills that supplied New Bedford with iron hoops, fasteners, and timber products. In addition, salt works and brick kilns were commonplace along the coast of Buzzards Bay.

During the War for Independence, British raids burned or destroyed the waterfronts, mills, and fishing and whaling vessels of many coastal towns. New Bedford in particular, known as a safe haven for privateers, was set ablaze by British forces. Few if any whaling vessels sailed out of New Bedford until the war ended in 1783. However, the Bedford merchants, particularly the Rotch family, who owned a majority of the whaling fleet, continued to invest in the industry. Although whale oil was in short supply at the turn of the century, demands for whale products remained high, as did profits. The Embargo Act of 1807, the subsequent War of 1812, and even the ‘Great Gale’ of 1815, which flooded the waterfront and destroyed the whaling fleet, would not stop New Bedford merchants from rebuilding to eventually become, per capita, one of the richest cities in the world (Allen 82: 1973).

New Bedford’s whaling fleet eclipsed Nantucket’s in vessel tonnage by 1823 and was the pre-eminent whaling port in the world between 1830 and 1860 (Arato and Eleey 1998: 18-19). New Bedford and Fairhaven were home to half the American whaling fleet and they launched more expeditions than all other American ports combined (Arato and Eleey 1998: 19). During this ‘Golden Age of Whaling,’ New Bedford’s fleet was nearly double the Nantucket fleet, employing approximately 10,000 individuals (Allen 1973: 82). However, American whaling had noticeably reduced Atlantic whale populations as early as the mid-18th century, and by the mid-19th century the north Pacific whale
fishery had collapsed (Reeves et al. 1999). Fewer whales meant voyages were longer, less productive and required larger vessels. To undertake profitable voyages whalers were required to sail as far as the Arctic Ocean and the northern Pacific Ocean near Kamchatka to reach largely untapped bowhead whale populations, not for oil but for their whalebone or baleen (Bockstoce 1977).

The discovery of petroleum in Pennsylvania in the late 1850s caused the demand for whale oil to plummet. This discovery and fewer whales were the primary reasons for the subsequent decline in whaling, but ultimately, numerous other factors contributed to the downturn in New Bedford’s whaling industry. In addition to a general shift away from whale oil to petroleum-based lubricants and fuels (e.g., kerosene), skilled labor was increasingly scarce due to migration to the western U.S. and the California gold rush, the completion of the transcontinental railroad meant Pacific whalers no longer had to return to New Bedford, the ability to refine products at sea limited dependence on New Bedford’s infrastructure, and insurance costs for Arctic expeditions were high. Specific events also conspired against the industry: during the Civil War approximately 40 Bedford and Fairhaven whale ships were scuttled in the Charleston and Savannah harbors in a failed attempt to block the ports. Dozens of ships were lost to Confederate privateers, and dozens more were lost in the Arctic Ice in 1871 and 1876 (Arato and Eleey 1998: 38). Of the 400-500 vessels that once called New Bedford home in the 1850s, only 19 ships or barks, 1 brig, and 12 schooners remained in 1897 (Ellis 1892: 431-434). *Wanderer* was the last whale ship outfitted in New Bedford, but did not make it far, foundering on the rocks near Cuttyhunk Island in August 1924. The last whaling voyage
to sail out of New Bedford was prosecuted by the schooner *John R. Manta* on August 20, 1925.

New Bedford merchants, perhaps prescient of the end, began a gradual shift from a maritime to an industrial and manufacturing economy in the late 1840s and early 1850s. These changes to the city’s industrial base towards developing large scale textile manufactories as well as iron and guano works, resulted in a significant transformation of the waterfront and urban landscape, and changes to the social fabric and cultural diversity of the community. The merchant elite that once occupied the waterfront moved up the hill and built some of the finest American examples of Federal-style and Greek Revival architecture. This was in stark contrast to the somewhat squalid waterfront that by 1860 was home to transient seamen, boardinghouses, saloons, dance halls, and old whale ships called “Arks” that were used as brothels (Arato and Eleey 1998: 24). Although the maritime trades and a strong Abolitionist movement had brought culturally diverse groups of people into New Bedford, the textile mills required another massive immigrant labor pool to work the thousands of cotton spindles. Large tenements and boardinghouses crowded the waterfront with mill workers from England, Ireland, Canada, Portugal, Azores and Cape Verde Islands, Scandinavia, Russia, Greece, and Poland (Heath 2001).

The Acushnet River had fulling and carding mills along its shores; however, it was not until 1849, when Wamsutta Mill powered-up its cotton spindles in Building #1 at the northern edge of the city that the textile industry of New Bedford burgeoned. Six stone and brick mill structures were added to the Wamsutta Mill in the second half of the 19th century. Numerous textile and other milling operations were also established near the waterfront at this time. By 1892, New Bedford ranked third in Massachusetts’ cotton
manufacturing industry behind Fall River and Lowell. Whaling conceded much of the waterfront in the latter decades of the 19th century to the steamships landing coal and cotton as well as to passengers and growing numbers of tourists to and from Marthas Vineyard and Nantucket.

Railroads were laid down and extended from the mills to the steamship wharves, which altered the waterfront landscape. The ubiquitous whale ships were replaced with steamships. Granite runners once used for carting barrels of whale oil through New Bedford’s streets were replaced with rails and street cars. By the early 20th century, the rotting hulks of whale ships lined the waterfront. Textile manufacturing and rail transportation reshaped New Bedford’s waterfront landscape and community in the early 1900s. However, when the textile industry began to succumb to market competition from southern states, the city was forced to shift the focus of its economy to deep-sea and bank fishing. Although New Bedford was a fishing port for centuries, fishing became the primary industry during the 20th century. The city maintains a sizeable scallop and fin fishing fleet today.

Few coastal communities have experienced such public revitalization and maritime preservation efforts as New Bedford. Whaling heritage was recognized as an important element to the identity and development of the city as early as the 1900s with the establishment of the Old Dartmouth Historical Society (1903) and the New Bedford Whaling Museum (1907). In 1962, the non-profit, Waterfront Historic Area League (WHALE) was organized with the goal of preserving historic sites, buildings and wharves, and to restoring a living, working waterfront. In 1996, the New Bedford Whaling National Historic Park was established by U. S. Congress in order to preserve,
protect, and interpret New Bedford’s whaling history. In addition, historic districts have been established throughout the city. Unfortunately, no park or district encompasses the waterfront, as construction of Route 18 and MacArthur Drive in the 1970s through the waterfront effectively segregated the community’s historic waterfront from its urban core (Arato and Eleey 1998: 102).

**Cape Cod Canal**

The Cape Cod Canal is located at the far eastern end of Buzzards Bay. Before settlement of the region by Europeans, this low-elevated stretch of land was an important trail and portage for Native Americans (Davin et al. 1994). Interest in building a canal from Buzzards Bay to Cape Cod Bay began as early as 1623 (Reid 1961: 3). Plymouth colonists used this overland route to avoid the more dangerous passage around Cape Cod, and the Aptuxcet Trading Post was established by English settlers near Bourne in 1627 (Farson 1977: 9). Beginning in 1697, numerous unsuccessful attempts were made at building a canal until August Belmont, a banker from New York, financed and began oversight of the project in 1904.

Prior to construction, Belmont issued a survey of the canal site as well as an evaluation of maritime traffic around Cape Cod in order to assess the logistical and economic viability of the project. To substantiate the case for building the canal the New England branch of the United States Engineers Division mapped approximately 1,100 shipwrecks that occurred in the Cape Cod region between 1880 and 1904. Canal construction began in 1909 with the building of a granite breakwater on Cape Cod Bay (Farson 1977: 44). The official opening of the canal, however, was not until July 29,
1914. The federal government temporarily seized the canal from Belmont and the Boston, Cape Cod and New York Canal Company during World War I. The federal government and Army Corps of Engineers eventually purchased the canal in 1928. The Corps widened and deepened the canal and has since maintained it, except when the U.S. Coast Guard and Navy managed the canal’s operations during the war years 1942-1945. The 146-m wide, 10-m deep, and 26-km long channel was designated a National Historic Engineering Landmark in 1985, and it is reputedly the widest sea level canal in the world (http://www.nae.usace.army.mil/recreati/ccc/history/canalstory.htm). Despite the loss of many archaeological sites during the building of the canal, a relatively high density of historic and prehistoric archaeological sites and National Register properties remain along the canal corridor (Davin et al. 1994).

**Woods Hole**

At the terminus of the southern mainland coast of Buzzards Bay is the village of Woods Hole. Like many towns on the southern shore of Cape Cod and Buzzards Bay, Woods Hole was first a small fishing and farming community in the 17th century that grew into a small-scale whaling and fishing port in the 18th and 19th centuries. The sheltered Great and Little Harbors of Woods Hole have deep water and were ideal for even large whaling vessels to safely wharf and land their cargoes. Woods Hole is now one of the pre-eminent marine research centers in the U.S. Established first as the headquarters of the U.S. Commission of Fish and Fisheries by Spencer Baird in the 1870s, the once small fishing and whaling town is now home to the Woods Hole Oceanographic Institute (WHOI), Marine Biological Laboratory (MBL), and various
research branches of the U.S. Navy, NOAA, NMFS, and USGS. Woods Hole was also
home to the precursors of the United States Coast Guard: the Light House Service,

The first significant alteration to Woods Hole’s waterfront occurred in 1863 with
the building of the Pacific Guano Company on Long Neck. The company had obtained
exclusive rights to ‘mine’ the guano of Howland Island in the Pacific Ocean, whereby the
guano was shipped to Woods Hole and ground with menhaden and sulfuric acid to
produce fertilizer (Smith 1983: 56). The guano supply on Howland Island was depleted in
1870, but the company had also acquired the Swan Islands in the Caribbean and
Chisholm’s Island in South Carolina in order to continue operations. Large phosphate
deposits were discovered at Chisholm’s Island in 1867, and a second plant was built in
South Carolina on the Ashley River. Although demand for fertilizer was high in the late
19th century, the Pacific Guano Company of Woods Hole declared bankruptcy in 1889,
and the factory was torn down in 1894 (Smith 1983: 56). The guano factory was critical
to Woods Hole’s later development, as the company needed rail to transport their
fertilizer products. Incidentally, the rail line, which was completed in 1872 and in direct
competition with New Bedford, increased access to the town and became a gateway to
Nantucket and Marthas Vineyard.

In 1872, Louis Agassiz, a Swiss naturalist from Harvard University established
the Anderson School of Natural History on one of the Elizabeth Islands, Penikese Island.
The Penikese Island pilot school was the precursor to the Marine Biological Laboratory
(MBL) and Woods Hole Oceanographic Institute (WHOI). The school was abandoned
after only two summer sessions – Agassiz died in 1873 and the school closed in 1874.
Yet, the school had a lasting impact on its students, who matured into the biologists and marine scientists that would lead MBL to become the “largest marine biological laboratory in the world” (Conklin 1983: 174).

In 1871, the naturalist Spencer Baird established the first federal marine science and conservation agency, the U.S. Commission of Fish and Fisheries in Woods Hole. Able to justify scientific research as relevant to national politics and economic development, Baird received modest funding from Congress to study the causes for declining fish catches in New England (Pauly 2000: 45). In 1875, a fisheries laboratory was furnished at Woods Hole, but it was not until 1882-1885 that Baird was able to procure significant funding for land acquisition, waterfront improvement, dormitory and laboratory construction, and commissioning of the research vessels Fish Hawk and Albatross (Bourne 1983: 162-163; Galtsoff 1962: 20).

The Queen Anne Revival-style fisheries complex built by Baird dominated the waterfront until a hurricane in 1938 destroyed or damaged many of the Fish Commission buildings (Bourne 1983: 170-171). Meanwhile, MBL had obtained significant private donations to purchase lands and waterfront buildings, including the old whaling wharf, bake house and candle factory at Woods Hole. The Rockefeller Foundation helped purchase additional property and build new research facilities adjacent to Baird’s fisheries research station. By the early 20th century, MBL was not only renown as the world’s largest laboratory, but it also became the primary summer gathering place for leading American marine biologists and scientists.

In 1923, a National Academy of Sciences Committee, comprised in part of MBL directors and scientists, recommended establishing an oceanographic research institute.
Naturally, Woods Hole was selected as the home of the institute in 1930. The Rockefeller Foundation would again provide most of the necessary funding to build a research campus and acquire the oceanographic research vessel *Atlantis*. Although Rockefeller had provided ample seed money, the federal government eventually stepped in to provide financial support for WHOI following the Second World War. Research in sonar, submarine acoustics, and underwater explosives during war years helped to ensure a steady stream of funding from the Office of Naval Research and the National Science Foundation.

Woods Hole is a unique representation of late 19th and early 20th century institutional and government waterfront development. Spencer Baird's fisheries research center was the cornerstone of federal government ocean research, policy and management. The work of the Fish Commission and the teachings of Louis Agassiz ultimately led to the establishment of MBL and WHOI, and in the mid 20th century, the Fish Commission would eventually be re-organized into NMFS of NOAA – a federal agency which maintains a strong presence in Woods Hole today.

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*Table 5.* Maritime districts, building and sites of the Buzzards Bay region on the National Register of Historic Places.
Wing's Neck Light
Butler Flats Light Station
Palmer Island Light Station
Bird Island Light
Ned Point Light
Fort Phoenix
Whitman Mills
Tremont Nail Factory District
New Bedford Gas and Edison Light Complex
Merrill's Wharf Historic District
New Bedford Historic District
New Bedford Whaling National Historical Park
Fort Tabler District
Padanaram Village Historic District
Russells Mills Village Historic District
Westport Point Historic District
Waquoit Historic District
Ernestina (schooner)
Lightship No. 114
U.S. Customhouse
Woods Hole School
SUMMARY

Table 5 continued. Maritime districts, building and sites of the Buzzards Bay region on the National Register of Historic Places.

Southern Islands

South of Cape Cod, this maritime area consists of the islands of Martha’s Vineyard, Nantucket, Nomans Land, and the Elizabeth Islands. It also includes the marine environments of Vineyard and Nantucket Sounds, Nantucket Shoals, Muskeget Channel, and the near shore submerged features and banks south of the Vineyard and Nantucket. These islands and submerged landscapes share a number of geologic and geomorphologic traits, but they are vastly different from the tough rocky shore of the
northern Gulf of Maine. The landscapes of the islands are a result, in large part, from Wisconsinan-period glaciations, which piled up debris collected from the Laurentide ice sheet’s gradual migration south across Massachusetts and Rhode Island. The terminal and recessional moraines that were deposited following periods of glacial melting and retreat formed the northern edges and elevated areas of the islands and shaped the southern shoreline of Cape Cod. Meanwhile, gravel outwash from the melting glaciers formed the largely flat and featureless plains of the Vineyard and Nantucket Sounds and the southern portions of the islands. In addition to shaping by glaciers, the soft sand and gravel sediments of the islands have been significantly affected by wind, waves, currents, tides, rising sea levels, as well as prehistoric and historic human occupation and land uses. The area is the most dynamic of any coastal area in the Gulf of Maine with continuously shifting sediments and extensive erosion occurring along the islands’ shores.

Although Marthas Vineyard and Nantucket are separated by a mere 24 km, their geologic formations in some ways are remarkably different. The Vineyard is the larger of the two islands and has a 200 km-long shoreline. Its triangular shape was caused by the meeting of two ice lobes. The moraine hills of the Vineyard have their foundations set in the Cretaceous and Tertiary Periods. The evidence of these geologic times is exposed along the southeast coastal cliffs of the island in an area known as Gay Head or by its Native American name, Aquinnah. The rocks and soils of the Aquinnah cliffs were folded up during the Pleistocene ice advances exposing approximately 100 million years of geologic history along its eroded clayey cliffs. Aquinnah has the most complete and visible geology of any place in the Gulf of Maine. A rich assortment of marine and mammal fossils such as whales, mastodon, horses and camels are found here, particularly
within the ‘green sand’ of the Tertiary period and the ‘osseous conglomerate’ of the Pleistocene epoch (Oldale 1992: 29).

Nantucket, located 48 km south of Cape Cod, is approximately 24 km in length and 10 km wide. Off its western edge are Tuckernuck and Muskeget Islands. Because of Nantucket’s and these islands’ southeasterly position, they missed out on some of the Wisconsin glacial deposits and actions that affected Martha’s Vineyard. Nantucket does not have as thick a layer of glacial till nor does it have the thrust-up clay and mineral deposits from pre-glacial times that are found on the Vineyard. Although Nantucket has not revealed the long and varied geological history found on the Vineyard, the stratigraphy of the Sankaty Head cliffs provide the only visible detailed accounts of the Wisconsinan as well as the earlier Sangamonian glaciers (Oldale 1992: 34). Nantucket’s sandy shores are slightly more vulnerable than some of the Vineyard’s clay-based sediments. Severe storms and rising sea levels have caused the soft sediments of sand bars and dunes to rapidly recede along Nantucket’s coast and in some areas shorelines have eroded up to 4.6 m in a year (Gutman et al. 1979: 23). Additionally, the island is mostly void of the large rocks and granite boulders that dot the Vineyard landscape. Nantucket, however, has a larger system of swamps and bogs, which formed at the southern edge of the glacial moraine. Historically, English colonists used peat from these swamps for fuel and heating, as the island’s timber supply was limited. The Vineyard’s swamps and bogs were also harvested for their peat. In addition, iron ore was extracted from the wetlands in the late 18th and early 19th centuries, and shellfish and cranberry farming continues in these environments today.
Freshwater springs, streams and ponds made both islands attractive and conducive to human settlement. Many ponds on the islands’ outwash plain were initially natural coastal inlets carved by meltwater streams. However, when sea levels began to rise the inlets were dammed over by shifting sands. Salt water drained back into the sea via subsurface water flow, which was replaced by fresh water to form ponds. In a few places, ice blocks left behind during the glaciers’ retreat melted to form kettle ponds along the morainal areas of the islands. These ponds supply some small streams and brooks that were used by colonists to power mills, but because of its porous soils, streams are uncommon on Nantucket. The Vineyard’s pre-glacial and glacial clays, however, allow for some water to collect and form into shallow-water streams.

The Elizabeth Islands to the north of the Vineyard are also part of a recessional moraine. The island chain extends southwest from Woods Hole on Cape Cod and includes the islands of Nonamesset, Uncatena, Monohansett, Naushon, Weepecket, Pasque, Nashawena, Penekese, Gull, and Cuttyhunk. This island chain separates Buzzards Bay from Vineyard Sound. Each island varies in size from a few to several thousand acres. They are scattered with numerous granitic and volcanic boulders that were brought by glaciers to the islands from southeast Massachusetts. Cuttyhunk, the westernmost island in the chain, a mere 3.2 km (1.9 mi) long and 1.6 km (0.9 mi) wide, was temporarily settled by the English explorer Bartholomew Gosnold in 1602 (Banks 1966, Vol. 1: 63). At that time, the island was “full of high timbered Oaks . . . . Cedars strait and tall, Beech, Elme, Hollie, Walnut trees in abundance . . . . Haslenut trees, Cherry trees . . . . Sassafras trees, great plenty all over the island . . . . also divers other fruit trees” (Burrage 1906: 334-335). Today, Cuttyhunk’s vegetation is mostly thick low
shrub and poison ivy. In 1902, a tower monument was built on the small island of an inland lake to commemorate the 300 year anniversary of Gosnold’s settlement. Few other notable maritime sites exist on these islands with the exception of Tarpaulin Cove on Nauchon – an important fishing place as well as a stopover point for coasting vessels before rounding Cape Cod (Banks 1966, Vol. 2, Gosnold Annals: 22-23). One of the earliest lighthouses along the southern New England coast was built in the cove in 1759 (Clark 1992: 202).

Surrounding the islands and beneath the sea are a number of shoal areas. Nantucket Shoal to the southeast of Nantucket Island is one of the most dangerous marine environments in the U.S. The shoals are a part of the same glacial moraine which continues eastward to form part of Georges Bank. Not only are the shallow shoals topped with glacially-deposited boulders, but the area also has extremely strong currents. These currents generate large sand waves. Constantly changing bathymetry, particularly where Nantucket Sound collides with the Atlantic Ocean, has caused hundreds of shipwrecks. Devil’s Bridge, a series of boulder reefs located between Aquinnah and Nomans Land, is another infamous shipwreck area. Additionally, the shoal areas of Vineyard Sound called Middle Ground and often referred to as the “graveyard,” are responsible for numerous shipwrecks (Schneider 2000: 18). Based on historical records, maps and the Massachusetts Board of Underwater Archaeology shipwreck inventory, shipwrecks certainly number in the hundreds here, and there are potentially more than 1,000 wrecks in this Gulf of Maine region.

The shoal areas and active hydrographic environments of the islands are also prolific marine habitats. Historically, the near- and offshore grounds produced abundant
amounts of cod and haddock. The region was also known in the 19th century as one of the best for tautog, sea bass, and lobster (Goode 1887: 41-42, 46-48). The fishing grounds were exploited primarily by island fishermen, particularly those at Marthas Vineyard using small indigenous craft such as the “Vineyard fishing-boats” and Nantucket dories (Goode 1887: 47). Larger cat-rigged boats from Hyannis, MA and well smacks from Connecticut also fished the grounds of Nantucket and Vineyard Sounds.

Widespread marine resource exploitation began with European settlement in the early 1600s, but the islands’ human history and maritime culture is far more ancient. Marthas Vineyard is one of a very few places in the Gulf of Maine with a continuous strand of Native American culture extending approximately 10,000 years. The continuity of Native American sites on the Vineyard reveal how over time prehistoric peoples adapted to the littoral environment, hunted marine mammals, gathered shellfish and fished in coastal waters. Nantucket was also occupied for millennia, but the Wampanoag population there was decimated by an epidemic in 1763 and there is now no Indian community on the island (Herbster and Cherau 2002). However, Nantucket has a rich archaeological heritage with dozens of known coastal prehistoric archaeological sites (Little 1979). Recent underwater surveys in the vicinity of Nantucket have also revealed large areas of buried intact paleosols, which indicates that prehistoric sites may lie buried in the offshore seabed (Robinson et al. 2003).

Before Bartholomew Gosnold’s name for Nomans Land, “Marthaes Vineyard,” was adopted, the Vineyard was (and still is) known in Algonquin as Noepe (Banks 1966, Vol. 1: 62). In particular, Aquinnah on the southwest head of the island has been continuously occupied by Wampanoag, and the area contains dozens of coastal
prehistoric sites, such as the Lucy Vincent Beach Site, which dates as early as the late Paleo-Indian Period (Chilton and Doucette 2002). The isolated geography of Aquinnah at the very southwestern tip of the Vineyard, as well as man-made barriers erected by English settlers beginning in the 18th century effectively excluded non-natives from this portion of the island (Banks 1966, Vol. 3, *Annals of Gay Head*: 11). These physical barriers limited Wampanoag access to other island resources, but ironically it helped to protect Wampanoag traditions and culture leaving numerous archaeological and venerable sites undisturbed. However, because of constant erosion of the Aquinnah cliffs and increased residential development pressures, Aquinnah archaeological sites are undoubtedly one of the most endangered groups of coastal cultural resources in the Gulf of Maine.

In historic times, the islands underwent significant waterfront and maritime landscape development. The limited waterfront space of Edgartown and Vineyard Haven developed primarily out of the towns’ fishing and whaling operations. Oil and candle works were important establishments on the waterfront. Boatbuilding and vessel outfitting were also important waterfront activities, but of relatively minor importance compared to other shipbuilding centers in the Gulf of Maine. Before New Bedford took over as the primary whaling port in the U.S., the Nantucket Town waterfront contained numerous wharves, landings and sea defense structures. In addition, try yards and works near the waterfront were necessary to process whale oil, and ship these products to markets throughout the world.

In the 17th century, Quaker settlers on Nantucket were taught by the Wampanoag how to process whales that came ashore and eventually how to catch them at sea. Within
a few decades northern right- and sperm-whaling became the island’s primary industrial activity and whale oil and spermaceti candles its most profitable export commodities. By the late 18th century it was also one of America’s most important and profitable industries, supported by a cheap but expert local labor pool of Wampanoag as well as Africans - the former being prized for their knowledge of whale habits, marine environments, and abilities as steersmen and harpooners (Starbuck 1989: 12-13; Banks, Vol. 1: 1966: 440-442). Eventually, the labor demands of the industry would bring Cape Verdeans, Azoreans, Irish, and many other Europeans, Africans, and Asians to the islands (Karttunen 2005). Nantucket reached a maximum population of approximately 9,000 in the 1840s, with a majority of the people whaling or engaged in related industries.

By the 1850s, however, New Bedford, MA eclipsed Nantucket and the Vineyard as the primary whaling ports. As the industry grew, local whale populations diminished, requiring larger ships to voyage to the far reaches of the Pacific, Arctic, and Antarctic regions. Nantucket did not have the deepwater harbor necessary to accommodate large whaling ships, nor did it have an expansive industrial waterfront and the rail facilities of New Bedford, which linked it to domestic markets. In addition, a devastating fire in 1846 left Nantucket town, the commercial waterfront and its wharves in ruin.

Salt manufacture was another important island industry in the late 18th and 19th centuries. Essential for the preservation of fish, salt was in short supply in America, particularly during the Revolutionary War and War of 1812, a time when blockades and embargoes prevented its importation. A significant sea-salt industry developed in the lagoon of Vineyard Haven and along the Edgartown waterfront of Martha's Vineyard. Initially, large kettles were used to boil sea water, but in the last quarter of the 18th
century solar evaporation was realized (Holmes et al. 1998: 92-93). Salt was procured by evaporation in wooden vats and pans on the islands up until the mid- to late 19th century when there was renewed availability of salt from Europe and the western United States.

Other maritime and navigation-related structures on the islands include marine hospitals and lighthouses. One of the earliest marine hospitals in the U.S. was built in 1825 in Oak Bluffs on the Vineyard. In 1895, a federal marine hospital was also constructed in Vineyard Haven (Banks 1966, Vol. 2, *Annals of Tisbury*: 64-65).

Lighthouses on the Vineyard include those erected at the entrance to Vineyard Haven on East and West Chop. West Chop was built in 1817, but like many southern island lighthouses, West Chop was set back in 1830 and repositioned again in 1846 due to erosion. East Chop, originally the site of a telegraph station, was built in 1869 in order to assist with navigating the shoal areas of Vineyard Haven (Clark 1992: 189). Gay Head Light was commissioned and built on the Aquinnah cliffs in 1799 along what was probably the most heavily trafficked maritime road in New England. In 1746, Brant Point Light on Nantucket was the second lighthouse built in the U.S. to assist fishermen and whalers into Nantucket Harbor (Clark 1992: 140). Repeatedly destroyed by storm, erosion, and fire, Brant Point Light was rebuilt 10 times, the last time in 1901. In total, the islands have had no less than 12 lighthouses built on their shores and promontories. In addition to lighthouses, numerous lightships were also positioned throughout the region to assist mariners in navigating dangerous shoals and sounds (Putnam 1917; Thompson 1983; Delgado and Foster 1990). The high number of lighthouses, lightships and shipwrecks of the southern islands is a testament to the challenges faced by mariners working and navigating the waters of this region.
Cape Poge Light
Edgartown Harbor Light
Tarpaulin Cove Light
East Chop Light
Gay Head Light
Brant Point Light Station
Sankaty Head Light
West Chop Light Station
Edgartown Village Historic District
Gay Head-Aquinnah Town Center Historic District
Nantucket Historic District
SUMMARY

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Table 6. Maritime districts and sites of the Southern Islands region (Dukes County islands, Martha's Vineyard, and Nantucket) on the National Register of Historic Places.

**Sandy Neck, Great Marsh and Barnstable Harbor**

Sandy Neck is one of the largest barrier beach systems in the Gulf of Maine. It is comprised of approximately 1,600 acres of barrier beach and dune, 1,000 acres of tidal flats, and nearly 4,000 acres of salt marsh (Town of Barnstable 2003). At the margins of the beach and marsh are a number of other wetland habitats including wooded swamps, streams, freshwater ponds, and cranberry bogs. These habitats are hosts to a variety of marine species, birds, reptiles, and mammals. Benthic animals including bay scallops, quahogs, blue mussels, and surf, soft shell, and razor clams are abundant. In 1978, Sandy Neck, Great Marsh, and Barnstable Harbor was designated by Massachusetts an Area of Critical Environmental Concern (ACEC), and in 2001 it was identified by the state's
Natural Heritage and Endangered Species Program (NHESP) as an area “with high biodiversity and most in need of protection” (Barnstable Conservation Commission 2003: 1).

Wildlife abundance and biodiversity must have been one of the primary reasons the marsh and harbor were attractive to Native Americans and European settlers. Fourteen prehistoric sites within the ACEC, dating from 8,000 to 450 BP have been identified and inventoried by the Massachusetts Historical Commission (MHC). However, the shifting dune sands of the Neck continually expose other middens, habitation and fish processing sites from prehistory as well as historic times. Consequently, the MHC has designated the entire barrier beach a significant archaeological and historical site. Clusters of archaeological sites are also located along the western portion of Scorton Creek, at the edges of the Great Marsh, and on the south side of Barnstable Harbor (Barnstable Conservation Commission 2003).

Sandy Neck began to take shape approximately 5,000 years ago as a combined result of rising seas and erosion of marine scarps and morainal deposits. These eroded sediments were subsequently redeposited by longshore transport. Sandy Neck varies in width from 60 to 750 m, and it extends ca. 10 km from shore. The protection afforded by the barrier beach led to the formation of Barnstable Harbor and Great Marsh. Natural cycles of sedimentation built up shallow sand flats, followed by grass colonization and succession. Gradual sea level rise and flooding supported the growth of marsh grasses and peat. As the peat formed, the height of the marsh surface increased. Continual cycles of marsh growth and decay have provided nutrients that make the marsh productive and
attractive for wildlife, as well as a favorable environment for human settlement and resource harvesting.

The salt marsh of Sandy Neck contains thousands of years of human and ecological history and is “one of the most intensely studied barrier beach and salt marsh systems in southeastern New England” (Dunford and O’Brien 1997: 82). Woods Hole Oceanographic Institute (WHOI) ecologist Patrick Butler first analyzed peat and soil cores from the salt marsh in 1952. His study revealed that the marsh peat is up to 9 m thick – the earliest peat layers were carbon dated to 5430 ± 120 BP (Butler 1959: 737). From cursory examination of pollen and carbon dating of foraminifera, Butler was able to identify long-term vegetation sequences as well as relative sea level rise. The posthumous publication of Butler’s findings by Barghoorn and Redfield in 1959 led to a more detailed geologic and geo-morphological study of the barrier beach and marsh by Redfield in 1972. Working from Butler’s initial findings, he concluded that Sandy Neck approached its current form ca. 3,000 BP, which approximates the time period that Native Americans are known to have first inhabited the Neck and began harvesting the area’s marine resources (Redfield 1972).

To date, no prehistoric site on the Neck has been systematically excavated by archaeologists (Dunford and O’Brien 1997: 88). Rather, the prehistory has been pieced together from artifacts collected in the late 19th and early 20th centuries by, among others, Cape Cod historian Henry Kittredge and WHOI ecologist Alfred Redfield (Dunford and O’Brien 1997: 88). In 1992, however, an intensive literature, walkover, and aerial survey by archaeologists did record a high density of prehistoric sites situated in the wind-exposed swales of the sand dunes (Dunford and O’Brien 1997: 88). Many of the
exposed sites documented by the archaeologists had been looted by collectors. Although artifacts and spot finds have contributed toward a prehistoric chronology of the region, the lack of specific provenance has limited the potential wealth of information that could have been gained if these finds were recorded in-situ and placed within their proper contexts, particularly in regards to prehistoric environment, resource availability, procurement, diet, technology, ritual and settlement.

In historic times, the neck and harbor was first visited by Plymouth colonists in the 1620s. Barnstable, known at that time as Mattacheese and Cummaquid, was heavily settled by Native Americans. Save for a few descriptions in William Bradford’s *History Of Plimouth Plantation* (1952), little is known about these Native American populations and settlements. Barnstable was settled by English colonists in 1638 and soon thereafter developed into an important shore whaling station (Dunford and O’Brien 1997: 90). Barnstable has been referred to as the “cradle of whaling” on Cape Cod, and it was one of the first communities to declare whaling grounds common property granting access to all residents (Stott 1987: 254). This was surely to the dismay of Native Americans whom had in all likelihood hunted whales in Cape Cod Bay for centuries. Access to grounds and ownership claims of stranded whales was important enough to warrant formal agreements between the English and Native Americans and specific mention of whaling rights in deeds (Stott 1987: 254-255). By 1715, Barnstable had 200 men shore whaling (Kittredge 1987: 169). Shore whaling abruptly ended in the mid 1700s. Increasingly, effort of Barnstable captains and merchants was placed in the offshore whaling industry of Nantucket. Only two whale ships sailed out of Barnstable in the 1770s, and the last
Barnstable whaler is reported to have sailed from the harbor in 1846 (Schneider 2000: 294).

Sandy Neck and the Great Marsh were used intensively for harvesting salt hay and as pasturage beginning in the 17th century. Erosion of the fragile dune systems was a concern for residents during initial settlement of the area and laws were enacted to limit the access of livestock to the Neck. However, the Neck had at least four try yards at the height of the shore whaling industry from 1725 to 1750, and erosion of the dune grasses was all but inevitable from the heightened whaling activity and coastal occupation (Dunford and O'Brien 1997: 90). Archaeological surveys in the 1940s located midden sites on Sandy Neck that may relate to these early shore whaling facilities (Bullen and Brooks 1948).

By the early 1800s, Barnstable, also known then as Cotuit, was less of a whaling station and had grown more significantly as a fishing port. Cod and mackerel fishing were the chief industries from 1790 to 1880. The fishing fleet reached its zenith in 1851 with the county reporting 45% of the state's total fish landings (Stott 1987: 272). Though not well documented, fishing stations and shipyards were likely sited on the Neck and at the edges of the marsh, adding yet another layer of fish processing and shipbuilding refuse to the landscape. Another prominent maritime feature, the Sandy Neck Light at Beach Point, was constructed in 1827. The light safely guided Barnstable fishermen as well as numerous coasting schooners into the shallow harbor.

By the late 19th century Barnstable had become a summer cottage community. It was also popular with bird hunters who were responsible for hunting species such as the Eskimo Curlew to extinction by the early 20th century (Schneider 2000: 325). The salt
marsh and adjacent wetlands have also been adversely affected by mosquito control projects. More than 300 km of ditches were excavated throughout the salt marsh to drain any standing water and limit the proliferation of mosquitoes. To further prevent their hatching, the marshes were sprayed with kerosene and DDT. Although the long-term consequences of such projects are uncertain, these physical and chemical changes to the wetlands are exemplary of historic mosquito control efforts that have irreversibly altered critical marsh habitats and feeding and spawning grounds throughout the Gulf region.

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Table 7. Maritime districts, building and sites of the Sandy Neck/Barnstable region on the National Register of Historic Places.

**Plymouth**

There is no dearth of information regarding the exploration and initial settlement of Plymouth Harbor, including *Mayflower* (the ship that brought the “Pilgrims”), Plymouth Rock (the place reputedly first landed on by the first settlers), the Mayflower Compact (the governing framework of the colony), and the origin of Thanksgiving (the most important of American holidays). Rather, there is what the 20th-century maritime
historian William Baker had referred to as a “superabundance of misinformation” (Baker 1980: 3). Plymouth Plantation’s lifelong archaeologist James Deetz noted that many sources, particularly those from the 19th century “need to be used with some caution insofar as historical reliability is concerned, and often require extensive consultation before it is possible to extract information for which one is searching” (Deetz and Deetz 2000: xi). Nevertheless, holding one of the most significant places in American history as the first permanent English settlement in New England, Plymouth has a rich historical and archaeological record.

Historical study of the exploration and settlement, and colonial history of Plymouth is considerable. In addition, ‘Historical Archaeology,’ the discipline within archaeology where written history is supplemented with archaeological research to construct a more complete account of the past, also has its roots at Plymouth Plantation. The archaeology directed by Harry Hornblower and James Deetz, which focused on the investigation of early 17th-century households of Plymouth, can be credited with laying the groundwork for historical archaeology in North America. In his own words, Deetz’s historical archaeology “makes a critical contribution to an understanding of the various ways in which houses were constructed in seventeenth-century Plymouth,” and it provides an “immediacy, dimensionality, and direct connection with people in the past that enables us to construct something of the material world in which they lived” (Deetz and Deetz 2000: 259, 269). The work of Deetz has not only helped to construct the material world of the colonial era, but also served to deconstruct nationalistic myths and misconceptions about the lives and historical events at Plymouth. Notwithstanding these important contributions, there is limited scholarship regarding 1) the area’s maritime and
post-Colonial history, 2) the role of Plymouth Harbor in developing New England maritime trade and communication networks, or 3) the development of the area’s ports into shipbuilding centers and fishing entrepôts.

On a map, Plymouth appears an ideally protected and defensible site. The barrier beaches of Plymouth and Duxbury extend south and north from the coast and nearly meet allowing only a 2 km-wide navigable entrance into Duxbury and Kingston Bays, and Plymouth Harbor. Together, these areas form a large enclosed estuarine system that constitutes an area of approximately 10,000 acres or 40 km². Navigation in the estuary is limited to mostly small, shallow-drafted vessels, as the bays and harbor have an average maximum depth of ca. 6 m (18 ft) at low tide. The village of Duxbury borders the northern part of the estuary and to the east lies Kingston. Plymouth lies along the southern shore. The estuary is fed with an ample supply of fresh water from upland ponds via the Eel River, Town Brook, Jones River, Bluefish River, and Back River. Historically, these rivers had productive runs of alewife, herring, and salmon. The region also has a productive Irish moss industry dating to the early 1800s (Lawton et al.: 1984: 50). Other abundant marine species include lobster, flounder, tomcod, mummichog, and pollock (Iwanowicz et al. 1974: 20-21).

Samuel de Champlain is the first documented European visitor to Plymouth Harbor. In 1605, he made a detailed chart of Port St. Louis (Plymouth Harbor) that was published subsequently in 1613 (Champlain 1922). The chart provides soundings and anchorages, and identifies natural and cultural resources such as Gurnet Point - a once forested headland, sand dunes, inner harbor islands, and most prominently drawn, the witu or wigwams of the Wampanoag village of Patuxet. Because of an epidemic that
devastated the Wampanoag ca. 1617, resulting from contact with English or French explorers, traders or fishermen, the village was mostly abandoned by the time Mayflower set anchor in 1620 (Deetz and Deetz 2000: 57). English explorer John Smith also visited Patuxet, and renamed the harbor and village as New Plimouth at the behest of Prince Charles, son of James I of England (Smith 1616). In all likelihood, the English separatists aboard Mayflower had a copy of Smith’s map and description of “New England” (Deetz and Deetz 2000: 71). In addition to the accounts provided by Mayflower passengers William Bradford and Edward Winslow (i.e., Of Plymouth Plantation, Mourt’s Relation [1966]), the natural and cultural landscapes of 1620s Plymouth are documented briefly by English merchants John Pory (1622) and Emmanuel Altham (1623), and Isaak de Rasieres (1628), the Dutch West India Company agent and secretary of New Netherlands (James 1963).

In the 17th century, Plymouth was engaged primarily in agriculture, animal husbandry, and fur trading. Although the colonists did fish and were intent to profit from it, poorly equipped and in constant dispute over fishing rights, they were unable to capitalize on the rich fishery resources nearby (Morison 1956: 121-122). The colony formed a loosely-knit government that was able to wield some control over and obtain financial benefit from the southern Cape Cod whale and mackerel fisheries; however, the debts incurred from the initial venture and settlement of the area by the ‘Adventurers of New Plymouth’ were ultimately paid off by fur trading (Morison 1956: 224). The Aptuxcet trading post on the shores of Buzzards Bay was critical to the survival of the colony. It served as a trading and communications link with southern English colonies, as well as the Dutch in New Netherlands and Native Americans (who furnished the bulk of
the animal furs that colonists traded for European goods, weapons and wampum). In addition, the colonists maintained ties to trading outposts in Maine at places such as Machias, Castine, and Augusta (Morison 1956: 134-135). Although merchants, traders, fishermen, and anyone of different religious persuasion (referred to as “Strangers” by the Separatists) were either excluded by or found disagreement with the rigid social norms and laws established by the Plymouth Separatists (who referred to themselves as “Saints”), Plymouth remained an important cultural, religious and political core for the first generations of English settlers. Within two short decades, however, the Massachusetts Bay Colony and Boston eclipsed Plymouth as the primary New England port and market, and in 1691 Plymouth was annexed by the Massachusetts Bay Colony.

In the early 18th century, to the north and west of Plymouth, the towns of Duxbury and Kingston developed shipbuilding as their primary industry. Replete with large stands of oak, deposits of bog iron ore and tar, the Plymouth Bay hinterlands ably supplied the raw materials necessary for shipbuilding. In addition, the Jones, Bluefish, and Back rivers, offered ample water flow needed to power iron foundries and lumber mills.

The shipbuilding era in Plymouth Bay began ca. 1720, but it was not until the 1800s that the bay’s shipbuilding peaked (Wentworth 1973: 91). The northern bank of Bluefish River, in particular, was an important shipbuilding site with “rope walks, foundries, steam sheds, storage buildings, sail lofts, and all the establishments that went with ship building” (Wentworth 1973: 121). The Weston family owned and operated the largest yards on the river, which were regarded as the most productive shipyards in New England in the first half of the 19th century. Although Ezra Weston began building ships
as early as 1764, it was his son, Ezra Weston II, who furthered the name of “King Caesar,” which was given to his father for his extraordinary ambition and financial success (Brown 2006: 2). A measure of the extent of shipbuilding and Weston family success is alluded to by noted orator and one time U.S. Secretary of State Daniel Webster who describes Ezra II in 1841 as “the largest ship-owner, probably, in the United States” (Wentworth 1973: 132). Shipbuilding declined precipitously in the second half of the 19th century. The last merchant vessels were built and launched from Plymouth Bay in the 1870s (Wentworth 1973: 121).

Although fishing was lackluster in the settlement and early colonial periods, the industry developed rapidly during the second half of the 18th century. Duxbury, for example, had 64 Bank fishing vessels by 1787 (Wentworth 1973: 108). Fishing continued through the 19th century, and fish landing sites, evaporative salt works, fish flakes, and factories for processing shellfish and menhaden into fish fertilizer were established along the southern shores of Plymouth Bay (Morison 1961: 145). A 305 m (1000 ft) long town pier was also built in Plymouth in the late 1800s, which continues to serve as the primary landing place for the commercial fishing fleet. Initially a groundfishing fleet, lobstering is now the predominant fishery (Hall-Arber et al. 2001: 221).

Plymouth Harbor is one of a few places in the Gulf of Maine that has received some maritime archaeological focus. Although the identification of ship timbers in the harbor as those belonging to the 1778 shipwreck and American privateer General Arnold is problematic, most artifacts recovered from the wreck site date to the mid- to late-18th century. The shipwreck was described by Peter Throckmorton (one of the seminal researchers in maritime archaeology) in 1978, as “the most important single marine
archaeological find in the world today” (Bowley and Johnson 1995: 110). A debacle of major proportions, the “archaeology” of General Arnold involved local citizens, Plimouth Plantation Museum, Massachusetts Board of Underwater Archaeology (MBUAR), and treasure hunter Barry Clifford vying for shipwreck salvage rights. Limited, and in some cases damaging, archaeological investigations were performed by former state representative, MBUAR founder and author Robert Cahill, and University of Maine nautical archaeologist Warren Reiss. The clamor for the real and intellectual property rights to the shipwreck ultimately led to its further demise. Although permits were granted by MBUAR for excavation in the 1980s by locals and avocational archaeologists, no scientific publication, or historical and archaeological analysis resulted from the investigations. Most artifacts recovered in the late 1980s, save for a few items retained by Pilgrim Hall Museum, are seemingly lost.

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**Table 8.** Maritime districts, building and sites of the Plymouth region on the National Register of Historic Places.
Table 8 continued. Maritime districts, building and sites of the Plymouth region on the National Register of Historic Places.

**Boston**

The Boston region is situated in the western part of Massachusetts Bay, and it is approximately 150 km$^2$ (60 mi$^2$) in area. Water depths are relatively shallow (average depth 4.9 m [16 ft]) and the mean tidal range is ca. 2.7 m (8.8 ft). The region has an Outer and Inner Harbor. The eastern boundary of the Outer Harbor extends from Deer Island south across the harbor entrance to Hull, MA and Point Allerton. The Outer Harbor includes a small cluster of islands (The Graves, Green, Calf and Brewster Islands) just outside the entrance of the harbor, as well as some 20 islands encompassed by the arms of the Deer Island and Hull peninsulas. The area is comprised of shallow bays (Hingham, Quincy, Dorchester, and Pleasure) and tidal/estuarine rivers (Weir, Weymouth Back, and Weymouth Fore). Dorchester Bay is also fed by the Neponset River.

Castle Island and Governors Island, now attached to the mainland as a result of centuries of infilling, define the boundary to the Inner Harbor. The Inner Harbor includes the Mystic, Charles and Chelsea Rivers and the tidal reaches of their tributaries. Chelsea River divides East Boston from Chelsea; Charles River flows between Cambridge and Boston; and Mystic River splits Chelsea from Charlestown. Fort Point Channel also separates South Boston from Boston proper.
The Boston region is comprised of a distinct group of geological features called drumlins. Drumlins, which are composed of thick deposits of glacial till and overlain by thin marine deposits, are the result of Wisconsinan glaciations beginning nearly 15,000 years ago (Weddle and Retelle 2001). Following the retreat of the ice sheet (ca. 11,000 BP), the shoreline was approximately 30-40 m (98-131 ft) below its current level (Peltier and Tushingham 1989). Later in the Holocene epoch, eustatic sea level rise overcame the rate of isostatic rebound of the land, submerging the region’s drumlins to form what is now Boston and the Harbor Islands.

There have been numerous cultural resource studies of Boston’s islands and coasts since the late 19th century. Cultural resource studies in more recent decades were initiated by modern development and the requirement to comply with the National Historic Preservation Act (NHPA) of 1966. However, Boston has also been the site of pro-active scholarly research, primarily in the field of prehistoric archaeology. The region is of particular interest to archaeologists, as it provides a unique island-environment in which scientists can examine early human settlement and maritime adaptations.

Although archeologists have worked in Boston since the 19th century, it was the discovery of the Boylston Street fish weir in 1913 by C. C. Willoughby that provided the first detailed glimpse into the prehistory of the region (Mrozowski 1985: 18). The groundbreaking archaeological work of Dena Dincauze in the late 1960s and early 1970s, however, provided the first rigorous and systematic attempt to locate prehistoric sites in Metropolitan Boston (Dincauze 1973). Dincauze was responsible for the discovery of several significant prehistoric sites in Boston Harbor (Casjens 1976). Following on the geological work of Kaye and Barghoorn in the 1960s, the effects of sea-level rise became
an important topic for understanding prehistoric cultural development. While some prehistorians argued that prehistoric cultural development was largely internally initiated (Ritchie 1969), others began to place additional weight on cultural development within the context of ecological variables such as sea level (Bourque 1971, Braun 1974, Snow 1980, Oldale 1980). The most comprehensive study of coastal change in Boston Harbor developed out of the Central Artery/Tunnel Project in Boston, MA – the discovery of a shell midden on Spectacle Island resulted in a detailed study of island geomorphology and sea level rise (Aubrey et al. 1996).

Beginning in 1975, the Harbor Islands were also the areal foci of archaeologist Barbara Luedtke. Luedtke surveyed nearly every one of the approximately 30 islands in Boston Harbor for Native American archaeological sites. Through scientific techniques such as radiocarbon dating and pollen analysis, Luedtke was able to partially reconstruct the Boston islands’ then predominantly arboreal environment before the arrival of Europeans as well as refine the chronology of Boston’s prehistory (Luedtke 1980; Luedtke 1996) (TAB. 9).

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Table 9. Cultural periods of Boston’s prehistory in radiocarbon years (After Luedtke 1996).

All periods of prehistory except for the Paleolithic Period (11,500–10,000 BP) are documented in the archaeological record of Boston. During the Paleolithic Period
sea level was approximately 30-40 m below its present level and the Atlantic coast was up to 15 km seaward of the existing coastline. Therefore, any coastal settlement or evidence of maritime activity is more likely to be found underwater nearer to what was the Paleoindian shoreline. The earliest find in the harbor is a fragment of a bifurcate-based point from Long Island, which is attributed to the Early Archaic Period (Luedtke 1984: 8).

The Archaic Period is marked by a climatic optimum when sea level rise slowed and Boston's slowly submerging glacial drumlins formed islands; freshwater wetland areas reduced; forest, grass, and coastal marsh growth increased; water temperatures cooled; and formation of intertidal mudflats provided a habitat for softshell clam. These changes led to fundamental shifts in human subsistence patterns, namely the harvesting of anadromous fish and shellfish. Shellfish harvesting is visible in the archaeological record in this period in the form of middens. The earliest known date of a midden in Boston Harbor is 3730 +/- 55 BP (Luedtke 1996: 50). The Boylston Street Fishweir, a Late Archaic Period site, also provides clear evidence of anadromous fishing and a shift toward coastal occupation.

Although ceramics are the distinguishing characteristic of the Woodland Period, there is continued evidence of marine resource exploitation in the form of shell middens, which remain the predominant archaeological site type in this period. As contact with European cultures developed in the Late Woodland Period, the era also witnessed an increase in the use of the outer harbor islands (e.g., Calf Island). The habitation of these islands may have been a site for early contact and trade with European whalers or explorers (Luedtke 1980).
The proactive archaeological survey and research of Dincauze and Luedtke, as well as many others that have studied the prehistory of Boston Harbor, ultimately led to the nomination of the Boston Harbor Island Archeological District in 1985 by the Massachusetts Historical Commission (MHC). In the 1980s, the Boston Harbor Islands gained increasing interest from historical archaeologists, but studies of historic archaeological sites, if not documented during prehistoric archaeological surveys of specific islands, have been primarily initiated by NHPA-required or MHC-initiated cultural resource surveys. For example, in 1981 the MHC conducted a comprehensive survey of *Historic and Archaeological Resources of the Boston Area* (1981). This broad-based and interdisciplinary survey is a synthesis on the population, transportation, settlement, land use, architecture, and economy of Boston 1500-1940 (MHC 1981: 4).

Historically, Boston was and is a hotbed of merchant and marine activity. Hundreds of piers, wharves, and landings have defined Boston’s waterfront for nearly four centuries. From 1630 to 1995 the landmass of Boston, once a small group of drumlins interconnected by wetlands, has increased fourfold (Krieger et al. 2001: xiii). Beneath tens of feet of fill and rubble are the marshes, mudflats and human settlements that once comprised the littoral environment of the Shawmut Peninsula. The Central Artery Project, known as the “The Big Dig”, which has placed the elevated federal highway I-93/95 underground, revealed numerous maritime archaeological sites beneath Boston’s streets and buildings (Seasholes 2003; Lewis 2001). In addition, many maritime architectural features and sites are extant in the Boston region, particularly those related to navigation, defense, shipbuilding, and mercantile activity.
Themes and properties noticeably absent from the Boston region National Register are places related to historic fishing activities. T Wharf and the Boston Fish Pier were significant fish landing sites in the 19th and early 20th centuries for one of the largest fishing fleets in New England and may be eligible for the National Register. Quarantine, hospital, and social welfare facilities are also under-represented in the register. These types of facilities were commonly sited on islands including Spectacle, Rainsford, and Peddocks Islands from the late 1700s through to the early 20th century (Claesson 2002). Additionally, Boston’s coastal landscape was significantly altered in the first and second World Wars with the construction of bunkers, storage magazines, torpedo rooms, and observation towers. These military resources, however, have received very limited conservation or study by archaeologists.

Although hundreds of ships have wrecked in the Boston region, no shipwrecks are listed on the National Register. The MBUAR shipwreck inventory documents that roughly 500 ships or boats have foundered in Boston waters, but no shipwrecks have undergone in-depth archaeological investigation. Four shipwrecks on the MBUAR List of Exempted Shipwrecks lie east of the Boston region, but none within the Boston region.

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Table 10. Maritime districts, building and sites of Boston on the National Register of Historic Places.
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<td>Northern Avenue Draw Bridge</td>
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Table 10 continued. Maritime districts, building and sites of Boston on the National Register of Historic Places.
Cape Ann

The shallow sandy beaches, drumlin islands, and estuaries of southern Massachusetts transition here to a rocky, steep-sided shoreline. To the north of the Cape Ann peninsula is Ipswich Bay – a featureless flat sandy plain with barrier beaches that buffer small estuarine systems. Extending seaward from Cape Ann is the submerged feature and historically productive fishing bank, Jeffreys Ledge. South of Cape Ann is Stellwagen Bank, also a historically prolific fishing ground. Cape Ann is supplied with freshwater by the relatively small Danvers, Essex, and Ipswich Rivers, which flow into coastal estuaries and protected harbors. In addition, Annisquam River (often referred to as the ‘Squam’), a broad but shallow tidal river that separates Cape Ann from the mainland, connects Gloucester Harbor and Massachusetts Bay to Ipswich Bay. The region includes, from south to north, the towns of Marblehead, Salem, Beverly, Manchester, Gloucester, Rockport, Annisquam, and Ipswich. These coasts of these communities are dotted further with small rock ledges and islands.

Archaeological evidence suggests that Cape Ann was populated by Native Americans at least 10,000 years ago. A large base camp from this period is located north of the region in Ipswich, and PaleoIndian fluted points have been found near Alewife Brook in Gloucester (Dincauze 1993). However, relatively few PaleoIndian and Early Archaic Period sites in the region are known, and any coastal occupation during these periods is now submerged. In the Archaic Period, with stabilizing sea levels, as in other regions, there is increasing evidence of coastal occupation and marine resource exploitation. Small-Stemmed and Susquehanna-type projectile points typical of this period are found along the North Shore, particularly in the vicinity of Beverly and Salem.
Harbor. Shell middens also date to this period, but it is in the Woodland Period that intensive exploitation of shellfish becomes evident. Middens are found along the Ipswich, Essex and Castle Neck Rivers, and the shorelines of Hog Island, Treadwells Island and Eagle Hill (Robinson 2006: 39-41). Other diagnostic artifacts from this period include bone tools such as barbed harpoons, ceramics, and foreign lithic materials. Prehistoric marine faunal remains from the region include whelk, soft shell clam, sturgeon and cod.

During the Contact Period (1500-1620), the Cape Ann peninsula was part of a larger territory occupied by the Pawtucket, Agawam or Naumkeag – subgroups of the Massachuset Indians (MHC 1985: 4). Habitation and fishing sites were located primarily along the coast and rivers. Maize horticulture, which began in the Late Woodland Period was ubiquitous by the Contact Period. These deforested tracts of lands would be attractive to the first European colonists in the area for agriculture and animal husbandry and eventually become the sites of permanent English settlements. However, the first European to visit, chart and describe the area was the French explorer Champlain in 1605. He named Cape Ann, *Cap aux Troil Îles*, perhaps after three prominent islands (Thatchers, Milk, and Straitsmouth or Salt Islands) that lie off the coast (Champlain 1622). His map of Gloucester Harbor, *le Beauporte*, also provides a first glimpse of the region’s geography and what was then known as Naumkeag, a densely settled Native American camp. John Smith visited the area in 1614 and re-named the cape ‘Tragabigzanda,’ but the name was changed by then Prince Charles to Cape Ann, which was published on Smith’s map of New England (Smith 1616).

The first Europeans to arrive and settle Cape Ann established temporary fishing stages or stations along the Cape’s rocky shores and on Annisquam River, but the first
permanent English colonies were established at Salem (1626) and Gloucester (1634). By this time, Native American settlements had largely vanished from the region because of an epidemic that hit the Massachuset shortly after Smith’s visit. Although the initial Cape Ann fishing venture of the Plymouth Colony failed, it took less than a decade for fishermen to familiarize themselves with the maritime landscape and successfully exploit what were once probably the most prolific inshore fishing grounds in the Gulf of Maine. Consequently, Gloucester became the most storied of all fishing communities in America. The market potential that John Smith referred to in his *The Description of New England* was quickly realized (Smith 1616: 30-31), and the fishing industry of Cape Ann was critical to the survival and development of the New England colonies. The export of codfish to Northern Europe and the Mediterranean nations resulted in large part to the rise of the Colonial merchant class (see e.g., Goodwin 1999; Pope 2004). Codfish were traded for European wine and products that were sold in the colonies. Furthermore, Cape Ann merchants traded fish and agricultural products with the West Indies for coffee, cocoa, sugar, and molasses to make rum.

Parallel with the growth of the fishing industry and long-distance trade was an expansion of and demand for shipbuilding. The ‘schooner,’ whose origin is disputed by historians but generally attributed to the vicinity of Gloucester, became the main vessel-type built and used for fishing and coasting trade in the first half of the 18th century (Morris 1927: 184-185; Hahn 1981: 14-15). Other unique watercrafts from the region include the ‘Pinky,’ a double-ended vessel, and the ‘Chebacco,’ a sharp or square-sterned boat and likely ancestor of the pinky, which were built and used mainly for the inshore fisheries (Chapelle 1973: 26). Additionally, the yards of Cape Ann built hundreds of
large ocean-going ships, brigs, and barkentines for Salem and Boston merchants in the European, West Indies, and Far East trade. From 1650-1950, approximately 4,000 ships were built and launched from the Essex River alone (Story 2001: viii). Notable yards include the Story Shipyard, which was established in 1813. The Story yard built hundreds of schooners, and it was one of the first yards to construct steam and diesel-powered fishing trawlers in the early 1900s (Story 2001: T8; Story 1995).

Gloucester grew significantly in population through the 19th century. Fishing prospered in this century, particularly with the exploitation of groundfish stocks on Georges Bank, which was not fished regularly by Gloucester fishermen until the 1820s (German 1987: 409). The mackerel fishery also gained prominence in this century, and fishermen sailed as far south as Virginia and north into the Gulf of St. Lawrence to seine mackerel. Rockport also prospered from fishing in this period, but in the 1830s the town’s granite quarrying became an important industry (Erkkila 1980). In Rockport Harbor, massive granite-block seawalls were erected to protect the fishing and coasting fleets from the sea. In addition, rail and loading facilities were built to accommodate transportation of granite blocks onto the heavily-built, reinforced hulls of stone sloops (Chapelle 1935: 300-302).

The merchant elite of Salem and Marblehead had moved the last of their commercial shipping operations to Boston and New York by the late 19th century, but fishing remained profitable for Cape Ann communities. Rail, ice, and new technologies such as Clarence Birdseye’s flash-freezing method, which developed in the 1920s, allowed for rapid delivery of fish products to inland and west coast markets. Cape Ann also developed in the first half of the 20th century as a resort destination.
With its prominent maritime history, it should not be a surprise that hundreds and perhaps more than a thousand shipwrecks have occurred off the coasts and islands of the Cape Ann peninsula. The MBUAR Exempt Shipwreck List includes nine vessels off Cape Ann – the most of any region. No shipwrecks are listed on the National Register, but exempt-listed naval wrecks such as *USS New Hampshire* (laid down originally as *Alabama* in 1818 at Portsmouth Navy Yard) may qualify if nominated and re-evaluated. Although *USS New Hampshire* lacks integrity due to refits in the late 19th century, burning and sinking when under tow to Bay of Fundy in 1922, and then from decades of wreck diving, artifact collecting and looting, it retains lower hull elements of one of a very few known examples of American Navy 74-gun ships (Chapelle 1949: 314).

Maritime historic districts of Cape Ann are well-represented on the National Register of Historic Places. The Salem waterfront is a National Historic Site, and archaeological excavations of The Central and Derby Wharf in 1992-3 led to the nomination of the Derby Waterfront District (Garman et al. 1998). These districts are representative of the New England merchant class, however, and not the fishing industry, which is the significant theme in the region’s history. None of Cape Ann’s prehistoric or historic fishing stations have been investigated by archaeologists, and very few waterfront architectural sites, such as landing sites or the impressive stone-block seawalls and sea defenses of Rockport Harbor are included on national or state cultural resource inventories. Cape Ann shipyards and their related sites and structures (e.g., loft houses, sailmaking facilities, mills) are also surprisingly absent from the National Register.
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Table 11. Maritime districts, building and sites of Cape Ann on the National Register of Historic Places.
**Merrimack River**

The main natural features of this region include the tidal segment of the Merrimack River (35.4 km [22 mi] from its mouth upriver to Haverill, MA), Joppa Flats, Plum Island, Salisbury Beach, Parker River estuary, and Ipswich Bay. The coastal towns with historic maritime character and resources in this region include, from south to north, include Ipswich, Rowley, Newbury, Newburyport, and Salisbury. The upriver towns of Amesbury, Merrimac, West Newbury, Groveland, and Haverill also contain maritime cultural resources relevant to this survey. The region falls within the Essex National Heritage Area. The Parker River National Wildlife Refuge and Salisbury Beach State Reservation, at the mouth of the Merrimack River, contain approximately 20 km² (7.7 mi²) of protected coastal area.

The coastal zone, replete with barrier beaches, estuaries, and significant freshwater and nutrient input, converge at Ipswich Bay to form the Merrimack River delta – one of the Gulf of Maine’s most biologically productive coastal areas. The bay is an important spawning ground for cod, and historically the river was abundant with anadromous fish including salmon, sturgeon, alewife, and shad (Wood 1977: 55; Storer 1839: 426-7, 440, 443). The salt marsh from Merrimack River and south to Essex, known collectively as the Great Marsh, is approximately 25,000 acres (ca. 100 km²) in area. The marsh, similar to other barrier-beach, salt-water estuaries, is high in wildlife diversity and a treasure trove of paleo-ecological information. The beach and marsh was the topic of numerous studies in recent decades (See e.g., Johnson 1966; Bloom 1967; McCormick 1968; Rhodes 1973; Lee 1981; Weinstein 1983; Lunsford 2002).
This region contains one of the earliest known sites of human occupation in the northeastern United States. The ‘Bull Brook’ sites, which are located in Ipswich and tentatively dated 10,600-10,200 BP, are believed to represent a “first arrival” and major settlement in New England (Curran 1999: 5-6). Located well inland during the sea level low stand of -47 m (ca. 10,500 BP), it is possible that sites from this period are preserved under water in submerged beach or bar deposits or beneath the thick alluvial deposits of the Merrimack delta (Oldale et al. 1983: 336). The Merrimack was an important Native American travel corridor for millennia, but intact Native American settlement or subsistence sites are surprisingly few and sites documented near the salt marsh date primarily to the Woodland Period (Barber 1979; Barber 1982; Essex National Heritage Commission 2005: 2).

English settlement of the region began in the 1630s. Shipbuilding and fishing were the earliest maritime industries. With ample supply of raw materials and natural resources Newburyport’s export economy grew quickly in response to West Indian and European demand. In addition, Newburyport was a critical transit point for trade with the hinterland, providing manufactured goods to inland communities and simultaneously exporting raw materials from the interior such as timber to foreign ports. Animal husbandry and agriculture were also important community activities in the Colonial Period. The Great Marsh provided an important source of hay for livestock. Mills were quickly erected on small creeks and rivers, particularly where tidal headlands meet freshwater falls. Grist, fulling, cider, and saw mills and tanneries were built on the Artichoke, Little, Parker, Ipswich, Mill, and Back rivers, and Pine Island Creek.
With Newburyport's mercantile success, the port became independent from Newbury in 1764. The port remained an important **entrepôt** into the 19th century. At this time nearly 60% of adult males were engaged in maritime-related occupations (Albion et al. 2004: 51). The success of international trade as well as privateering during the American Revolution contributed to the rapid growth of Newburyport and the resulting wealth led to construction of some of the finest examples of Federalist-period architecture in the nation. However, trade embargoes and the War of 1812, a catastrophic fire in 1811, the silting up of the harbor, construction of the Middlesex Canal, and eventually rail, restricted the town’s expansion. These factors led to a sharp economic decline in the first quarter of the 19th century.

The region’s economy and industrial base diversified in the 19th century, however. As in other New England communities with ample water power, textile manufacturing became a leading industry, and the high demand for labor brought in new immigrants from Ireland, French-Canada, Greece, and Poland. Other industrial activities included shoemaking, lace production, carriage assembly, and snuff making. Although mercantile trade was in decline in this period, Newburyport as well as Salisbury remained important fishing communities in the mid-1800s (Hayward 1839). Shipbuilding had waned after the American Revolution, but the industry saw resurgence in the 1840s. Shipbuilding on the Merrimack was spurred by the need for ships to support the Civil War, transport California gold-rush migrants, and supply raw materials and fuels for manufacturing and the booming textile industry (Faulkner et al 1978: 136).

In the late 19th and early 20th centuries, Haverill, Amesbury, Salisbury and Ipswich continued with relatively small-scale textile and shoemaking operations.
Newburyport was in decline again, but it remained a depot for delivering products and fuels to and from upriver communities, and continued to serve as a critical juncture in the land and rail transportation network, connecting Portsmouth and Boston via the Essex-Merrimac and Newburyport bridges. In the early 20th century, Newburyport, Salisbury Beach and Plum Island began to develop as resort and beach destinations.

The historic and prehistoric maritime cultural landscape of the Merrimack River region is poorly represented in the National and State Registers of Historic Places. Although no Native American sites are confirmed in Newbury, survey of farmlands east of the Spencer-Pierce-Little Farm (a National Register of Historic Places property) in the early 1990s resulted in the recovery of numerous fragments of Woodland-period pottery (Beaudry 1995). Intensive archaeological surveys of the Great Marsh, Joppa Flats, Plum Island, Salisbury Beach and inshore waters are likely to reveal additional evidence of a Native American presence and marine resource exploitation dating as far back as the PaleoIndian Period.

An archaeological investigation of the Newburyport waterfront in the 1970s was instrumental in the listing of the Central Waterfront Historic District to the National Register (Faulkner et al. 1978). The study is one of only a handful of archaeological excavations that sought to document commercial waterfront structures. The excavation revealed the remains of numerous pre-1800 wharf structures. In one instance, the entire façade of an 18th-century wharf was accidentally exposed during seawall construction (Faulkner et al. 1978: 37). Unfortunately, there is no detailed documentation of the wharf building techniques and no architectural reconstructions were drawn. Presumably, there
are still remnants of the historic waterfront within the district that date as early as the 17th century.

The National Register lists lighthouses or ranges, but does not include other navigational aids such as Ben Butler’s Toothpick, a wooden pyramidal structure built on a stone jetty in Salisbury, or the massive granite breakwaters in Joppa Flats that were engineered, albeit unsuccessfully, to prevent harbor siltation. The shifting sands along the coast of Salisbury Beach, Plum Island, and at the mouth of the Merrimack River have caused numerous shipwrecks. There are at least 85 documented shipwrecks in the region dating from 1772 to 1936 (Weare 1996: 38-39). Fragments of these ships are occasionally exposed at low tide. Artifacts salvaged from these wreck sites, such as the brig *Pocahontas*, which ran aground Salisbury Beach in 1839, are often donated to local historical societies, but no wreck sites or salvaged artifacts have been studied by archaeologists (<http://www.themaritimesociety.org/shipwrecks.html>).

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*Table 12. Maritime districts, building and sites of Merrimack River region on the National Register of Historic Places.*
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<thead>
<tr>
<th>Lowell's Boat Shop</th>
<th>Amesbury and Salisbury Mills Village Historic District</th>
<th>Ipswich Mills Historic District</th>
<th>Newburyport Historic District</th>
<th>Choate Bridge</th>
<th>Newburyport U.S. Customhouse</th>
<th>SUMMARY</th>
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Table 12 continued. Maritime districts, building and sites of Merrimack River region on the National Register of Historic Places.

**Piscataqua River**

The Piscataqua River basin is formed by the confluence of the Winnicut, Squamscott, Lamprey, Oyster, Bellamy, Cocheco, and Salmon Falls Rivers into the Great and Little Bays. These shallow but expansive estuarine bays create the forceful tidal ebb and flow of the Piscataqua River. From the bays, the river flows approximately 21 km (13 mi) to the Atlantic Ocean. This region includes the submerged lands out to and including the Isles of Shoals, which are located approximately 11 km (7 mi) from Portsmouth Harbor. The Piscataqua region is ca. 310 km² (120 mi²).

At the tidal headlands of the main Piscataqua River tributaries are the towns of Exeter, NH (Squamscott River), Newmarket, NH (Lamprey River), Durham, NH (Oyster River), Dover, NH (Cocheco River), and South Berwick, NH (Salmon Falls River). These towns are located where freshwater falls meet tidal waters. Each of these places has utilized the available water power for milling and manufacturing operations since the 17th century. The city of Portsmouth, however, is located on the south bank of the main channel of the Piscataqua River – opposite Seavey Island and the Portsmouth Naval Shipyard in Kittery, ME. The Maine towns of South Berwick, Eliot, Kittery and Kittery
Point lie on the northern shore of the river, and the towns of New Castle and Rye, NH form the southern seaward boundary of the region.

The region is generally described as an estuarine system, but it contains a variety of marine and terrestrial environments including rocky coasts and islands, deep navigable river channels, as well as the eel grass beds, salt marshes, mudflats and wetlands commonly associated with estuarine geography. The region is diverse with seabirds, marine invertebrates as well as historically abundant fish stocks including cod, haddock, salmon, shad, bass, mackerel, bluefish, herring, alewives, eels, pollock, clams, mussels, oysters, lobsters, and shrimp. Wetlands and some coastal areas are protected by the conservation areas of Great Bay National Wildlife Refuge, a National Estuarine Research Reserve, and state parks (Odiorne State Park in Rye, NH, and Fort Foster and McClary Parks in Kittery, ME).

Both Native Americans and Europeans settled, sailed and fished the Piscataqua River and islands prior to the 1630s permanent English settlement at Strawbery Banke. Native American settlements and subsistence practices are poorly understood in the Piscataqua region, as the few prehistoric archaeological sites found on the river and bay coastlines have not been extensively excavated or studied. However, a rare Paleoindian encampment was confirmed and partially excavated in Eliot, ME in 1998, clearly indicating a human presence in the region by at least 10,000 BP (Kellogg 2003). Furthermore, prehistoric occupation from the Archaic to the Contact Periods is well-documented immediately south of the study region in Hampton and Seabrook, NH (Robinson 1976; Robinson and Bolian 1987; Goodby 1995; Greenly 1999). In addition, shell middens have been found at the Portsmouth Naval Shipyard (Wheeler and Hannum
Concentrations of isolated finds are also reported from the lower Squamscott River, and Adams and Fox Points on Great Bay (Brummer and Chesley 1980; Skinas 1980).

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<th>Paleolithic</th>
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<td>Archaic</td>
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<tr>
<td>Early Archaic</td>
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<td>Middle Woodland</td>
<td>2000–1000</td>
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<td>Late Woodland</td>
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Table 13. Cultural periods of New Hampshire’s prehistory (After Bunker 1994).

The English explorers John Smith (1614) and Christopher Levett (1623) visited the Isles of Shoals, where fishermen had established themselves at least before Levett’s arrival (Levett 1988). Other pre-1630 fishing stations in the region include the 1623 “Pannaway” plantation and “Great House” of David Thomson (Odiorne Point in Rye, NH), Hilton’s Point, a fishing and trading station occupied in the 1620s (now called Dover Point at the mouth of Little Bay) (Harrington 1985). These fishing and trading outposts were part of a small network of English fishing settlements located on the coasts of Cape Ann in Massachusetts and mid-coast Maine.

Fishing was the impetus for the region’s Euro-American settlement and growth. The Isles of Shoals were world renown for their dunfish, which was preferred by the elite and royalty of European and Mediterranean nations. Shoals’ dunfish fetched high prices—typically three times that of other fish products (Harrington 1985: 28). In return, cargoes of wine, brandy, salt, sugar and manufactured items were brought back to the English colonies of North America, or sold in European or West Indian markets. Portsmouth and
Kittery merchants, such as William Pepperell, made their fortunes by exporting fish as well as timber products, especially rough hewn ship’s masts and spars for the British navy (Labaree et al. 1998: 81). Huge mast ships of 400-500 tons carried mast timbers to England for the navy from the 1660s until the American Revolution (Saltonstall 1941: 60-61).

Portsmouth flourished as a seaport throughout the 18th century. With ample supply of timber and water power, shipbuilding also became a principal industry in the region. During the late 17th and 18th centuries, small and medium-sized sloops and schooners were frequently built along the shores, tributaries, and inlets of the Piscataqua River. In addition, unique watercraft such as the flat-bottomed, lateen-rigged gundalow, the Hampton fishing boat, and the swift-rowing Piscataqua wherry were designed and built to contend with the strong currents of the river and to navigate the shallows of Great Bay and its tidal tributaries (Brown 2002: 15-17: Winslow 1983).

As commercial needs demanded larger ships, maritime activity shifted away from the small tidal inlets at places such as Strawbery Banke toward deeper water in the main river channel of the Piscataqua. In the late 18th and early 19th centuries the region expanded shipbuilding operations in order to construct and outfit large merchant and naval ships. The first American warship, *Ranger*, commanded by John Paul Jones, was built on the Piscataqua in 1777 (Labaree et al. 1998: 149). The Portsmouth Navy Yard, the first federal government shipyard on the Atlantic coast, was established on the river in 1800. The period after the War of 1812 was a boon for shipbuilding, and Newington, Kittery, Eliot, and Portsmouth were erecting massive ships for the increasingly global and industrial-era trade networks (Brighton 1989).
The mouth of the Piscataqua River has been extensively fortified since its earliest European settlement. Fort Point (referred to variably as Fort Constitution or Fort William and Mary) at the mouth of the Piscataqua in New Castle was a fort at least since 1632 and fortified in every war through World War II (Mansfield 2002: 44). Fort McClary, originally Fort Pepperrell, in Kittery was fortified by the late-17th century. A unique octagonal blockhouse of logs with clapboarding, constructed in the mid 19th century, stands at the fort site today. Fort Washington (Pierce’s Island) and Fort Sullivan (Seavey’s Island) were built in 1775. Construction of the Naval Prison (1905) likely destroyed any remains of Fort Sullivan; however, breastworks of Washington remain intact even though a significant portion of the fort was destroyed to make way for the Portsmouth Wastewater Treatment facility in 1963-64 (Lawry et al. 2004).

The Piscataqua was heavily fortified during the Spanish-American War and World War II. Fort Stark on New Castle Island was fortified in 1746 and again in the Revolutionary and Civil Wars, but remains of these forts were mostly obliterated during construction of concrete building and batteries beginning in 1901 (Mansfield 2002: 50). Fort Foster, situated on Gerrish Island in Kittery was also constructed during the Spanish-American War. Massive concrete bunkers and batteries as well as an observation tower dominate the landscape. In World War II, mines and a submarine net spanned the river channel from Fort Foster to Fort Constitution. Fort Dearborne, constructed in 1944 at Odiorne Point, is also the site of numerous batteries. The forts of the latter wars, perceived as a necessity at the time, were never utilized to defend the Piscataqua region and the Portsmouth Navy Yard. Only Fort Constitution and McClary are listed on the National Register.
Strawbery Banke in Portsmouth, NH is the only extant 17th-century waterfront community in the Gulf of Maine. The work of local preservationists saved the community from destruction and urban renewal in the 1950s. All but five of the 40 buildings on the grounds of the Strawbery Banke Museum sit on their original foundations. Not surprisingly, Strawbery Banke is described as “one of the ten most important architectural locales in the entire United States” (Harrington 1983: 53). Known as Puddle Dock in the 19th century, the shallow tidal inlet along which the community was built, was filled-in at the turn of the 20th century, preserving the waterfront features and wharves. The archaeology and historical research at Strawbery Banke has added significant details not only about maritime life, but also how early European settlers adapted to and altered the coastal environment (Ingersoll 1971; Agnew 1988; Pendry 1978; Harrington 1983; Pinello and Dupree 1993).

Piscataqua River is one of the few Gulf of Maine regions where maritime-oriented archaeological surveys have been conducted. Surveys of Great Bay, Piscataqua River and Isles of Shoals by Switzer (1985, 1991, 1994), Farrell (1984) and Harrington (1987, 1989, 1992) were supported by grants from the University of New Hampshire (UNH), Cornell University and the State Historic Preservation Offices of Maine and New Hampshire beginning in the 1980s. Switzer conducted underwater remote sensing surveys while Farrell and Harrington focused primarily upon intertidal and terrestrial surveys at the Isles of Shoals.

The marine surveys by Switzer and the Kittery Historical and Naval Museum in the early 1980s detected two notable underwater archaeological sites: 1) the structural remains of the Piscataqua River Bridge, built in 1794 to connect Dover and Newington,
and 2) a shipwreck at a depth of 10.5 m (35 ft) near the mouth of Piscataqua River called the Harts Cove Wreck (Switzer 1991). Excavation of the Harts Cove Wreck in 1986-1987 uncovered a small craft approximately 9.1 m (30 ft) in length. The vessel is tentatively identified as a late 17th- or early 18th-century shallop (Switzer 1991). In addition, another nearby wreck site, dubbed the Salamander Point Wreck, was investigated in the 1990s by Switzer (1992). This shipwreck was looted and disturbed by sport divers in the 1970s, but the lower portions of the hull are intact. At both wreck sites, thousands of artifacts dating primarily to the 1700s and early 1800s were recovered; however, their association with the wreck sites is problematic, as disturbance by wreck divers and site proximity to Fort William and Mary (i.e., Fort Constitution), has resulted in the dispersal of artifacts by sea action along the seabed and on top of the wreck sites. Another wreck site, *Lizzie Carr*, a lumber schooner that wrecked on Wallis Sands Beach in Rye in 1905 was studied by Switzer in 2001-2002 (Switzer 2004). A portion of the hull was recovered and is now on display at the NH Seacoast Science Center. Although the NH SHPO does not contain an inventory of shipwrecks in New Hampshire waters, nearly 70 vessels are known to have wrecked in the region between 1800 and 1900 (Berman 1972).
Table 14. Maritime districts, building and sites of Piscataqua River region on the National Register of Historic Places.

Saco Bay

Saco Bay is a broad and relatively shallow bay. The bay is circumscribed mainly by the fine sandy beaches of Old Orchard and Higgins Beach. It is also indented by the wetlands of Scarborough Marsh and Biddeford Pool, dotted with rocky islands and points at its northern and southern ends, and is the site of the outfall of Saco River – the fourth largest river in Maine. The bay is bounded by Cape Elizabeth and Richmond Island to the north and Biddeford Pool to the south. At the mouth of the Saco River are a small cluster
of islands: Wood, Negro, Stage, Basket, Ram, and Eagle Islands. A granite breakwater or jetty that is over 2000 m in length, one of the largest on the Atlantic seaboard, extends from the northern side of the river. The cities of Saco and Biddeford are situated approximately 8 km (5 mi) upriver at the Saco Falls, where the fresh and tidal waters meet.

The intertidal and wetland areas of Saco Bay are unique. Biddeford Pool, located at the southern end of the region, is protected by barrier beaches and rocky outcrops. It is a large tidal basin approximately 400 acres or 1.6 km², which is connected to the sea through a narrow channel. The Pool completely fills and drains during each tidal cycle. On the northern shore of the bay, Scarborough Marsh, which is approximately 3,100 acres or 12.5 km² in area, is the largest salt marsh in Maine. The Nonesuch River is the main tributary of the marsh. At the mouth of the river and marsh is a rocky promontory known as Prouts Neck. The small islands of Bluff and Stratton are located slightly offshore the Neck. Along with Richmond Island, slightly to the east, the promontory and islands were settled by English fishermen in the first half of the 17th century.

Recent marine surveys have confirmed that the sea level low-stand in Saco Bay was at about 60 m below present sea level approximately 10,500 BP (Lee et al. 2006). Human occupation in the region at this time is undocumented, but does not preclude their presence. In 1959, the remains of a mastodon or mammoth were discovered in Scarborough marsh. Subsequent excavations in the 1990s revealed additional bone fragments, which were radiocarbon dated 12,200 ± 55 and 12,160 ± 50 (Bourque et al. 2001: 18). Study of the bones suggests that they are the remains of a *Mammuthus primigenius*, or woolly mammoth. Although no cultural material were found in
association with the mammoth remains, the discovery in Scarborough Marsh confirms that mastodon were present in the region and in all likelihood co-existed with Paleoindians, who may have hunted them.

The Saco River is not only a natural boundary but also is believed to represent a Prehistoric cultural boundary, with hunting and gathering to the north and east, and a more sedentary and horticultural economy generally to the south and west (Lore 2006: 6; Demeritt 1991: 183). In 1603, when Samuel de Champlain explored the region, he made a detailed account of an Armouchiquois Indian village at the mouth of the Saco River, which was then called the Chouacoet. Archaeological surveys and excavations along the southern river bank, beginning in 1997, have revealed that the area was occupied since at least the Late Archaic Period (Lore 2006: 4). Despite the dearth of maize remains found at the ‘Chouacoet Site’, the presence of maize-based horticulture was confirmed by Champlain, suggesting that the Ceramic-Period Armouchiquois had a well-developed horticultural as well as marine resource-based economy and subsistence strategy.

Fishermen visited and fished Saco Bay and nearby offshore banks perhaps as early as the late 1500s, but the French explorer Samuel de Champlain in 1603 was the first to visit, map and illustrate the coastal region and its extensive Native American occupation (Langton et al. 1922). In 1616, Englishman Richard Vines was sent by Sir Ferdinando Georges to survey Saco Bay. He wintered at the Pool supposedly naming it ‘Winter Harbor’ (Folsom 1975: 24). Alternatively, the name may be derived from the establishment and operation of a fishing station on Richmond Island by John Winter from 1632 until 1646 (Baxter 1884). Aside from Winter Harbor, the northern shore and islands of Saco Bay appear to be places of earliest European settlement and activity. Richmond
and Stratton Islands were active fishing stations and Prouts Neck and Pine Point in Scarborough were settled by the 1630s (Duncan 1992: 95; Faulkner 1980).

These coastal settlements were short lived, however. The most significant and longstanding European settlements occurred five miles up the Saco River at the Saco Falls, which is now centrally situated by the cities of Biddeford and Saco. The freshwater river, whose headwaters flow from the White Mountains of New Hampshire, splits around a rocky island at the falls and drop over 12 m (40 ft) into the tidal waters of the river. Known historically as Indian, Cutts, Factory, and Saco Island, the island was an important seasonal encampment for salmon fishing and place of worship for Pequawket Indians (Gibb 1950: 19, 21).

The Native American occupation of the island was overrun by Europeans, who realized quickly the water-power potential of the river for mill operations. The island and surrounding lands were purchased by the Kittery merchant William Pepperell in 1716 (Gibb 1950: 18). He acquired and established numerous sawmills. Lumbering remained the chief industry until the early 1800s. Forest stands as far away as the Mount Washington Valley and the White Mountains were within reach via the river. Timber was transported downriver to the mills where it was processed and shipped to foreign and domestic markets.

Historically, at least a dozen saw, grist and fulling mills have occupied the banks of the river near the Saco Falls at any one time. Maine never quite caught the cotton fever of southern New England states, but with major timber stands mostly depleted by the early 19th century, there was a significant shift toward cloth and textile machine manufacture. The first iron works was first established at the falls in 1811 to manufacture
nails and other iron fasteners (Edwards 1950: 11). In 1825, the Saco Manufacturing Company was established marking the beginning of the textile machine-making era. Known collectively as the “Saco-Lowell” shops, the Saco Company mirrored the development of machine shops established in Lowell, MA (Gibb 1950; Edwards 1950). It is at about this time that there was a massive influx of immigrant labor into Biddeford and Saco, particularly from French Canada (Guignard 1980).

Clearly, the characterization of Biddeford-Saco as a dead port in the first half of the 19th century is unfounded (Labaree et al. 1998: 101). Shipbuilding had indeed declined, as had local timber supplies, but processing lumber at the mills had not and the export trade was brisk and profitable. In addition, Biddeford developed a diverse economic base in the 1830s and 1840s that included not only lumber milling and shipbuilding, but also cotton/cloth and machine manufacture, and brick-making. Abundant river clay and the introduction of horse-powered machinery in the 1830s resulted in the production of approximately ten to twelve million bricks per year up until the 1850s (Gibb 1950: 52). The bricks were not only a significant export commodity, but also were used to build the massive mill structures that stand along the Saco River today. The river remained the primary transportation artery for products and passengers until 1842 when rail was laid linking the area to Boston and U.S. markets south and west (Gibb 1950: 50).

The fishing industry had peaked in the early 17th century, but witnessed resurgence in the mid-19th century, particularly at Biddeford Pool (Smith 1887). There was a significant swordfishery off Wood Island and at a bank known as the “Peak” (Smith 1887: 46). Mackerel and lobstering also developed as important fisheries, while
hand and long-lining for cod, haddock, cusk and hake continued throughout the century. Vacationing at the Pool and the broad sandy beaches of the bay also grew in popularity in the mid-19th century. It was remarked that “there is no resort on the whole Atlantic coast that Biddeford Pool is second to as a summer watering place” (Smith 1887: 19). By the late 19th century, the Pool and Old Orchard Beach in particular, were nationally renowned as summer resorts and destinations. The Pier at Old Orchard Beach, originally a 1770-ft steel pier with covered pavilion or ‘casino’, was built in 1898 as a tourist attraction (Fairfield 1956: 346). Repeatedly damaged by storm and fire, in later years the steel Pier was shortened and replaced by wooden pilings and featured an aquarium, curio shops, and restaurants. Now only 152 m (500 ft) in length, it is still the longest and only still-standing pier in Maine built exclusively for entertainment and recreation purposes.

Entry into and navigation of the Saco River is facilitated by stone markers and massive breakwaters or jetties. In 1825, at the same time as the establishment of the Saco Manufacturing Company, the Federal government built a stone navigation aid or tower on Stage Island and established nine piers along the river bank to facilitate storage of goods in warehouses and the landing of ships (Fairfield 1956: 35). The tapered, stone-built navigation tower stands today, but is not listed on any state or federal inventory or register. A paired jetty system is located at the mouth of the Saco River. Begun in 1867, the jetties were built to prevent siltation of the river mouth and allow safe anchorage and passage for ships. However, recent studies have shown that sand migrates from the Saco River as a source toward the north; subsequently, beach sand has not been replenished resulting in extensive erosion of the shore by wave action (Kelley et al. 1995). In
addition, granite breakwaters were built in the 19th century south of the Saco Falls to prevent siltation in the main river channel and facilitate navigation.

Although the Saco Falls area is heavily disturbed due to successive occupation and waterfront construction, many historical-period waterfront architectural elements remain intact. This author’s survey of the Saco Island waterfront in 2005 documented minimally six different types of coastal defense or waterfront architecture. Additionally, the northern and southern sides of the river were the primary shipbuilding and landing areas for Biddeford-Saco, as well as the site of Saco Fort, a fortification constructed in the 17th century but believed destroyed by construction of a water-power machine company in 1843 (Maine Historic Archaeological Sites Inventory 2006).

Minimally, 42 ships have foundered in the vicinity of Saco Bay according to the Maine Historic Archaeological Sites Inventory (2006). However, numerous vessels documented in the historical record have yet to be inventoried. For example, a skirmish during the War of 1812 with the British frigate Bulwark resulted in the burning of three vessels belonging to the Cutts family, a prominent merchant family of Biddeford. The remains of one vessel lie partially exposed in the Biddeford Pool mudflats (Smith 1887: 26). A 6.4 m (21 ft) long dugout canoe was discovered in and excavated from Biddeford Pool in 1986 (Baker 1988). The unique craft is not believed to be aboriginal and its date is problematic as no artifacts were found in association with the canoe. Unfortunately, the dugout has not undergone any scientific study or detailed documentation, and its current whereabouts are unknown.
Casco Bay

Casco Bay is a rocky and island strewn embayment that extends from Portland Head Light in Cape Elizabeth north to Small Point in Phippsburg. The bay’s shoreline, 930 km (578 mi) in length, encompasses ca. 518 km² (200 mi²) of water and approximately 785 islands, islets and exposed rock ledges (CBEP 2005: 4). Approximately 220 of these features are islands. Long parallel ridges and submerged valleys of stratified rocks of schist, phyllite, gneiss, and shale trend in a southwest to northeasterly direction giving the islands and the finger-like northern coastal peninsulas their long jagged shapes. The primary freshwater inputs into the bay are the Fore, Presumpscot, Stroudwater, and Royal Rivers. Situated on the southern half of the bay are towns and cities of Cape Elizabeth, South Portland, Portland, Falmouth, and Cumberland. The northern half of the bay includes Yarmouth, Freeport, Brunswick, Harpswell, West

Table 15. Maritime districts, building and sites of Saco Bay on the National Register of Historic Places.

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<td>Richmond’s Island Archeological Site</td>
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<td>Fletcher’s Neck Lifesaving Station</td>
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Bath and Phippsburg. Casco Bay also embays numerous coves, sounds, and lesser bays (e.g., Maquoit Bay). The mean tidal range of the region is 2.77 m (9.1 ft).

Native Americans have continuously occupied Casco Bay since at least the Terminal Archaic Period (ca. 4,250 BP) (Yesner 1988: 56). Artifacts found in coastal midden sites on Moshiers, White, and Great Diamond Island from this period include projectile points, harpoons, plummet and netsinkers (Hamilton and Yesner 1985). The presence of these artifacts and large quantities of marine faunal remains indicate a high reliance on seasonal fishing, sea-mammal hunting, and shellfish gathering (Yesner 1984: 113). Most archaeological sites in the bay, however, date to the Ceramic (or Woodland) Period. These period sites are distinctive not only for the presence of ceramics but also in midden composition, which consist almost entirely of soft-shell clam (*Mya arenaria*). Warmer-water species such as oysters, quahog, and bay scallop are also found in Casco Bay middens, but these species are associated with refuse layers that date from 4,000 to 2,500 BP (Yesner 1988: 56).

Portland, Maine's largest city, occupies a peninsula between the Fore River and Back Cove at the southwest end of Casco Bay. To the east of Back Cove is the mouth of the Presumpscot River. The city and harbor are situated approximately 6.5 km (4 mi) from the Atlantic Ocean. The outer harbor of Portland includes some of the largest islands in Casco Bay: Cushing, Peaks, House, and Great and Little Diamond. The inner harbor is delineated at the mouth of the Fore River; the river separates Portland and South Portland. It is along these southern bay shores and rivers that have witnessed considerable coastal human settlement and landscape development.
The entire Casco Bay region was known as Falmouth by early English settlers. Raleigh Gilbert, sailing from the Popham Colony at the mouth of the Kennebec River, was the first Englishman recorded to visit the area in 1607 (Spencer 1973: 218). The English explorer Christopher Levett, however, was the first to establish a fortified dwelling in 1623-4 near the Presumpscot River on a harbor island the native peoples called ‘Quacke’ (Spencer 1973: 218-219). The Portland peninsula, known as Machegonne by natives, was likely occupied prior to 1635 by English fishermen and fur traders (Baker 2005: 1; Spencer 1973: 211). The northern region of the bay, near Freeport and the Bunganuc River in Maquoit Bay, was settled as early as 1639 (Spencer 1973: 239).

By 1675, Falmouth “was having a thrifty trade in fish, masts, spars, ton-timber, oar-rafters, and sawed lumber as mills had been built at Capisic, at Long Creek, and at some other places” (Otis 1901: 22). Conflict with France and Indians in the latter 17th century resulted in near abandonment of the region by English settlers, and resurgence in settlement did not occur until around 1725, seven years after Falmouth was officially incorporated in 1718. Through this tumultuous period the mast, spar, and West Indies trade and to a lesser extent fishing and shipbuilding were the primary industries. Just as Falmouth seemed to establish itself as a regional entrepôt, the Revolutionary War interfered with its further establishment and growth. On October 18, 1775, a British squadron bombarded and burned nearly the entire waterfront and city of ‘Old Falmouth’ (Leamon 2005). Following the war, Falmouth was rebuilt and divided in 1786 into the cities of Portland and South Portland.
Portland and Casco Bay grew as a commercial port in the 1800s, but did not experience significant maritime development until the second half of the 19th century. The region emerged as a fisheries market and transshipment point following the Civil War, and in the 1880s Portland became the primary fishing port in the U.S. alongside Gloucester and Boston, MA (O'Leary 1996: 182). Portland maintained a significant portion of the region’s mackerel fleet at that time and operated numerous fish-processing and canning facilities. Portland’s mid-19th century growth coincided with transportation improvements, namely, steam and rail. Simultaneously, Portland experienced a boom in waterfront development and wharfing out to accommodate larger vessels and steamships (Willis 1972: 566-567). Navigation aids and improvements were constructed at Spring Point and Cape Elizabeth, and a massive dry dock was constructed east of the bridge connecting Portland and South Portland in 1864 in order to repair Portland steamship company vessels (Willis 1972: 734). In addition to rail, water transportation corridors were constructed to facilitate inland trade. Begun as early as 1791, but completed in 1830, the Cumberland and Oxford Canal connected Sebago Lake to the Fore River, allowing for quick transit of raw materials to and from Portland Harbor (Anderson 1982).

By 1855 shipwrights in the State of Maine were building more than one-third of all ships in America with a majority of coasters, clipper ships and down-easters built along the rivers and shores of Portland and South Portland (Summers 1999: 29). The only extant example of a Maine-built clipper ship is *Snow Squall*, which was recovered from the Falkland Islands by archaeologists in the 1980s (Dean and Switzer 2001). Originally employed in the China tea trade, the ship was built in the Butler yard of South Portland in 1851. During the shipbuilding and mercantile boon of the mid-19th century, wharves,
piers and port facilities expanded to accommodate the industrial growth. The wharves at the base of Munjoy Hill were capable of landing some of the largest vessels of the day including the behemoth British steamship *Great Eastern*, which was 211 m (692 ft) in length (Summers 1999: 67). South Portland remained an important shipbuilding port through World War II specializing in the construction of massive steel “Liberty ships,” or cargo vessels, which were employed by the U.S. and Britain during wartime (Jones 1945).

During the Civil War, Casco Bay went largely unscathed except for one incident in which Confederate seamen in 1863 captured and destroyed a supply ship, *Caleb Cushing* (Summers 1999: 54). At the close of the Civil War in 1866, however, Portland experienced one of the worst urban fires in American history. Known as “The Great Fire,” the inferno, which was likely sparked by fireworks during American Independence celebrations, razed the commercial district, waterfront, and more than 1,800 buildings (Summers 1999: 54-59). Portland was rebuilt again, and surprisingly, out of the ashes emerged one of the finest examples of Victorian-era brick and granite architecture in the United States (Summers 1999).

Fortifications were established in Casco Bay as early as 1680, and subsequently, the southern bay was heavily fortified in each following American conflict. Significant coastal landscape impacts from fortification building occurred at the outset of the Spanish-American War, when the United States began construction of a coastal defense system on the islands of Portland Harbor. The system of fortifications included Fort Williams, Levett, Preble, Lyon, and McKinley. Fort McKinley, located on Great Diamond Island, was the largest coastal defense fort in New England and the tenth largest
Endicott-era fort in the nation (Eastman 1988: 9). These forts were never called to defend Portland and were ultimately decommissioned and abandoned after World War II.

The numerous islands and ledges of Casco Bay have resulted in minimally 218 shipwrecks dating as early as the 17th century (MHPC Inventory 2006). To date, there have been no archaeological surveys for submerged cultural resources in Casco Bay. The Portland and South Portland waterfronts are currently undergoing significant landscape alteration and building, and the potential for encountering archaeological sites and buried yet extant waterfront architecture can be regarded generally as very high. Native American archaeological sites, totaling over 200 on 50 separate bay islands, which were identified by archaeological surveys conducted in the 1970s and 1980s, are also rapidly disappearing due to residential development and erosion (Yesner 1988: 56).

<table>
<thead>
<tr>
<th>Portland Observatory</th>
<th>Halfway Rock Light Station</th>
<th>Portland Headlight</th>
<th>Portland Breakwater Light</th>
<th>Ram Island Ledge Light Station</th>
<th>Spring Point Ledge Light Station</th>
<th>Battery Steele</th>
<th>Fort Gorges</th>
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Table 16. Maritime districts, building and sites of Casco Bay on the National Register of Historic Places.

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Table 16 continued. Maritime districts, building and sites of Casco Bay on the National Register of Historic Places.

**Mid-Coast Maine**

This region stretches from Phippsburg at the northern end of Casco Bay to Port Clyde, a peninsular fishing village situated at the mouth of Saint George River and bordering Penobscot Bay. There are four major bays along this coast: Sheepscot, John, Booth-, and Muscongus Bays. Except for Boothbay, the coast here is not very sheltering from the open gulf waters. The deep and navigable but strong tidal current rivers of the region contain countless small rocky inlets and numerous islands, however, that do offer shelter from the open ocean. These rivers, from west to east include the Kennebec, Sheepscot, Damariscotta, Medonak, Meduncook, and Saint George Rivers. Situated as far as ca. 16 km (10 mi) offshore are the islands of Seguin, Damariscove, Allen, Burnt, and Monhegan, which figured prominently in the Gulf of Maine’s European fishing and early settlement history.
The prehistory and Native American history of mid-coast Maine is rich and complex. As evidence, the region has the most prehistoric archaeological sites listed on the National Register of Historic Places. The majority are coastal sites with high visibility in the form of shell middens, which were formed by discard of shellfish remains. Shell middens appear in the Archaic-period archaeological record but feature even more prominently in the Woodland (or Ceramic) Period. In 1886, Frederick Ward Putnam of Harvard University’s Peabody Museum of Archaeology and Ethnology organized one of the first archaeological investigations of a shell midden in Damariscotta known as the “Whaleback” (Bourque 2001: 4). This unusual Ceramic-period midden, which originally reached depths of up to 9 m (30 ft), contains oyster shells exclusively, some of which measured up to 30 cm (1 ft) in length (Bourque 2001: 86). The Boothbay region, in particular, has a high density of middens scattered on seemingly each and every island in the bay.

East of the Kennebec River, prehistoric archaeological assemblages are overwhelmingly ‘maritime’ in nature. There is no evidence of maize or other horticulture in this region and a preponderance of marine fauna as well as fishing tools such as hooks, net sinkers, plummets, and harpoons. The larger region, between the Kennebec and Penobscot Rivers, is remarkable for its ‘Moorehead’ cultural phase which emerged ca. 5000 BP; a period defined by the appearance of “Red Paint” burials, and unique artifacts including ground-slate bayonets, plummet-like objects, and an abundance of swordfish remains (Bourque 2001: 51). The Stanley archaeological site, located on Monhegan Island, which is affiliated with the Moorehead phase, is indicative of the nautical
capabilities of these Archie-period peoples (Sanger 1975: 62). More attention will be
given to this maritime culture in the proceeding section of the Penobscot Bay region.

The first documented contact between Native Americans and Europeans in this
region was the 1604-5 de Monts-Champlain expedition; Champlain made landfall and
contact with local Indians at the entrance to the Kennebec River in 1605 (Champlain
1922, I: 313-322). The failed Popham Colony, established in 1607, was the second
European (the first being Champlain's wintering on St. Croix Island [see Passamaquoddy
Bay region]) and the first English attempt at establishing a permanent settlement in New
England. Although the Popham Colony was short-lived, year-round English fishing
communities were established at Damariscove and Monhegan Islands by the 1610s
(Brain 1995). These island colonies played a crucial role, along with the southerly fishing
stations at Cape Ann, Isles of Shoals and Richmond Island, in the provisioning and
survival of the southerly Plymouth Colony (McLane 1992: 9). By the 1650s an English
settlement was established on a mainland peninsula called Pemaquid. Pemaquid became
the preferred locale for fishing operations, perhaps for its more protected harbor, greater
access to fresh water, agricultural lands and forests, and fur trading opportunities (De
Paoli 2001). The islands were occasionally and temporarily occupied as safe havens
during French and Indian Wars in the 17th and 18th centuries. However, the islands' populations stagnated until the 19th century when there was increased market demand for
mackerel and lobster, and in the late 19th century, as a secluded destination for artists and
summer retreat for affluent Bostonians and New Yorkers (McLane 1992: 240-241).

Pemaquid was a pivotal economic and cultural node in the Gulf of Maine through
most of the 17th century until it was destroyed by an Indian raid in 1689 (Bradley and

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The frontier location of Pemaquid permitted inter-cultural exchange and trade not only with southern New England colonies but also with the French in Acadia and the Penobscot, Passamaquoddy, and Maliseet or Micmac to the north and east. By the mid- to late-17th century a network of trading posts and fishing stations were established along the Kennebec River Basin to facilitate trade, which included the Clark and Lake Company trading post on Arrowsic Island, a fishing station on Sagadahoc Island (Georgetown), and as far north as the Cushnoc trading post in Augusta (Cranmer 1990). The nearby coastal settlement of Capenawagen (Cape Newagen) on Southport Island and trading and fishing settlements on Damariscotta and to a lesser extent St. Georges Rivers were also part of this English frontier community and trade network. The close of the 17th century was ushered in by a relatively dark period of limited European expansion and settlement of the Mid-Coast Maine, as French and Indian hostilities with the English raged.

The shores of the lower segment of Kennebec River, from Bath to the river's outlet at Popham State Beach Park also played a critical role in the development of the lumbering industry and Maine's legendary shipbuilding history. Near the river mouth was the building site of the first English ship, the pinnace *Virginia*, which was constructed in 1607 at the short-lived Popham Colony settlement (Goldenberg 1976: 6). Further upriver and just below the confluence of the Androscoggin and Kennebec Rivers at Merrymeeting Bay, however, is the 19th-century shipbuilding capital of Bath. Timber, which floated down the long reaches of these rivers, was sawn at mills in Topsham, Brunswick and Augusta, but the raw and processed lumber was shipped primarily out of Bath (Wood 1971: 13). Due in part to this ample regional timber supply, Bath
subsequently developed into the preeminent shipbuilding center in the Gulf of Maine as well as the nation by the late 19th century.

The shipyards of Bath are perhaps the most historically-significant shipbuilding sites in the nation and areas of the city have been designated historic districts and are listed the National Register of Historic Places. One district, the Percy and Small Shipyard, is now home to the Maine Maritime Museum. Shipbuilding on the Kennebec River in any considerable volume did not begin until about the 1780s (Baker 1973: 146). The lower Kennebec, which was largely a wooded backwater up until this time, began to shape into an industrial working waterfront, particularly on the western shore of Bath, with the construction of wharves, warehouses, and shipyards. The region was transformed within a couple of decades as the regional shipbuilding center – from 1789 to 1807, 151 vessel totaling over 25,000 tons were constructed in Bath and West Bath (Baker 1973: 167-168). In the 19th century, the family-owned shipyards of the McLellans, Houghtons, Pattens and Sewalls, to name a few, produced some of the largest wooden ships and fleets of the era (Baker 1973: 285). Most of these vessels were ships and brigs built for the trans-Atlantic and Pacific trades and transport of bulk commodities such as salt, cotton and coal.

Only a very few of the world renown "clippers" were built in the Kennebec region during the 1850s (Baker 1973: 374-375). Instead, ship design and construction focused on maximizing hull and cargo capacity for transport of heavy and bulk cargoes over long distances. This trend culminated at the Percy and Small Shipyard of Bath (1894-1920), which built four-, five-, and six-masted ships known as the "Great Schooners." In 1909, the shipyard built Wyoming, which was, with jib-boom 137 m (450 ft) in length, the
largest wooden ship ever built in North America (Snow and Lee 1999: 3-4). Bath’s identity with shipbuilding continues today owing its existence to this earlier generation of shipbuilding on the shores of the Kennebec River, as Bath Iron Works, now a builder of Navy destroyers, is located just upriver from the Percy & Small Shipyard.

With the extensive system of navigable waterways in the region, the need for roads was limited. Rather, ferries were the primary mode for river-crossing and an integral part of the local transportation network. Simple, flat-bottomed scows, occasionally powered by horses, ferried cargoes, livestock and passengers continuously from at least the early 18th century to as late as 1960 (Baker 1973: 547). The first documented ferry crossing was Mayne’s at the Chops at the outlet of Merrymeeting Bay (Baker 1973: 546).

After the heyday of fishing in the 17th century, the industry waned considerably until the 19th century when mackerel, menhaden and lobster fisheries and markets developed. The epicenter for the industry in this period was Southport Island and Boothbay Harbor. In the first part of the century, Boothbay vessels typically fished the Labrador cod fishery in the spring and the Gulf of St. Lawrence mackerel in summer (O’Leary 1996: 95). However, the mackerel fishery in the Gulf was in decline by 1865 effort shifted toward menhaden or porgy fishing. The first steam-powered vessel for the menhaden fishery operated out of Boothbay ca. 1871 (Albion et al. 2004: 193). At this time, numerous menhaden oil as well as guano factories were constructed along the Boothbay and Bristol waterfronts (O’Leary 1996: 257). With decline in demand for menhaden at the close of the 1870s, lobstering began to develop as an important industry
of Boothbay due in part to a growing demand from hotels and restaurants to feed tourists visiting the region.

With the intensity of trade and shipbuilding, it should not be surprising that at least 300 ships have either wrecked offshore or lie derelict along the many rivers, coves and islands of the region. Long visible were the late-19th and early-20th century behemoth schooners such as *Hesper* and *Luther Little*, which lay abandoned on the Wiscasset waterfront attracting tourists and local appreciation for decades. Although dismantled and destroyed by the town in 1998, save for a few small hull fragments, the memory of these vessels are preserved via listing on the National Register of Historic Places in 2004. *Cora Cressey*, intended for use as a lobster pound on Medomak River, is another behemoth 5-masted schooner with a largely intact but deteriorating hull that remains *in situ*. Mill Cove in Boothbay Harbor is yet another site of large derelict schooners, serving as the resting place of the remains of at least two schooners *Edna M. McKnight* and *Courtney C. Houck*. This site is currently not listed on the National Register.
| Burnt Island Light Station | ● |
| Cuckolds Light Station | ● |
| Hendricks Head Light Station | ● |
| Monhegan Island Lighthouse and Quarters | ● |
| Manana Island Fog Signal Station | ● |
| Pemaquid Point Light | ● |
| Ram Island Light Station | ● |
| Tenants Harbor Light Station | ● |
| Doubling Point Light Station | ● |
| Kennebec River Light Station | ● |
| Perkins Island Light Station | ● |
| Squirrel Point Light Station | ● |
| Seguin Island Light Station | ● |
| Marshall Point Light Station | ● |
| Fort Edgecomb | ● |
| Fort William Henry | ● |
| Fort Baldwin Historic Site | ● |
| Thompson Icehouse | ● |
| Pejepscot Paper Company | ● |
| Percy and Small Shipyard | ● |
| Archeological Site 16.175 | ● |
| Archeological Site 16.198 | ● |
| Archeological Site 16.20 | ● |
| Archeological Site 16.21 | ● |
| Archeological Site 16.37 | ● |
| Archeological Site 16.38 | ● |
| Archeological Site 16.47 | ● |

Table 17. Maritime districts, building and sites of Mid-Coast Maine on the National Register of Historic Places.
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<td>Cora F. Cressey (schooner)</td>
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<td>Hesper and Luther Little (schooners)</td>
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<td>Sequin (tugboat)</td>
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<td>Arnold Trail to Quebec</td>
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<td>Richmond Historic District</td>
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<td>U.S. Customhouse and Post Office (Waldoboro)</td>
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<tr>
<td>U.S. Customhouse and Post Office (Bath)</td>
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<td>Fort Popham Memorial</td>
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**SUMMARY**

Table 17 continued. Maritime districts, building and sites of Mid-Coast Maine on the National Register of Historic Places.
Greater Penobscot Bay

Approximately 32 km (20 mi) from Metinic Island to Isle au Haut and Deer Isle, and 45 km (28 mi) from the outer islands of Criehaven and Matinicus Rock to the mouth of Penobscot River, Penobscot Bay is the largest embayment of the U.S. Gulf of Maine coast. Including the 624 islands and ledges, the shoreline of the Bay is nearly 1,600 km (1000 mi) in length (Conkling 1999: 64). Isleboro, North Haven and Vinalhaven islands divide the bay into East and West Penobscot Bay. Numerous historic coastal towns and harbors are situated along the Bay’s shore, the most prominent being Rockland, Rockport, Camden, Belfast and Searsport on the West Penobscot coast, and Castine and Stonington on the island shores of East Penobscot Bay. The Penobscot River, which empties into the bay at Stockton Springs, is the marine approach to the upriver towns of Bucksport and Winterport, and the cities of Bangor and Brewer. The Passagassawakeag River, located on the northwest coast of the bay, provides a significant freshwater input into Belfast Bay. This bay seafloor also contains ‘pockmark’ or crater-like features that are believed to have formed from escaping natural gas (Kelley et al. 1994). The mean tidal range of the region varies from 3.05 m (10 ft) at Belfast to about 4 m (13.1 ft) at Bangor. The strong tidal currents of the bays and rivers often exceed 5 knots.

East of Penobscot Bay are Blue Hill Bay and Frenchmans Bay. The defining coastal feature of these bays is Mount Desert Island, an undulating, bulbous mass of granitic pluton that forms the smooth, rounded peaks of Acadia, Cadillac, Champlain, Norumbega, Pemitic and St. Sauveur Mountains (Conkling 1999: 69). Along the fringe of Mount Desert are a number of other granite-based outcrops and islands such as Long and Swans Islands and Cranberry Isles in Blue Hill Bay, and Stave, Ironbound and the
Porcupine Islands in Frenchmans Bay. Splitting Mount Desert Island nearly in half is Somes Sound – a tidally-mixed embayment with the distinct appearance of a shallow fjord, which is a unique feature in the Gulf of Maine (Pettigrew et al. 1997: 42-43). The main of Mount Desert Island and Isle Au Haut, located southwest of Mount Desert, comprise the Acadia National Park system.

The greatest post-glacial emergence of land in Penobscot Bay occurred ca. 10,500 BP (Barnhardt 1994). At this time, the land-sea interface was located approximately 55-60 m below current Mean Sea Level (MSL). This period roughly corresponds to the initial peopling of the region by Paleoindians. Approximately 6000 BP, marine transgression was roughly 8-10 m below MSL. This date marks the end of the Middle Archaic cultural period and the appearance of the terrestrial, coastal archaeological record. Therefore, the coastal and estuarine occupation of Penobscot Bay by Paleoindian, Early and Middle Archaic groups is now under water.

Artifacts found by fishermen, as well as archaeological surveys, have confirmed the presence of submerged prehistoric sites and landscapes, within Penobscot Bay and the relatively unexplored region of Blue Hill Bay. Distinctive Native American artifacts have been found from minimally five different locations in these bays at depths from 10 to nearly 60 meters below sea level. For example, large biface blades, dating to the Early and Middle Archaic Periods, were recovered by Maine scallop fishermen in Blue Hill Bay in the 1980s and early 1990s (Crock et al. 1993, Sanger 1988). A dive survey near Lazygut Island in the 1980s yielded ca. 6000 BP artifacts (Bourque and Cox 1985). Additionally, in situ fossilized oysters found at the site were believed to be part of an adjacent estuarine depression. Remote sensing survey of this area determined that the

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artifacts were part of an elevated, fossil stream terrace (Belknap 1995). Interviews by an archaeologist of Blue Hill Bay fishermen in June 2006 also revealed remarkable examples of Native American gouges and a spear point that were hauled by a scallop dragger from approximately 20-30 meters below sea level (Price and Spiess 2007). These artifacts are tentatively dated 6,000-8,000 BP.

The bay region’s archaeological record exhibits remarkable marine biological and cultural diversity throughout the Holocene, but particularly during the Archaic Period (ca. 10,000-3500 BP). Of the more than 150 prehistoric archaeological sites (mostly shell middens) documented solely on the Fox Islands, the Turner Farm Site on North Haven is the most extensively excavated, studied and published prehistoric coastal site in the Gulf of Maine (Bourque 1995: 13; Spiess and Lewis 2001). The cultural chronology of the Archaic Period (the earliest period represented in the archaeological record along the immediate Maine coast and islands) has in large part been defined by archaeological investigation at this and other sites of the Greater Penobscot Bay region.

The cultural periods of the Late Archaic Period, in particular, are well-defined in this region and based primarily on distinct lithic technologies and mortuary traditions (Robinson 1992; Robinson 1996; Bourque 1995; Spiess and Lewis 2001):

<table>
<thead>
<tr>
<th>Period</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Archaic</td>
<td>10,000-8000 BP</td>
</tr>
<tr>
<td>Middle Archaic</td>
<td>8000-6000</td>
</tr>
<tr>
<td>Late Archaic</td>
<td>6000-3500</td>
</tr>
<tr>
<td>Small-Stemmed Point</td>
<td>5000-4500</td>
</tr>
<tr>
<td>Moorehead Phase</td>
<td>4500-3800</td>
</tr>
<tr>
<td>Susquehanna Tradition</td>
<td>3800-3500</td>
</tr>
<tr>
<td>Woodland (Ceramic)</td>
<td>2700-500</td>
</tr>
<tr>
<td>Contact</td>
<td>1580-1760 AD</td>
</tr>
<tr>
<td>Colonial to Recent</td>
<td>1630-present AD</td>
</tr>
</tbody>
</table>

Most apparent, however, is the extensive exploitation of marine fauna during the Late Archaic Period, which included a variety of fin- and shellfish, and top predators such as swordfish (Spiess and Lewis 2001: 133). The ecological characteristics of this region during the Late Archaic Period, when relative sea levels began to stabilize, air and water temperatures warmed, and biological productivity increased, likely contributed to its human settlement and cultural development (Sanger 1988: 84).

Broad-scale English settlement of the Penobscot region does not occur until the 1760s and after the Treaty of Paris (1763), and historians have generally focused their research on this later Anglo-American settlement (see e.g., Williamson 1877). Historically, Penobscot Bay defines the western extent of what was once known as Acadia, a region claimed by the French in the 17th century that included settlements on the St. John River in New Brunswick, Port Royal and Cape Sable in Nova Scotia, and Pentagoet (now Castine, Maine) in Penobscot Bay. French exploration of Penobscot Bay, which began with the De Monts/Champlain expedition in 1604, must have been followed in short time by other Frenchmen, as Henry Hudson in 1609 noted that Natives were familiar with French traders (Faulkner and Faulkner 1987: 14). Claude La Tour may have established an outpost in the Bay ca. 1610-1613, but it was not until 1613 that a French colony, Saint Sauveur, was founded on Mount Desert Island (Faulkner and Faulkner 1987: 14). This colony was destroyed, however, by the Virginia Company’s Samuel Argall within a few short weeks of its establishment and the site was abandoned.

The first permanent French settlement and fort in the region was Pentagoet. Archaeological excavations and intensive documentary research has revealed that the site
was inhabited continuously for 3,000 years, first by Etchemins, ancestors to the Penobscot, then predominantly by the French from 1629 to 1674. The site was ultimately in possession of the English but was not occupied by them for over 75 years until after the end of the French and Indian Wars in the late 18th century. During this time, the French maintained trade relations with Etchemin (or Penobscot Wabanaki), and had established at least one nearby trading post, Saint-Castin’s Habitation, which existed as part of an Etchemin Village located on the Bagaduce River (Faulkner and Faulkner 1987: 29).

Although the French were the initial European occupants of Penobscot Bay, English settlers managed to infiltrate the region in the second half of the 18th century with the building of the British Fort Pownall at the mouth of the Penobscot River in 1759. The British subsequently built a fort (Majabagaduce) at Castine in 1779. American sentiments to be free of British economic and political controls heightened conflict in the region again during the American Revolution. Penobscot Bay was a prominent scene of British-American hostilities, which culminated in the single greatest naval fleet loss in American history known as the Penobscot Expedition.

In 1779, a fleet comprised of some 40 vessels including brigs, transports and privateers attempted to attack Majabagaduce and expel the British from the region (Hunter 2004). The American forces had nearly succeeded until a British squadron of 6 vessels entered the bay and expedition commanders Dudley Saltonstall, Solomon Lovell and Paul Revere panicked sufficiently to retreat and flee upriver. Although the British were significantly outnumbered in men and ships, nine transports were captured by the squadron. The other vessels escaped upriver, but they were subsequently scuttled by the
Americans to prevent their capture. Three vessels in Penobscot Bay have undergone archaeological investigation: the privateer Defense, and what are probably the remains of the brig Diligent (also known as the Phinney Site), and the Devereaux Cove Site (Hunter 2004: 76; Green 2002). The identification of the latter site as one of the Penobscot Expedition vessels is uncertain, but its hull construction suggests an 18th-century date (Green 2002: 124). However, the splintered and charred remnants of some 30 vessels remain buried somewhere in the Penobscot River and Bay.

Although Diligent and the Devereaux Cove vessel hull preservation is limited to below the bilge turn, the excavation of Defense (1975-1981) uncovered significant hull remains as well as ship supplies and fittings, armament, and personal belongings (Sands 1988: 155). Unfortunately, the hull remains were not properly documented to reveal the true shape, design and construction of the ship. As the Defense hull lies in situ, future investigation of this site, as well as other expedition vessels discovered, will contribute toward understanding the architecture and construction of the first ships outfitted for the U.S. Continental Navy and provide additional details regarding this important event in American history. The Underwater Archaeology Branch of the Naval Historical Center has conducted numerous diver and remote sensing surveys for these vessels with support of the Department of Defense Legacy Resource Management Program, University of Maine, and the Maine Historic Preservation Commission (Hunter and Schmidt 2003; Hunter et al. 2003).

The region in the post-Revolutionary period and throughout the War of 1812 remained hotly contested, leading to construction of another series of coastal fortifications. Fort Castine was built in 1811 and Eatons and Jacobs Point Forts were
erected in Camden ca. 1814. This American building effort and the taking of the British brig *Boxer* by USS *Enterprise* off Monhegan Island in 1813, however, did not prevent the British from retaking and occupying Fort George (Majabagaduce) and Fort Castine in 1814 (Picking 1941). During a period of concern over Maine’s northern borders in the 1840s and later during the Spanish-American conflict, Fort Knox and Madison in Prospect and Castine were also constructed and re-fortified.

Following the end of French and Indian hostilities and the Treaty of Paris there was considerable land speculation, increased settlement, and extensive exploitation of the largely untapped natural resources of the region. Industries that developed in the 19th century included lumbering, fishing, stone and lime quarrying, ice, and menhaden oil and fertilizer production. These industries had a significant impact upon the maritime landscape. Although the mainland held large tracts of mostly untapped forests that were accessible via the Penobscot River and its main tributaries, logging rapidly denuded the Piscataquis and Mattawamkeag Rivers, and the islands of Penobscot Bay of their forests for cord- and kilnwood and shipbuilding needs (Wood 1971: 14).

After the War of 1812, the Penobscot custom district developed as a fishing center, and from 1830 to 1870 it represented a quarter to a third of Maine’s entire fishing fleet (O’Leary 1996: 16-17). The regional fishery declined post-Civil War, however, and shifted back to Portland (Falmouth) as the primary port and market (Goode 1887: 40; O’Leary 1996: 181). At this time, many fishermen began to seine with steamers and weir fish for menhaden to supply the leather-tanning oil and fertilizer factories of Bristol, Boothbay, and Swans and Deer Isles (O’Leary 1996: 256-257). This short-lived industry, however, collapsed in the late 1870s. Lobstering also became popular in the late 19th
century, particularly as demand for lobster by restaurants and inns grew with increased tourism to the region (McLane 1997: 15).

As the fishing industry grew, lime and granite quarrying also burgeoned as significant regional industries. A geologically unique, narrow, vertical vein of lime rock, which extends nearly 20 km (12 mi) from Thomaston through Rockland and Camden to Rockport, was mined as early as 1733 but major extraction and lime production did not begin until the first half of the 19th century (Allin 1987: 187). By the 1880s, the region exported 1.4 million barrels of lime annually by schooner to east-coast cities such as Boston, New York, Philadelphia, and Washington (Maclachlan et al. 2006: 8). On return voyages the schooners brought coal, which was used to fuel the lime kilns. Field and pot kilns were built on the Rockport waterfront in the 1830s, but it was the construction of granite, 12.2 m (40 ft) tall patent kilns built in the 1850s that permitted nearly continuous production of lime (Maclachlan et al. 2006: 28, 43). The high-quality lime from Rockport was typically used in construction of urban and public buildings including the United States Capitol in 1817 (Maclachlan et al. 2006: 26). The kilns were closed in 1958, but the Dragon Cement Company in Thomaston continues to extract limestone for cement and concrete manufacturing. The company plant and quarry is designated a State Historic Civil Engineering Landmark.

Minimally, 35 islands in the bay have been quarried for granite. Experienced stone-cutters from Ireland, Scandinavia and Italy immigrated to the region to work the quarries, but when the decline in bank and bay fisheries occurred in the late 19th century, many fishermen also shifted their occupation to stone-cutting and quarrying (McLane 1997: 318). Prominent granite quarries on Deer Isle and Crotch Island remained in
operation for over a century (McLane 1997: 16). The granite quarries of the bay and islands were conveniently situated alongshore, allowing for relatively convenient transport of the heavy cargo to urban centers by schooners with reinforced hulls. Penobscot Bay granite was also used to construct a variety of government buildings including the Washington Monument and John F. Kennedy’s tomb in Arlington Cemetery. The massive cut-granite wharves of the Stonington waterfront (formerly Green’s Landing) are testament to the area’s post-1870 quarrying era.

While there are more historic districts in Penobscot Bay than any other Gulf of Maine region, few encompass waterfront areas, and the region’s hundreds of extant historic 18th- and 19th-century wharves and landings are grossly under-represented in the Maine state archaeological inventory and National Register of Historic Places. Penobscot Bay has experienced more underwater archaeology than any other region stemming primarily from survey for the 1779 Penobscot Expedition fleet; however, there has been no archaeological study of the nearly 500 or so shipwrecks related to the area’s broader maritime industry themes of fishing, lumbering, lime production, and stone and ice quarrying (Maine Historic Archaeological Sites Inventory 2006). Shipbuilding sites are also largely absent from the state inventory and federal register. Camden and Rockland are notable for their fleet of twelve National Register listed ‘windjammers’ or historic schooners that sail for educational purposes and tourism.
<table>
<thead>
<tr>
<th>Maritime districts, building and sites of Penobscot Bay on the National Register of Historic Places.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baker Island Light Station</td>
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<tr>
<td>Bass Harbor Head Light Station</td>
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<tr>
<td>Bear Island Light Station</td>
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<tr>
<td>Browns Head Light Station</td>
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<tr>
<td>Burnt Coat Harbor Light Station</td>
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<td>Curtis Island Light</td>
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<tr>
<td>Egg Rock Light Station</td>
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<tr>
<td>Fort Point Light Station</td>
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<tr>
<td>Goose Rocks Light Station</td>
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<tr>
<td>Great Duck Island Light Station</td>
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<tr>
<td>Grindle Point Light Station</td>
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<tr>
<td>Heron Neck Light Station</td>
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<tr>
<td>Indian Island Light Station</td>
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<tr>
<td>Isle Au Haut Light Station</td>
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<tr>
<td>Matinicus Rock Light Station</td>
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<tr>
<td>Mount Desert Light Station</td>
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<td>Owls Head Light Station</td>
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<td>Prospect Harbor Light Station</td>
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<tr>
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<tr>
<td>Rockland Breakwater Lighthouse</td>
</tr>
<tr>
<td>Saddleback Ledge Light Station</td>
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<tr>
<td>Whitehead Light Station</td>
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<tr>
<td>Winter Harbor Light Station</td>
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<tr>
<td>Fort George</td>
</tr>
<tr>
<td>Wharf House</td>
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<tr>
<td>Rockport Historic Kiln Area</td>
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<td>Ellsworth Power House and Dam</td>
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Table 19.
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</table>

Table 19 continued. Maritime districts, building and sites of Penobscot Bay on the National Register of Historic Places.
Table 19 continued. Maritime districts, building and sites of Penobscot Bay on the National Register of Historic Places.

### Machias Bay

Machias Bay has all the natural resources and components conducive for human settlement and development: a deep-water bay dotted with islands and protective rocky peninsulas, the freshwater Machias and East Machias Rivers, which fall rapidly into the bay, protective wetlands, abundant terrestrial, avian and marine life, and an extensive forested hinterland. The islands of the bay are composed of dramatic angular and fractured bedrock, which makes the rocky coastal terrain difficult to access. While
navigating the bay is convenient for both small and large watercraft, the extreme shift in tides here, nearly 6 m (20 ft), also requires vigilance if traveling by sea to prevent stranding on rocks or the bay’s vast tidal flats. The region supports a remarkable variety of avian life, including the blue heron, which has its principal eastern U.S. breeding grounds or rookeries on the bay islands. In addition, the Machias River has a significant salmon population, which currently represents approximately 20% of the remaining wild Atlantic salmon in the United States (www.nature.org).

Machias Bay’s maritime heritage is unique for the ubiquitous presence of Native American rock carvings sited along its rocky shores. The ancient petroglyphs of the Passamaquoddy depicted on the ledges of Machias Bay were well-known by bay settlers and documented in 1888 by Mallery Garrick of the Smithsonian Institution (Varney 1886; Garrick 1893). Since the 1970s, petroglyphs have been located on the shores of Holmes Point, and Birch or Clark Point, and Hog Island (Lahti 1976; Hedden 1984, 1985, 1986, 1987, 1989, 1991). These places are listed on the National Register of Historic Places. Another petroglyph site was found recently on the ledges of another bay island (Lenik 2002: 41). The flat, smooth rock formations in the bay provide a broad and visible canvas for the hundreds of pecked and hammered designs, which are mostly anthropomorphic figures and abstracted animal forms. Large seasonal gatherings of Native Americans in birch-bark canoes were witnessed in Machias Bay up until the 1790s; however, from their provenience in the intertidal zone and position relative to sea level, the glyphs are tentatively dated ca. 3,000-380 BP (Drisko 1904 :7; Hedden 1986; Lenik 2002: 44). The rock carvings are believed to represent “the work of tribal shamans and indicate an evolution of the depiction of that experience and, perhaps, an evolution of
the performances or public demonstration of the interaction between shaman and spirit” (Lenik 2002: 45).

Although their presence has not been confirmed by archaeology, historical records indicate the establishment of English and French trading posts and farmsteads in Machias in the first half of the 17th century. Isaac Allerton and Richard Vines of the Saco Bay fishing settlements established a trading post in the bay in 1631, but it was occupied by the French in 1633 only to be re-taken by the English in 1643 (Bradford and Ford 1912: 349). However, the French seem to have endured in Machias throughout the 17th century; their presence confirmed by English census takers in 1688 (McLane 1989: 6). In addition, Sir William Phips reportedly expelled two Frenchman from Machias Bay in his expedition to re-establish British possession of Acadia, New Brunswick and Nova Scotia in 1690 (Baker and Reid 1998: 87).

European activity in the first half of the 18th century in Machias is absent from the historical and archaeological record. It was not until 1763, when English settlers from Scarborough, Maine, in search of marsh hay to feed their livestock, found Machias largely unoccupied and soon thereafter built mills on the Machias River to harvest, saw, and export timber (McLane 1989: 289). Although a small-scale lumbering operation compared to Penobscot Bay, Machias produced a variety of wood products that were shipped as far as the West Indies and the Iberian Peninsula (Wood 1971: 203-4). The towns of Machias, East Machias, and Machiasport developed around the bay’s rivers, streams and tidal inlets, which powered the numerous saw, grist, fulling and carding mills (Varney 1886). Shipbuilding of schooner for lumber transport, fishing and coasting was also a significant local industry; wooden schooners were built on the bay shores until ca. 200
1920 (Duncan 1992: 467). Near-shore and bank fishermen harvested primarily cod in the mid-19th century until the mackerel and lucrative herring fisheries of the Passamaquoddy Bay and Gulf of St. Lawrence region developed ca. 1875 (O'Leary 1996: 108). South of Machiasport, Bucks Harbor developed as the prominent fishing community of the bay (McLane 1989: 296).

Machias has a unique place in American history, as the site of the first naval battle of the American Revolution. In 1775, the British ship Margueritta, a lightly-armed sloop or schooner, was sent to Machias Bay to escort and secure a British Loyalist's lumber cargo from Machias to Boston as well as to recover guns salvaged by Machias residents from the wreck of the British schooner Halifax, which foundered on Sheep Island earlier that year (Duncan 1992: 208). However, a ragtag group of Machias citizens, armed with but a few guns, swords, axes and pitchforks, seized on the opportunity to attack Margueritta. The citizens commandeered the merchant schooner Unity, apprehended the British vessel, killed the helmsman, and with the commander badly wounded, Margueritta surrendered. A subsequent attempt was made to quiet the rebels of Machias only 3 weeks later, but within that time residents had erected and reinforced the coastal defenses of Fort O'Brien and Foster, and somehow were able to repulse the British fleet and prevent the landing of nearly 1,000 men (Duncan 1992: 212). Six weeks later, an overland expedition by the British from Passamaquoddy Bay to Machias was abandoned because of the difficult overland terrain. During the War of 1812, the British finally retook Machias in 1814 without resistance, but realizing there was little threat and few supplies they left Machias after only one week of occupation (Duncan 1992: 270-71).
The bay region is infamous for thick fog and according to Libby Island Light Station records there were at least 35 wrecks near the light between 1856 and 1902 (McLane 1989: 300). The island known as Old Man to the east of Cross Island, and near the entrance to Little Machias Bay, is also a notorious shipwreck site that has been regarded as the “graveyard of coastal shipping” (McLane 1989: 321). Shipwrecks listed in the Maine Historic Archaeological Sites Inventory (2006) in Machias, Machiasport, and Cutler number nearly 100, many of them 19th century fishing and coasting schooners from Canada.

In 1873, 22 lifesaving stations were established along the U.S. Atlantic coast, including 5 in Maine: Quoddy Head Station in Lubec, Fletchers Neck Station in Biddeford Pool, Browney’s Island Station west of Great Wass Island near Moosabec Bay, Whitehead Station on Whitehead Island in Penobscot Bay, and Cross Island Lifesaving Station No. 2 on Cross Island in Machias Bay. In 1929, eight new stations were added along the coast of Maine as well as new boathouses and dwellings added to the original stations. Although a Multiple Property Documentation Form has been filed with the National Register for the “Lifesaving Stations of Maine,” Cross Island Lifesaving Station No. 2 is the only one of the five original stations that is not nominated to the National Register as an individual property. The experiential educational organization, Outward Bound currently owns and has renovated the 1929 dwelling and boathouse for their camp quarters. Although under the jurisdiction of the U.S. Fish and Wildlife Service (FWS) as part of the Petit Manan Wildlife Refuge, the original 1874 lifesaving station has not been maintained by FWS and is now near ruin. With its numerous 18th- and 19th-century
milling operations, it is surprising that no industrial sites are preserved or have been studied in-depth by historians and archaeologists, or listed on the National Register.

Table 20. Maritime districts, building and sites of Machias Bay region on the National Register of Historic Places.

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<thead>
<tr>
<th>Libby Island Light Station</th>
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<td>Maine Archeological Survey Site 62.46</td>
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Quoddy Region

The Quoddy region is generally defined as extending from Cutler, Maine to Point Lepreau, New Brunswick, but this survey is centered primarily around the St. Croix River, the macrotidal estuarine system of Cobscook Bay, the Campobello and Deer Island archipelagoes, and Passamaquoddy Bay (Larsen 2004: 3). The foundations of the rivers
and bays of this dramatic rock-strewn region are slate, shale, sandstone, and volcanic bedrocks. The geology is unusual in that the bays and basins trend in a direction opposite to those of mid-coast and western Maine. Because post-Pleistocene era relative sea levels were as low as -65 m (213 ft), the bay features, which now have average depths of 10-25 m (33-82 ft), were shallow valleys and estuaries until the mid-Holocene. Located at the confluence of the Bay of Fundy and the Gulf of Maine, the region has extraordinary marine biological productivity and diversity that is due primarily to significant freshwater discharge from the St. Croix River, cold Labrador water inflow, and significant tidal fluctuations that exceed 7 m (23 ft) (Larsen 2004: 3).

The St. Croix River is the primary river inflow into Passamaquoddy Bay. The river forms the political boundary between the United States and Canada, and provides water access, albeit via a series of falls and rapids that must be portaged, to the Chiputneticook and West Grand system Lakes. The lower river is generally navigable up to the Milltown falls above Calais and St. Stephen. Upriver dams have significantly diminished migration of anadromous species such as alewife and salmon and the introduction of invasive species has deteriorated native trout populations (Sanger 1987: 125). Moose, caribou, and deer habitat the river corridor and the lakes are populated with beaver, muskrat and abundant avian life. The river has numerous regulatory schemes and conservation management initiatives that are governed primarily by the St. Croix River International Waterway Commission as well as numerous state agencies and land trust organizations.

Archaeology in the region began as early as 1797 at the de Monts–Champlain colony on St. Croix Island, but beyond excavation and study of this first European
colonization attempt in New England, historical archaeology has been relatively absent (Sanger 1987: 5). Rather, ethnography of the Passamaquoddy-Maliseet culture and archaeology of their ancestors, the Etchemin, has been the focus of areal research. In 1881, the Smithsonian Institution founder, Spencer Baird, was one of the first to investigate the Passamaquoddy Bay shell middens in *Notes on Certain Aboriginal Shell Mounds on the Coast of New Brunswick and New England*. The R.S. Peabody Foundation of Andover, MA, surveyed sections of Passamaquoddy and Cobscook Bays in the 1950s. In the 1960s, David Sanger of the University of Maine began systematic archaeological survey and excavation of the region’s coastal prehistoric landscape and archaeological sites (Sanger 1987).

Sanger’s research established that the Passamaquoddy and Cobscook Bays have a rich archaeological record, particularly from the Woodland (or Ceramic) Period. Coastal occupation before 3,000 BP is not present on the bay shores; sea level rise has likely inundated or eroded older coastal sites (Sanger and Kellogg 1989: 120). Sanger defines a ‘Quoddy Tradition,’ which began ca. 2,200 BP and exhibits relatively stable coastal subsistence and settlement strategies. Contrary to the widely held theories of prehistoric peoples’ transhumance espoused by Snow (1980), that coastal settlement and marine resource exploitation was primarily a warm season phenomenon with migration in colder seasons to sheltered hinterlands, Sanger’s research revealed that the northern shores of Passamaquoddy Bay were occupied throughout the winter and year (Sanger 1996: 523). Additionally, he notes that although there are variations in lithic and ceramic technologies throughout the Quoddy Tradition, “a cosmological and spiritual centrality united the region” (Sanger et al. 2006: 23).
The historical extent of the Passamaquoddy Indian region and Quoddy Tradition has been defined further in recent years through ethnographic research, namely a Passamaquoddy place-name study and development of a Passamaquoddy-Maliseet language dictionary (Sanger et al. 2006). Currently, the coastal zone of the historic Passamaquoddy homeland extends from the Union River in Maine north to Point Lepreau, New Brunswick (Sanger et al. 2006: 315). Historical evidence and oral traditions place firmly the St. Croix River as central to Passamaquoddy cultural geography. In 1704, a large Passamaquoddy settlement existed near Salmon Fall but it was abandoned for St. Andrews in the mid-1700s when an influx of British Loyalists from America forced their migration to Deer Island. They ultimately made an agreement with Massachusetts to cede their lands in eastern Maine for a 23,000-acre settlement on Lewis Island near Calais and at Sipayik or Pleasant Point peninsula (Wicken 2005: 53; Bourque et al. 2001:226).

With a decline in hunting and increased agriculture and sedentism in the 19th century, the Passamaquoddy began to produce wood products, basketry, and birch-bark torches and herring sticks for the period’s burgeoning herring fishery. They continued to hunt porpoise from birch-bark canoes through the 19th century for their high-quality oil. These canoes were 5.4–6.0 m (18-20 ft) in length with a wide beam and high free-board (Adney and Chapelle 1964: 75). Although examples of these craft exist in museums (e.g., Maine State Museum in Augusta, ME), neither birch-bark nor dugout canoes from the region have been documented in an archaeological setting.

The Quoddy region in the 19th century developed as the Gulf of Maine’s prominent herring and sardine fishery and processing center. Herring fishing in the first
half of the 19th century was prosecuted not in local waters, but in the Gulf of St. Lawrence around the Magdalen Islands. Until ca. 1850, fishing fleets caught herring primarily at the Magdalenens and returned to their respective ports of Lubec and Eastport to smoke and box their herring catch for export (O’Leary 1996: 110). When the Magdalen herring fishery declined precipitously ca. 1875, herring fishermen turned to the local inshore herring grounds. Although not as prized for smoking or pickling, the Quoddy region herring were small and ideal for canning. The first sardine (or small herring) cannery was built in Eastport in 1875. By 1886, 45 fish-processing and canning plants were in operation, mostly at Eastport and Lubec (O’Leary 1996: 261). Herring were caught mostly in hundreds of makeshift stone and brush tidal weirs extending from the shores of Passamaquoddy and Cobscook Bays. The catch was then transported to the canneries by small sloops known as “carryaway boats” (O’Leary 1996: 260).

Herring fishing for regional settlements was “one of the three commodities that formed the bedrock of their maritime commerce” (O’Leary 1996: 134). Plaster and wood laths were the other key products. The bulk of these products were shipped from Lubec plaster mills to New York via coasting schooners for use in construction. Ground gypsum was also used in agriculture as fertilizer, particularly in the southern United States (Smith 2005: 118). Gypsum for plaster production was mined near the head of the Bay of Fundy and generally smuggled into American, Passamaquoddy Bay ports for processing. Smuggling was conducted initially by Loyalists from Penobscot Bay that were displaced to St. Andrews, New Brunswick after the American Revolution. Post-Revolution, these merchants supplied the Royal Navy in Halifax with mast timber in exchange for contraband British goods that could fetch high prices in urban American markets (Smith
2005: 116). It was gypsum smuggling, however, in the first decades of the 19th century, that became so prevalent and profitable it culminated in the “Quoddy Plaster War” of 1820, a small but armed conflict between Loyalist and Passamaquoddy Bay merchants and the New Brunswick and American officials who sought to regulate their trade (Smith 2005: 121). The illicit trade of gypsum from New Brunswick to U.S. ports continued well into the 1850s.

Despite the relatively intensive archaeological and ethnographic research in Passamaquoddy Bay, no prehistoric archaeological sites or cultural landscapes important to the Passamaquoddy are currently represented on the National Register of Historic Places. Additionally, Cobscook Bay is known to contain prehistoric and historic Native American archaeological sites, but “has been neglected as a research area” (Sanger 1987: 110). Except for the McCurdy Smokehouse of Lubec, neither the herring nor the plaster industries of Washington County are represented on the National Register of Historic Places (TAB. 1). The extant wharves and waterfront structures of the Red Beach Plaster Company in Calais, which is dated to 1838, for example, may be suitable for intensive study and potential listing to the National Register (Morrison 2004; D.H. Bailey & Co. 1889). The Maine Historic Archaeological Sites Inventory (2006) lists further 274 shipwrecks in Washington County with nearly 100 of these occurring in Eastport, Lubec and Calais. Although Lubec, Calais and Eastport have historic districts listed on the National Register, none are based on or encompass waterfront areas and structures.
Georges Bank

The first known description of Georges Bank was by Giovanni da Verrazzano following his 1524 exploration of the northwest Atlantic Ocean. In a letter to Francis I, he states that “We found sandbanks which stretch from the continent 50 leagues out to sea. Over them the water was never less than three feet deep: thus there is danger in sailing there. We crossed them with difficulty and called them *Armellini*” after a tax collector, Francesco Cardinal Armellini (Wroth 1970: 140). The first representation of the Armellini Shoals appears on the Salviati Mappemonde (ca. 1525), which is based, in all likelihood, on information provided by the Portuguese explorer Estevão Gomez (McCorkle 1987: 11). In the early 1600s, with descriptions and maps by English and French explorers including those of Gosnold, Pring, Champlain, Waymouth and Smith, Georges Bank begins to take on its true shape. The bank derives its name after the
English colonist and land patent holder, Sir Ferdinando Gorges, who was the primary financier for the founding of Popham colony, established on the Kennebec River in 1607 (McCorkle 1987: 10).

Georges Bank, as we know it today, forms the majority of the southern boundary of the Gulf of Maine ecosystem. Lying between the Northeast Channel (230 m depth) and the Great South Channel (75 m depth), the bank is approximately 280-km long and 150-km wide. The edges of the bank can be defined at the 100-m isobath, but depths are as shallow as 3 m. Beyond 100 m and along the southern edge of the bank is the rim of the continental shelf. The shelf is indented with submarine canyons that extend to a depth of over 3000 m to the abyssal plain of the Atlantic Ocean. The area of Georges Bank, within the 100-m isobath, is approximately 33,700 km$^2$, or roughly one-third of the area of the Gulf of Maine or the size of Massachusetts, Connecticut and Rhode Island combined (Backus 1987: 22).

Following Wisconsinan glaciations and prior to sea level rise in the early Holocene Georges was connected to the mainland. It elevated at least 40-50 m and was covered by boreal forest (Emery et al. 1965). The discovery of salt-water peat by scallop fishermen near Great South Channel in the 1960s, also revealed that estuarine environments existed along the fringes of the Georges landmass ca. 11,000 BP. Oyster shells recovered from near the channel at depths of 30-60 m, and dating from 8,000 to 11,000 BP m, add to the body of evidence that such estuarine systems were present (Emery et al. 1965: R99). Sea level rise ca. 6,000 BP, ultimately drowned these estuaries, and the glacial sediments of the bank were reworked and eroded further by continued sea level rise, the ebb and flood of tides, and storms.
The presence of undisturbed paleosols beneath thick layers of sand and silt alludes to the possibility of preserved prehistoric cultural materials and landscapes. The fossilized bones of walrus, mastodon, mammoth, giant moose, musk ox, horse, giant sloth and tapir, oyster and plants material recovered by fishermen provide a glimpse of the preservation potential as well as illuminate the diversity of late-Pleistocene and early-Holocene megafauna of Georges Cape or Island (Uchupi 1964: 20; Emery 1987: 39). Georges was the southern extent of late-Pleistocene glaciations, and following glacial retreat and isostatic rebound, Georges would have been the first and most northeasterly landmass exposed in North America and where humans could have hunted and lived. Surface detection for evidence of human occupation is highly unlikely, as centuries of bottom-trawl and scallop-drag fishing, and extensive reworking of sediments by tides and storms makes such detection impractical. However, the northern edges of Georges Bank, coincident with the presence of ancient fauna and intact peat deposits 30-60 m below sea level, are perhaps areas where the discovery of deeply buried, undisturbed soils may provide evidence of an early human presence.

The ridge of the continental shelf, where Gulf Stream water collides with the colder and shallower Gulf of Maine waters, is a highly diverse and productive biological area. Georges Bank has one of the highest rates of primary production or phytoplankton growth in the world - three times the mean rate for world continental shelves and almost ten times the open ocean rate (Bourne and Yentsch 1987: 210). The bank’s commercial fish production is world-renown, and is also home to a variety of large, migratory pelagic predators (shark, swordfish and tuna), sea turtles, seabirds, and marine mammals (whales, dolphins and porpoises). Surprisingly, Georges Bank did not become a prominent fishing
ground until the mid-19th century. Fishing trips were made to Georges as early as the mid-18th century, but it was not until the 1820s that Gloucester fishermen regularly went for cod, mackerel, and halibut, and by the mid-century, haddock and swordfish (German 1987: 409). The scallop fishery dates back to the 1860s, but significant exploitation of sea scallops on Georges Bank did not occur until the 1920s (German 1987: 410).

Shipwrecks are ubiquitous on Georges Bank. NOAA navigational charts (e.g., Gulf of Maine and Georges Bank [No. 13009]) show the locations of dozens of fishing obstructions and wrecks, but reveal only a fraction of the probably hundreds of vessels that have foundered on the bank. There is a prevalence of shipwrecks on the ‘Southeast Part’ of the bank, reflective of the rich yet dangerous fishing grounds that lie near the edge of the continental shelf and warmer Gulf Stream waters. The majority of shipwrecks are likely fishing-related, but ships of exploration and those engaged in trans-Atlantic trade also had to navigate the shoals of the bank and possibly wrecked here. In consideration of the bank’s significant biological diversity, productivity and abundance, and the profuse presence of cultural materials (in the form of shipwrecks), Georges Bank is a leading candidate for marine protected area designation. However, extensive exploration and survey is necessary in order to precisely quantify the number and condition of archaeological sites on Georges Bank. There is no shipwreck from Georges Bank listed on the National Register.

**Stellwagen Bank**

Stellwagen Bank lies between Cape Ann, MA and the tip of Cape Cod, and separates the larger Gulf of Maine from the inshore waters of Massachusetts and Cape
Cod Bay. The bank was an exposed land mass during a sea-level low stand of 40-60 m approximately 10,000 years ago, and it would have been accessible at that time to prehistoric peoples and post-Pleistocene mega-fauna such as mastodon and caribou (Pelletier and Robinson 2005; Barnhardt 1994; Peltier and Tushingham 1989). Today, this submerged bank is ca. 30 km (18.75 mi) in length, and at its widest point, roughly 10 km (6.25 mi) across. Depths vary from 91 m (300 ft) off the northern end near Cape Ann, MA, to within 19 m (65 ft) at its mid-section. As the bank nears Cape Cod, depths increase to approximately 60 m (200 ft). Upwellings on Stellwagen Bank create a particularly productive environment for plankton, species that feed on plankton, and the species that feed on them. A variety of groundfish species can be found on the bank, including halibut, cod, pollock, haddock, skate, yellowtail founder, winter flounder, goosefish, sculpin, and dogfish. Common migratory species include sea herring, alewives, bluefish, tuna, swordfish and mackerel. The bank is also famous for its many visiting whale species, including finbacks, minkes, humpbacks, and North Atlantic right whales (Ward 1995).

Stellwagen Bank was well-known to fishermen, merchants, explorers and settlers by the 17th century, as any seagoing vessel could not enter into Massachusetts Bay to reach the region's plantations and colonies without crossing this fertile ecosystem. Maps from the early 1800s refer to this historic fishing ground as "Middle Bank" (Lambert 1812). "Stellwagen Bank", however, was not officially named and charted by the federal government until 1854, when Henry S. Stellwagen, then commander of a U.S. Coast Survey team informed Survey Superintendent Alexander Dallas Bache that "I consider I
have made an important discovery in the location of a 15-fathom bank lying in a line between Cape Cod and Cape Ann” (Ward 1995: 20).

The strategic location of Stellwagen Bank between Massachusetts Bay and the Gulf of Maine, its proximity to land, and abundant fish resources, have made it a primary food source and point of resource extraction for approximately 400 years. While other bays and banks within the Gulf of Maine historically have yielded significantly greater amounts of fish products, few banks in the gulf have the consistent, well-documented, and long-term fishing history of Stellwagen Bank. Consequently, Stellwagen Bank presents an excellent case for studying the affects of 400 years of continuous human interaction with this marine environment.

Cape Cod and Massachusetts Bay fishermen in the 17th and 18th centuries fished Stellwagen (Middle) Bank using simple technologies. Most commonly, day fishermen employed small sailing vessels and dories to catch halibut, cod, and haddock with baited hook-and-line. In the late 1850s, however, bank fishermen began to use tub trawls (also referred to as long-lines, bultows, and trawl lines) to catch these fish. Traditional hook-and-line or ‘jigging’ fishing techniques, which were used to catch schooling fish such as mackerel and sea herring, were also largely replaced with seine and gill nets by the 1870s and 80s (Collins 1887). In the early 20th century, steam-powered otter trawlers and gas-screw boats began to replace sailing vessels and long-line fishing in the Stellwagen Bank area (Jensen 1967: 6-7; Alexander et al. 1915: 15). Access to the fisheries of Stellwagen Bank changed dramatically after this period, as internal combustion- powered fishing vessels with gill nets and otter trawls were able to reach the bank within a few hours.
Merchant trade and passenger transportation across Stellwagen Bank represent a significant part of the Gulf of Maine’s maritime history that is related directly to the economic development of Massachusetts. Coastal communities, particularly those on Cape Ann (e.g., Gloucester, Marblehead, and Rockport) and Cape Cod (e.g., Provincetown and Truro), have strong historical ties to the bank through centuries of fishing as well as merchant trading and passenger travel with Boston and other New England ports. Historically, the City of Boston was one of the nation’s primary commercial ports of call and immigration hubs. Until the Cape Cod Canal was built in 1914, all seaborne trade and travel in or out of Boston crossed the bank. Consequently, “several hundred historic vessel losses” have occurred in the vicinity of Stellwagen Bank (SBNMS 2007: 113).

In 1992, the Stellwagen Bank National Marine Sanctuary (SBNMS), an area covering 2180 km$^2$ (842 mi$^2$), was authorized as a National Marine Sanctuary by the U.S. Congress under the National Maritime Sanctuaries Act of 1972 (NMSA) to “enhance public awareness, understanding, appreciation and wise and sustainable use of the marine environment, and the natural, historical, cultural, and archaeological resources of the national Marine Sanctuary System” (Section 301). Specifically, NMSA mandates that the sanctuary program “support, promote, and coordinate research on, and the conservation, curation, and public display of, the cultural, archaeological, and historical resources” (Section 309). To meet this mandate, SBNMS has instituted a marine archaeology program that nominates shipwrecks to the National Register of Historic Places and actively conducts marine surveys to discover, document, and manage and protect maritime cultural resources within the sanctuary (see Draft Environmental
Plan/Environmental Assessment (SBNMS 2007: 111-122). Additionally, the sanctuary conducts public outreach activities and supports coastal communities, for example, in attaining “Preserve America” designations (SBNMS 2007: 11); a program initiative issued by President George W. Bush on March 3, 2003 (Executive Order 13287).

While there is the possibility of the existence of submerged prehistoric sites within the sanctuary, archaeological research in SBNMS has focused primarily on survey and documentation of historic-era shipping and transportation-related watercraft. To date, sanctuary archaeologists have located eighteen historic shipwrecks (SBNMS 2007: 113). Archaeological surveys have mapped 85 km$^2$ (32.8 mi$^2$), yet this area represents only four percent of the total sanctuary area (SBNMS 2007: 112). Following intensive deep-water remote-sensing surveys, documentation and historical research by sanctuary staff, the late 19th-century passenger steamer *Portland* was nominated and listed to the National Register of Historic Places in 2005, and in 2006 the wreck site of the early 20th-century coal schooners *Frank A. Palmer* and *Louise B. Crary* were listed (Marx 2004; Lawrence 2004, Marx and Lawrence 2004; Marx and Lawrence 2006). In addition, the 5-masted schooner and collier *Paul Palmer* was nominated to the register and listed in 2007 (Marx and Lawrence 2007). These are the only watercraft in federal Gulf of Maine waters that are listed on the National Register.
### Table 22. Shipwrecks of Stellwagen Bank on the National Register of Historic Places.

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<thead>
<tr>
<th>Theme</th>
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<th>Frank A. Palmer and Louise B. Crary</th>
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**Analysis and Summary**

Historic properties, archaeological sites and cultural landscapes that are notably absent are associated with the following themes: Native American Culture and Society, Fishing and Whaling, Shipbuilding, Race and Ethnicity, Waterfront and Sea Defense, and Maritime Landscapes (TAB. 23). The maritime themes Navigation, Industry and Energy, Commerce and Trade, and Military, Navy and Coastal Defense, although deficiencies exist in some areas, are well represented in the broader Gulf of Maine region. It should be noted that numerous properties, sites and landscapes are ‘eligible’ for listing under National Register criteria, but have not been formally nominated. However, until places are officially nominated and listed, they generally remain outside of public, and even scholarly, purview. Therefore, nomination of eligible places would assist in filling in the gaps of maritime thematic representation on the register.
Native American Culture and Society on the National Register is especially prolific in Mid-Coast Maine and Penobscot Bay regions, but overall, poorly represented on the register. Although many Native American places and sites are eligible, and therefore protected by law, the dearth of properties listed on the National Register makes them invisible to the public. Moreover, no maritime landscapes significant to Native Americans are eligible or listed on the register. Finally, the potential for presence of submerged prehistoric archaeological sites and landscapes off the New England coast is understudied and thus unknown, but warrants special attention because of the anticipated increase in offshore development projects.

Table 23. Representation of maritime themes on the National Register of Historic Places by area: (●) Theme represented on the register, (○) Theme present but no register listing, (?) Presence of theme is unknown, (x) Theme does not exist.
Table 23 continued. Representation of maritime themes on the National Register of Historic Places by area: (●) Theme represented on the register, (○) Theme present but no register listing, (?) Presence of theme is unknown, (x) Theme does not exist.

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<th>Area</th>
<th>Piscataqua River</th>
<th>Saco Bay</th>
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<th>Mid-Coast Maine</th>
<th>Penobscot Bay</th>
<th>Machias Bay</th>
<th>Quoddy</th>
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There are very few historic properties, places and sites in the Gulf of Maine representative of the region’s rich fishing and whaling history. While historic districts in New Bedford and on Nantucket provide some representation of whaling activities via preservation of domestic properties and historic residences, the districts lack representation of the commercial aspects of whaling and the waterfront structures associated with the industry. There are even fewer registered places representative of the fishing industry. The dearth of fishing-related properties is likely due to the fact that fishing remains a prominent activity in the Gulf of Maine. Moreover, archaeological sites related to fishing are industrial in nature and lack the material culture present at domestic archaeological sites and historic properties. Generally, fishing facilities are also poorly constructed, and extant structures are rarely preserved. Fishing-related archaeological sites, however, are important because they contain environmental data regarding past ecosystem conditions such as abundance and diversity of marine species, as well as how the harvesting and processing of fish impacted the coastal landscape and the marine environment. Furthermore, New England’s earliest coastal communities were fishing-
based, and archaeological research and conservation of these types of properties can provide a glimpse into the economy, society and culture of New England’s formative historic period. No fishing-related vessels or shipwrecks from the Gulf of Maine are currently listed on the National Register.

Shipbuilding, which was also one of the Gulf of Maine’s most prolific industries, is poorly represented on the National Register. Although the archaeological record of shipyards offers little in the way cultural refuse, shipbuilding involved significant alteration to the coastal landscape, including land reclamation and excavation for construction of ship building and launching facilities such as locks, canals and dry docks. The thick wood debris deposits typically found at shipbuilding sites, which may yield information about the past condition of New England forests, has yet to be explored. Studies on National Register shipyards and boatbuilding sites have focused on the engineering and methods of vessel construction, as well as documenting the lives of shipyard owners and operators, but rarely do such studies tackle issues of immigration and labor, and race and ethnicity of shipbuilding communities (see e.g., Snow and Lee, *A Shipyard in Maine*, 1999).

Waterfront and Sea Defense, Maritime Landscape, Race and Ethnicity, and Marine Research and Science are also themes in the Gulf of Maine that lack representation on the National Register. In general, research and documentation of archaeological sites and properties relating to these themes has been insignificant. Reasons for deficient representation of these themes vary. Waterfront and Sea Defense properties often include monumental architecture in the form of sea walls and jetties, but these properties, which are often partially submerged or buried, consist of multiple
building phases in urban environments that are difficult to document and rehabilitate. Maritime landscapes are also typically complex properties that may cover miles of coastal, riverine or underwater areas with vague boundaries and multiple property types. Race and Ethnicity, unless complemented by historical documentation, is difficult to detect and document in the archaeological record. Finally, Marine Research and Science facilities, stations and vessels, are currently not listed to the register because of their relatively young age, but should be nominated to the register in coming decades because of their unique contribution to understanding of the oceans and estuarine environments of the Gulf of Maine.

Maritime themes in the Gulf of Maine that are well-represented include Navigation, Industry and Energy, Commerce and Trade, and Military, Navy and Coastal Defense. Within these categories, however, listings of specific property types related to these themes are noticeably absent. For example, Navigation is represented in each region by lighthouses, but other prominent navigational aids such as channel markers and spindles are unlisted. Listings of watercraft related to Industry and Energy and Commerce and Trade are also largely deficient. Currently, no listings or nominations exist for historic shipwrecks in Maine, New Hampshire, or Massachusetts state waters. The Coastal Defense theme has numerous listings, but most WWII coastal fortification and batteries, though eligible, have also not been nominated to or listed on the register.

Additional and significant research, documentation, and nomination of eligible register properties is needed in most all regions with the exceptions of Boston, Cape Ann, Mid-Coast Maine and Penobscot Bay. However, the offshore regions of Stellwagen Bank and Georges Bank, have very few, and in the case of Georges, no properties listed on the
National Register. The Stellwagen Bank National Marine Sanctuary (SBNMS) has made significant headway in the nomination of several shipwrecks – the only watercraft in New England federal waters currently listed on the register. Georges Bank, primarily under jurisdiction of the Mineral Management Service (MMS) and National Marine Fisheries Service (NMFS), currently have no management plans for documentation or conservation of submerged cultural resources, let alone an action plan to nominate cultural resources to the National Register. NMFS, which manages marine resources and fishing activities on Georges Bank, has neither reviewed nor complied with NEPA and NHPA in the determination of the impact of commercial fishing upon cultural resources. With the exception of Stellwagen Bank, no systematic survey or research has been conducted in order to measure the presence and extent of offshore cultural resources. A preliminary survey of only four percent of SBNMS has clearly shown the potential for well-preserved shipwrecks and significant maritime cultural resources offshore (SBNMS 2007: 112). An equally impressive archaeological record can be expected for regions such as Georges Bank that have a long history of marine exploitation. Without survey, research and management, the submerged cultural resources of places such as Georges Bank will be lost not only by natural degradation but also natural gas and petroleum extraction, seafloor development and commercial fishing.
A SUSTAINABLE APPROACH TO CULTURAL RESOURCE MANAGEMENT

The terms *sustainable development* or *sustainability* first appeared in a publication by the International Union for the Conservation of Nature in 1980. The publication was the result of a growing awareness of the global effects of environmental degradation, and an effort by the international community to develop an economic strategy to balance human and environmental needs. The concept of sustainability did not receive full attention, however, until the end of the 1980s when a much broader definition of sustainable development was drawn by the World Commission on Environment and Development, also known as the Brundtland Commission. The Brundtland Commission Report defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987: 43). Since the publication of the report by the commission in 1987, sustainable development has become a widely accepted philosophy for developing regulations and building programs that maintain environmental integrity and promote long-term economic growth. The broad characterization of sustainability by the Brundtland Commission has also led to other related, conceptual developments such as sustainable architecture, sustainable tourism, sustainable democracy, and even sustainable military forces.
As an approach that intends to provide intergenerational equity (i.e., satisfy the needs of present and future generations), sustainable development has seen surprisingly limited implementation in cultural resources management. Cultural heritage is noticeably absent in the Brundtland Commission Report, with the exception of one statement by Aristides Katoppo: “basic needs include the right [of people] to preserve their cultural identity, and their right not to be alienated from their own society, and their own community” (WCED 1987: 31). If this fundamental cultural right is recognized, it still remains to be determined how sustainability can be used to meet these basic needs, and how sustainable development can be implemented to preserve cultural identity for present as well as future generations.

Both UNESCO and the National Park Service (NPS) briefly touch upon the concepts of intergenerational equity and sustainable development in their definitions of cultural resource management. NPS states that cultural resource management “involves research, to identify, evaluate, document, register, and establish other basic information about cultural resources; planning, to ensure that this information is well integrated into management processes for making decisions and setting priorities; and stewardship, under which planning decisions are carried out and resources are preserved, protected, and interpreted to the public” (NPS 1998: 1). Cultural resource management, according to UNESCO, “encompasses recognition, description, maintenance, security and the overall management of cultural resources. The objective of cultural resource management is to ensure the protection of the cultural significance, integrity and authenticity of the resource for present and future generations through conservation and sustainable resource utilization” (Box 1998: 3).
Conference and workshop proceedings have recently begun to address the potential of integrating cultural resource management with sustainable development (Hutter and Rizzo 1997; Schuster et al. 1997; De la Torre 2002; Teutonico and Palumbo 2002). The U.S. President’s Advisory Council on Historic Preservation (ACHP) is also recommending the application of ecological economic valuation methods for the purpose of analyzing the costs and benefits of heritage tourism (ACHP 2003, 2002a, 2002b). However, which principles of sustainability (beyond intergenerational equity) are useful to cultural resource management and how exactly they should be applied is uncertain. In the following sections I first discuss the similarities and differences between natural and cultural resources. Then, I define the principles of sustainability that may guide cultural resource management and provide an ethical foundation for conservation of heritage resources. I also consider the applicability of ecological valuation techniques to assess the value of the Gulf of Maine’s maritime cultural resources. Finally, I discuss the concepts of ‘significance’ and ‘value,’ and outline an integrative process to assess maritime cultural and archaeological resources.

**Natural and Cultural Resources**

At face value, cultural resources are not much different from natural resources. Natural resources are comprised of renewable (e.g., fish and timber) and nonrenewable (e.g., minerals) resources, the ecosystems that maintain the quality of the environment, and the vast genetic library known as biodiversity (Throsby 2002: 106). Cultural resources also consist of renewable resources (e.g., historic buildings) and nonrenewable resources (e.g., archaeological sites). Like natural resources, they require support and
maintenance, and their flow of economic and social benefits can depreciate if they are not
cared for. As a mechanism by which humans adapt to and make sense of the natural
world, culture and its by-products may also be considered an ecosystem function. As
biodiversity is essential to maintaining natural ecosystems, likewise cultural diversity is
fundamental to the stability and functioning of society (WCCD 1995).

Although ecological scientists and environmental policy makers have been
surprisingly unaware of the similarities and the interconnectedness of natural and cultural
systems, cultural resource managers have sought for decades to align cultural resource
management with environmental policies and regulations that support the long-term
sustainable development of archaeological sites and historic architecture (Lipe 1984).
Much like natural resource management, in order for managers to make good decisions
about cultural resources, regional baseline data are needed to answer questions such as:
what are the existing legal and management frameworks, what types of resources are
located in the region, what are the physical and biological processes affecting the
resources, what are the potential human and environmental threats to the resources, who
are the stakeholders and users of the resources, and how can management respond to
change while continuing to provide appropriate access to resources?

Fortunately, environmental legislation has been utilized by cultural resource
managers and archaeologists in the U.S. for a few decades with reasonably good success
(King 1998: 16-17). The overarching legislation that protects natural resources in the
U.S., the National Environmental Policy Act of 1969 (NEPA), defines the human
environment as “the natural and physical environment and the relationship of people with
that environment.” Specifically, Section 101 of NEPA articulates that it is the
responsibility of the federal government to “preserve important historic, cultural, and
natural aspects of our national heritage, and maintain, wherever possible, an environment
which supports diversity, and variety of individual choice.” Within this definition the
flow of benefits from cultural resources are on an equal footing with natural resources.
Accepting this definition concedes that efforts to conserve pieces of the natural landscape
will likely result in the preservation of the cultural landscape, as most ecosystems retain
evidence of a human presence or past. Whether it is the scars of scallop draggers on the
seafloor, roads that crisscross the landscape, or the pollution in the air, few ecosystems
are exclusive of human impacts. Conceptually then, the treatment of cultural resources
can potentially apply the same principles of sustainability, ecological economics, and
methods to guide management and formulate policy that are used in natural resource
conservation and management.

**Principles of Sustainable Development**

The principles of sustainability can provide the holistic framework within which
the overall goals and objectives of maritime cultural resource management may progress.
Sustainable development approaches to natural resource management can further provide
a model for capturing the overall worth of cultural resources in terms of their historical,
cultural, social, environmental, as well as economic value. Economist David Throsby has
highlighted a number of sustainable development principles that can be used to guide
cultural resource management and valuation (2002). His list of principles is reiterated
here, but with some modification of terminology and with emphasis on maritime cultural
resource conservation and management in the Gulf of Maine.
**Intergenerational Equity**

Intergenerational equity is the root principle of all other branches of sustainable development philosophy. As the keystone principle of sustainable development of cultural heritage resources, intergenerational equity is referred to by Throsby as “fairness in the distribution of welfare, utility or resources between generations” (Throsby 2001: 54). The principle is often invoked in cultural heritage conservation using the common cliché ‘preserving the past for the future.’ Beyond this notion of providing future generations with access to resources and an opportunity to know their past, the principle tacitly rejects short-term exploitation of resources for financial gain and reinforces conservation and sustainable use of heritage resources in order to achieve long-term social and economic growth and stability.

**Intragenerational Equity**

Less known but equally important, intragenerational equity infers access to resources for present generations or existing members of society. Fairness is recognized as a principle in the distribution of wealth among the present generation, and intragenerational equity asks whether the direct benefits of heritage conservation are uniformly accessible to all community groups (Throsby 2002: 109). Wide participation in planning and decision-making processes is necessary in order to balance stakeholder and resource-user interests. Intragenerational equity asserts that all community groups with a stake in cultural heritage should have a voice in managing change and conservation of the human environment. Stakeholders in maritime heritage may include native and
community interest groups (e.g., tribal groups, historical societies, and recreational diving clubs), those involved in maritime-related industries (e.g., fishermen, shipbuilders, and commerce and transportation specialists), conservation professionals (e.g., archaeologists, historians, and preservationists), resource managers, developers, planners and government (e.g., federal, tribal, state, local).

**Precautionary Principle**

Originally an outgrowth of European efforts in the 1970s to limit environmental damage and promote long-term management of natural resources before irretrievable loss occurs (Rosenberg 2000: 577), the precautionary principle is firmly grounded in sustainable development theory (WCED 1987). It considers the needs of future generations by avoiding present and future actions that will result in irreversible change to the environment. The principle also recognizes the importance of biodiversity in nature and the interconnectedness of human and natural systems; notions essential in determining the full effects and impacts of change on natural and cultural resources (FAO 1996). In 1992, this principle was applied as an approach to curtail irreversible damage to fish stocks worldwide by the United Nations Conference on Environment and Development. Principle 15 of the United Nations Rio Declaration states that “in order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation” (Johnson 1993). Few states have implemented the precautionary approach. Archaeologists, architectural preservationists
and cultural resource managers have not included (and in most cases are unlikely to have
even heard about) the precautionary principle and its potential use as an approach to
resource management. However, recognition of the approach by national ocean
commissions and research councils shows that it is becoming widely accepted in the U.S.
(e.g., U.S. Commission on Ocean Policy 2004).

The precautionary approach is an applicable framework that can work within
existing heritage legislation and management regimes. When managers are faced with
uncertainty, for example, about the presence of submerged prehistoric archaeological
sites within an area that will be irreversibly damaged by human action, they typically
favor the proposed action. The precautionary approach turns this traditional management
response on its head. It means that the burden of proof is on the developer or exploiter to
demonstrate that there will be no significant long-term impacts to cultural resources (see
e.g., Dayton 1998). Even in the face of uncertainty and limited scientific information,
decisions leading to irreversible change should err on the side of resource conservation.
Uncertainty or lack of information should not preclude making management decisions
that prevent damage to maritime cultural heritage.

**Cultural Diversity**

Similar to biodiversity in nature, cultural diversity is a measure of cultural health
and system stability in society. Referred to as the “common heritage of humanity”
(UNESCO *Universal Declaration on Cultural Diversity* [2001]) as well as the
“mainspring of sustainable development” (UNESCO 2004: 11), cultural diversity can be
defined simply as the multiplicity and wealth of distinct practices, traditions, values, and
belief systems of different groups of people. A variety of American, European, African, and Asian cultures exist throughout the Gulf of Maine. Monuments, buildings and landscapes as well as cultural traditions and practices, have varying significance to these different groups. Exactly which aspects of the human environment should be conserved is dependent primarily upon individual and group interpretations and perspectives. Participation and recognition of minority and ethnic groups in community decision-making is essential in managing change and also for maintaining cultural diversity.

In what is an increasingly global and homogenized world, cultural diversity helps to enhance respect, dignity, and appreciation for different ways of life. This principle stands for freedom of expression, empowers communities, creates a sense of belonging, and enriches human co-existence. Therefore, actions taken under the guise of cultural or religious righteousness, which lead to oppression of minority groups and women, or results in the destruction of cultural heritage, are in direct opposition to this principle. Cultural diversity also has economic significance. Although tourism can degrade the quality of local culture, diversity is essential to heritage tourism in that it provides unique experiences and makes places attractive to visitors.

**Interconnectedness of Systems**

There is a strong link between how the environment shapes culture and *vice versa*. Culture and its tangible and intangible heritage resources reflect the diverse strategies developed and used by humans to adapt to certain environmental conditions. Although definitions of ecosystems typically do not explicitly refer to humans, the dynamic interaction between humans (as living, biological organisms) and the physical
environment, means that humans are part of ecosystem processes. The notion that cultural and natural systems are interconnected is apparent, in that areas high in biodiversity also tend to be culturally diverse. Therefore, theoretically, a significant change in bio- or cultural diversity may result in ecosystem instability. Cultural resource conservation activities are also inexorably linked to broader economic and social activities. Decision-making by governments and communities in the Gulf of Maine regarding cultural heritage, however, is usually separated from other economic and social policies or excluded from community planning and natural resource management efforts altogether. A fundamental reshaping of decision-making philosophy is necessary in order to recognize system interconnectedness, and to acknowledge that cultural heritage is a key factor in managing change, strengthening natural resource conservation, and promoting sustainable economic development.

**Cultural Capital and Ecological Economics**

Determining the social and economic benefits of heritage conservation to present and future generations means providing a comprehensive assessment of heritage resources’ socio-cultural values and economic uses. Knowing the value of cultural resources in terms of their direct and indirect uses as well as the value of non-market services (e.g., existence value) can help to quantify the costs and benefits of cultural heritage conservation to stakeholders (Champ *et al.* 2003). Cost-benefit analyses and other market or non-market valuation techniques are necessary to prioritize management strategies, identify long-term economic and social welfare benefits of conservation, and
ensure that maritime cultural resource are available to present as well as future generations (Alder and Sumaila 2002).

In the eyes of many preservationists, assessing the economic value of a cultural resource is a particularly disturbing task. Most would likely contend that the intrinsic qualities of heritage resources preclude an assessment of their value. They might also argue that cultural heritage is denigrated by a process of economic valuation. At first hand, an assessment of economic value suggests that profitability might take precedence over historical and cultural worth and imply that only those cultural resources which yield a profit should be preserved. However, economic valuation should not be interpreted to mean financial valuation (e.g., the value of gold coins recovered from a shipwreck), nor should economic assessments be viewed as a detraction in any way from the social, cultural, or research qualities (or values) of a cultural resource. Rather, economic valuation techniques have developed over recent years to account for both tangible and intangible benefits people derive from ecosystem functions and processes.

In fact, economists argue that heritage resources possess a distinct form of non-market value, which some have termed “cultural capital” (Berkes and Folke 1992; Throsby 1999; Ulibarri 2000; Shockley 2004; Throsby and Rizzo 2006). Specifically, cultural capital is “an asset that embodies a store of cultural value, separable from whatever economic value it might possess; in other inputs the asset gives rise to a flow of goods and services over time which may also have cultural value” (Throsby and Rizzo 2006: 3). Accepting this interpretation, economic valuation may contribute to cultural heritage management by not only identifying market costs and benefits, but also in measuring the intrinsic values or non-market, socio-cultural benefits of cultural heritage.
and conservation projects. Cultural capital is more broadly defined by Hall-Arber et al. (2001: 10):

"Cultural capital consists of specific behaviors, values, and skills transmitted among and between members of a population, including across generations, applied to their adaptation to specific environments including the transformation and utilization of natural, human, and social resources in those environments . . . . . Cultural capital can be either subtle or overt characteristics and learned skills and behavior. The use of language and slang, notions of personal space, appropriate dress, presentation and learned use of specific technologies is part of a group’s cultural capital. In addition, the myriad parts of personal cultures, such as personal preferences that make one more or less satisfied, comfortable and, most importantly, predictable to be around are part of cultural capital. People acquire cultural capital through families, peer groups, neighborhoods, special cultural centers such as bars or exclusive college campuses, churches or other voluntary associations."

Consequently, the inclusion of economic valuation as an approach to cultural resource management may allow for the interpretation of cultural capital within broader social and economic contexts, and potentially provide greater flexibility in decision-making and policy formulation (Hutter and Rizzo 1997; de la Torre 2002). This section examines how ecological economic techniques may be applied to capture the value of cultural heritage resources in terms of their cultural and social value as well as their economic benefits and costs. It seeks further to answer these questions: What is the value of maritime cultural heritage? What are the good and services it provides to society? And what exactly are the benefits of maritime cultural heritage conservation to Gulf of Maine communities?
The Value of Maritime Cultural Heritage

Economic valuation methods are often employed by ecologists in order to quantify the components, processes and overall value of ecosystem functions as well as to measure the possible costs and benefits of environmental change and management decisions to human well-being (see e.g., Costanza et al. 1997; Sanchirico et al. 2002). While many of the functions and services of ecosystems are quantifiable in monetary terms, other cultural or aesthetic benefits of ecosystems are especially difficult to capture in commercial markets and monetary units. In the same way, culture heritage maintains a host of intrinsic qualities (e.g., spiritual, symbolic, historical, cultural values), which are not easily measured. Nevertheless, ecologists, economists, and preservationists (e.g., the U.S. President’s Advisory Committee on Historic Preservation [ACHP 2003]) have started to address both the market (principally in regards to heritage tourism) and non-market values of cultural heritage, as well as to develop methods for assessing their overall value in economic terms (see e.g., Hutter and Rizzo 1997; Navrud and Ready 2002; Throsby and Rizzo 2006). Economic analyses typically involve the expression of value in some monetary terms so that the costs and benefits of disparate services can be compared using a common metric (Alcamo and Bennett 2003: 128). However, monetary units are simply a matter of convenience, and other qualitative-type metrics can also be used to assess the value of cultural resources (see e.g., Coles 1988; Nijkamp and Coccossis 1995; Klein et al. 2003). Ecological economics and ecosystem valuation techniques are developed and utilized in this study to capture the tangible as well as intangible qualities of maritime cultural heritage in both socio-cultural and economic terms.
Economically speaking, cultural resources are “public goods” (Navrud and Ready 2002). This infers that they are non-rival, meaning that the enjoyment of a resource by one person does not come at the expense of another, and non-excludible, meaning that a person generally should not be excluded or prevented from receiving benefits provided by a cultural resource. Economists and ecologists typically classify values according to how goods and services are used, as well as by the socio-economic and cultural values that humans place on heritage resources. Therefore, economic valuation assesses the value of cultural heritage in both utilitarian and non-utilitarian terms – it intends to measure the usefulness that humans derive from goods or services (utilitarian value), and measures the intrinsic socio-cultural qualities of cultural heritage (non-utilitarian value) (Alcamo and Bennett 2003: 130). When framed around the principles of sustainable development (i.e., inter- and intragenerational equity, interconnectedness, precaution, cultural diversity, generational benefit), utilitarian and non-utilitarian value assessments can be used to capture the ‘value’ of cultural heritage.

As a first step in such a valuation process, however, the ‘functions’ and ‘services’ of cultural heritage must be defined in order to broadly comprehend its importance to society. Although there is no standard among preservationists and a dearth of quantitative data and literature in defining cultural functions and services, a few notable ecosystem and heritage preservation studies have recognized the significance of human values and cultural heritage components (e.g., material culture, built heritage, traditions) within ecosystem assessments. Typologies of cultural heritage broadly classify culture or cultural heritage according to their functions, services, or values (Pagiola 1996;

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<td>1) Aesthetic information</td>
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<td>2) Recreation and tourism</td>
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<td>3) Cultural and artistic inspiration</td>
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<td>4) Spiritual and historic information</td>
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<td>5) Scientific and education information</td>
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<th>Cultural Services (After Alcamo and Bennett 2003)</th>
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<tr>
<td>1) Aesthetic values</td>
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<td>2) Recreation and ecotourism</td>
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<td>3) Inspiration</td>
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<td>4) Spiritual and religious values</td>
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<td>5) Educational values</td>
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<td>6) Knowledge systems</td>
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<td>7) Social relations</td>
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<td>8) Sense of place</td>
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<td>9) Cultural heritage values</td>
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<tr>
<th>Cultural Heritage Values (After Throsby and Rizzo 2004)</th>
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<td>1) Aesthetic value</td>
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<td>2) Spiritual value</td>
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<td>4) Historical value</td>
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<td>5) Symbolic value</td>
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<td>6) Authenticity value</td>
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<tr>
<th>Cultural Heritage Values (After Mason and Avrami 2002; Demas 2002)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Economic value</td>
</tr>
<tr>
<td>2) Historical and artistic value</td>
</tr>
<tr>
<td>3) Spiritual or religious value</td>
</tr>
<tr>
<td>4) Social and civic value</td>
</tr>
<tr>
<td>5) Symbolic or identity value</td>
</tr>
<tr>
<td>6) Research value</td>
</tr>
<tr>
<td>7) Natural value</td>
</tr>
</tbody>
</table>

Table 24. Typologies that classify culture and cultural heritage in terms of functions, services, and values.

The meanings and uses of ‘function’, ‘service’, and ‘value’ are problematic, and differ considerably within ecological, economic and preservation scholarship. The classification of functions and services is a value-laden process; therefore, ‘functions’ and ‘services’ and ‘values’ can be ideologically difficult to extricate (Pagiola et al. 2004: 3). The classification schemes in Table 1 illustrate the problem – functions are often used to
imply values, others equate values with services, and yet others re-conceptualize functions to mean services. The terms ‘goods and services,’ ‘benefits’ and ‘uses’ carry similar meaning and are used in this present study interchangeably. For simplification purposes, ‘goods and services’ are collectively referred to as ‘services.’ De Groot et al. notes that current scholarship generally refers to ecosystem functions as either the processes or internal functions of ecosystems (e.g., trophic interactions), or as the goods and services (i.e., benefits or uses) provided to humans by ecosystem processes (e.g., food production, medicine) (2002:394). In an attempt to clarify the matter, De Groot defines ecosystem functions as “the capacity of natural processes and components to provide goods and services that satisfy human needs, directly and indirectly” (de Groot 1992; de Groot et al. 2002). Unfortunately, cultural processes and components are not captured within this definition. Therefore, ‘functions’ are defined here simply as the primary set of values that society imbues or associates with cultural heritage. ‘Services’ are defined as the direct and indirect benefits that society derives from cultural heritage.

Whether in the form of archaeological resources, the built heritage, or traditional lifeways, all cultural resources possess some degree of value or function which supports human welfare. The degree of significance of certain values or functions, however, is likely to vary in relation to the perspectives of different groups of people. Therefore, cultural heritage functions are broadly aggregated and exhaustively classed here so that most values are held accounted. Although descriptions of ecosystems functions tend to be value-neutral, cultural heritage functions are unavoidably value-laden. The main social and economic functions of cultural heritage include:
<table>
<thead>
<tr>
<th><strong>Recreation and Tourism</strong></th>
<th>Relaxation, leisure activities.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research, Science, Education, Knowledge</strong></td>
<td>Cognitive development, understanding of past events, conditions, and cultures.</td>
</tr>
<tr>
<td><strong>Sense of Place, Identity</strong></td>
<td>Sense of belonging and community or cultural affiliation. Comfort, safety, and familiarity afforded by association with recognizable structures and landscapes in human and natural environments.</td>
</tr>
<tr>
<td><strong>Spiritualism, Religion</strong></td>
<td>Enlightenment, self-reflection, continuity and understanding of place in the universe.</td>
</tr>
<tr>
<td><strong>Social and Civic Relations</strong></td>
<td>Meetings, interactions, communication, and working with others at communal structures, places, and sites.</td>
</tr>
<tr>
<td><strong>Symbolism, Artistic Inspiration</strong></td>
<td>Places, sites, monuments and objects that convey meaning and inspiration. Influences folklore and art, and formation of national or cultural symbols.</td>
</tr>
<tr>
<td><strong>Aesthetics, Authenticity</strong></td>
<td>Beauty, harmony, natural setting, historical and cultural integrity. Genuine experiences and connections with culture and environment.</td>
</tr>
</tbody>
</table>

Table 25. Values associated with cultural heritage.

These functions broadly reflect what society believes is valuable or important about cultural heritage. Because values are likely to change over time (what we value today might not be valued tomorrow), decision-making and management of cultural heritage should be viewed within the framework of sustainable development. By exercising caution in the face of uncertainty, considering the needs of future generations, and respecting cultural pluralism, sustainability can help to account for future functions and values that may become associated with cultural heritage.

**Definitions and Methods**

The services provided by cultural resources are a subset of their functions and are the quantifiable market and non-market benefits provided by cultural resources. Although the valuation of services is dependent upon the type of cultural resource components being addressed and to whom the services are being provided, the potential value of
specific cultural resources (i.e., archaeological sites, built heritage, traditional lifeways) and their services can be estimated. The Total Economic Value (TEV) framework, commonly used by ecological economists to identify and value ecosystem goods and services, is one method that can be used to assess the overall value of cultural resources (Pearce and Warford 1993: 102). The TEV can be used to derive the total economic value, against which the benefits and costs of specific impacts, threats and management regimes can be measured (Alcamo and Bennett 2003: 130; Pearce and Warford 1993: 132). It classifies ecosystem goods and services according to 'use' and 'non-use' values (also commonly referred to as 'market' or 'non-market' values). Use values are the direct and indirect, tangible and intangible, consumptive and non-consumptive (or extractive and non-extractive), goods and services provided by an ecosystem. Non-use value refers typically to the benefits of non-market goods and services, such as a resource’s existence value (valuing the existence of a heritage item, even if it is not experienced directly) and bequest value (the desire to bequeath a resource to future generations).

The flow of benefits and services derived from cultural resources is analogous to natural resources, which have market and extractive, as well as non-extractive and non-market properties (Serageldin 1999: 25). Extractive uses refer to the harvesting of goods and services such as fish from the ocean or oil and natural gas from the seafloor. An example of an extractive use of a cultural resource is the re-use of New England’s historic riverfront mill buildings for living or working space. Tourists visiting maritime museums or historical societies are another example of direct uses and possibly extractive services provided by cultural resources. Non-extractive uses are services provided by a resource that do not require the harvesting of goods. Examples might include the
aesthetic benefits provided by the unique natural and cultural landscapes of the Boston Harbor Islands or Acadia National Park. Non-market value refers to the intrinsic or existence value of resources. Although it is unlikely that any of us will ever visit the deep-water shipwreck of the historic steamship *Portland* in Stellwagen Bank Marine Sanctuary, we might feel a sense of loss if any such heritage site is destroyed. Cultural resources, in particular, retain a host of intrinsic historic, artistic, social, spiritual, and symbolic qualities valued by society, which are not readily observed in markets.

Maritime cultural resources have few direct or extractive uses, but these limited uses still have considerable economic value. The adaptive re-use of historic waterfront building and structures (e.g., mill buildings, lighthouses, military fortifications and structures, waterfront landings, and waterfront residential homes) has significant market value in the rehabilitation construction industry. The real estate industry through the buying, selling, and renting of desirable historic waterfront properties for commercial and residential use, is also a market activity with considerable economic impact (Costanza *et al.* 1997). Extractive uses of maritime cultural resources also include heritage recreation and tourism activities. Nationally, approximately 118 million American adult travelers (or 81% of all tourists) visit heritage or cultural sites and places annually (TIA 2003). These travelers spend significantly more money: $623/trip compared to $457/trip for other types of tourists (NTHP 2007). Heritage tourism is a leading industry for Maine, New Hampshire, and Massachusetts, and recreational SCUBA diving, particularly ‘wreck-diving,’ appears to have grown substantially in the Gulf of Maine over the last decades.
Other heritage tourism extractive and non-extractive activities include: visiting coastal state and national parks that contain historic sites (e.g., historic buildings, lighthouses, archaeological sites); vacationing to historic New England maritime villages; experiencing first-hand maritime industries, working waterfronts, and reconstructed historic lifeways (e.g., lobstering, fishing, tall ship sailing, boat-building, traditional or native arts and crafts, colonial-period museum villages); visiting museums to appreciate maritime art; or boating and kayaking along the gulf’s coast and islands to appreciate the natural beauty of the region’s marine, riverine, and estuarine environments and maritime cultural landscapes. Significant infrastructure and management costs are needed to sustain heritage tourism, as well as to maintain the integrity of the region’s maritime cultural resources (which attract tourists in the first place); however, these maritime-related activities generate significant direct and indirect economic benefit for Gulf of Maine communities.

Although difficult to estimate in any detail, non-market and non-utilitarian values are equally important to assess. Maritime archaeological sites, in particular, contain information relevant to the understanding of our natural and human environments, which can be gained from scientific research and study. Shipwrecks, historic waterfronts, cultural landscapes, coastal and submerged prehistoric archaeological sites all provide knowledge toward understanding socio-economic structures and processes, and help to understand the relationship between humans and the marine environment. Knowledge can be gained about past environmental conditions (e.g., paleo-environmental data, land use patterns, biological data), natural resource exploitation and extraction behaviors (e.g.,
fishing patterns), technology development (e.g., coastal engineering, shipbuilding), communication, trade and relations between cultures and people.

Many maritime cultural resources are important to individuals or communities simply because of their existence value. Others may want to bequeath future generations with the potential scientific, educational, and knowledge that could be gained, for example, from the study of the multitude of shipwrecks that lay quietly beneath the sea, even though they may never acquire that knowledge themselves or witness the discovery of the archaeological sites within their own lifetimes. Maritime cultural resources also inspire art and music, and often represent symbols that instill cultural pride and nationalism. Archaeological sites and landscapes have intrinsic religious and spiritual value, particularly for Native Americans. They also retain value as places where people assemble, socialize, and work (e.g., landings, piers, fishing holes and boardwalks).

Non-market values can be determined in large part by consultation with stakeholders that have a vested interest in a particular resource, reached through a process of group consensus, or decided by resource specialists. One valuation approach is the current national historic preservation scheme, where historic contexts are developed by heritage specialists to serve as a measuring stick from which the significance of a cultural resource may be determined (NPS 1997). Alternatively, an ecosystem valuation approach may analyze non-utilitarian values, for example, by using hypothetical scenarios, where resource users and non-users are asked their willingness to pay for continued access or existence of a resource. However, in order to achieve any measure of specificity for non-market values of maritime cultural resources, resource assessments must typically be conducted on a case-by-case or site-by-site basis. A regional willingness-to-pay survey is
beyond the scope of this study; but the place-based study in Chapter 4 provides a broad, regional non-market valuation metric for maritime cultural resources in the Gulf of Maine. This contextual study can serve as a guide or framework for conducting more precise, site-specific, non-market value assessments, and when combined with valuation tools and techniques, may be used to assess the stock of a region’s cultural assets and prioritize conservation and management efforts.

**Market and Non-Market Valuation Tools and Techniques**

Ecosystem valuation techniques are rooted in welfare economics. They measure an individual’s willingness to pay (WTP) or accept loss (WTA) for changes in the use of or access to certain goods and services (Alcamo and Bennett 2003: 134). As a rule, WTP measures the increase in services for beneficiaries that do not own resources, and WTA calculates decreases in the value of goods or services owned by beneficiaries. Because WTA estimates are generally higher, WTP is preferred in valuation studies for its conservative results. Numerous valuation techniques have been used to estimate WTP for cultural heritage services in Europe (particularly built heritage, but also museums, performance art, and urban archaeological sites). There is a dearth of published economic valuation studies of cultural heritage in the U.S. (Poor and Smith 2004: 218). Recent studies by Schuster _et al._ (1997), Throsby (2001), Navrud and Ready (2002), and the Getty Conservation Institute (Demas 2002) have broadly assessed the advantages, limitations and applications of various economic valuation techniques to cultural heritage.
There are two primary ecosystem valuation methods: revealed preference and stated preference (TAB. 26). Revealed preference methods are used to assess observable market behaviors, either directly or indirectly, of producers or consumers. This method utilizes standard direct market-price and indirect valuation techniques. Indirect techniques are used to analyze surrogate markets or non-rival services such as the aesthetic benefits of a cultural landscape (Pagiola 1996: 2). Indirect services are difficult to put a price on, but numerous economic techniques have been developed to analyze such non-market values. Alternatively, when no market goods or services are traded or observed, stated preference techniques are used to analyze hypothetical behaviors. These techniques are preferred (but not used exclusively) for non-market service valuations, and they typically involve group deliberation, ranking of particular services, or utilize survey questionnaires in order to measure WTP based on individual responses to direct questioning.

<table>
<thead>
<tr>
<th>Revealed Preference</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Price</td>
<td>Admission fees to maritime museums in New England.</td>
</tr>
<tr>
<td>Hedonic Pricing</td>
<td>Comparative analysis of real estate value of National Register to non-historic waterfront property.</td>
</tr>
<tr>
<td>Travel Cost</td>
<td>Analysis of time and travel costs to Acadia National Park from major U.S. cities.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stated Preference</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contingent Valuation</td>
<td>Survey of WTP for conservation of a shipwreck, such as the 19th-century steamship Portland in Stellwagen Bank National Marine Sanctuary</td>
</tr>
<tr>
<td>Contingent or Discrete Choice Valuation</td>
<td>Individual assessment of tradeoffs based on hypothetical scenarios, e.g., WTP for rehabilitation and development of a historic waterfront park vs. construction of a parking garage</td>
</tr>
<tr>
<td>Group Valuation</td>
<td>Same as Contingent/Discrete Choice, but WTP or WTA determined by consensus in open public debate.</td>
</tr>
</tbody>
</table>

Table 26. Revealed and Stated Preference methods applicable to cultural resource service valuations.
Revealed Preference Methods

The ‘Market Price’ method uses standard economic techniques to estimate the value of goods such as fish and timber, which are bought and sold in commercial markets. The method is applicable to cultural heritage goods and services such as recreation and heritage tourism, where market data is available. For example, museum admissions and membership fees, as well as gift shop and cafeteria sales, or hotel and restaurant revenue data generated directly through the presence of cultural heritage, can show people’s willingness to pay for heritage services at market prices. Market price is measured by calculating economic surplus, or the sum of consumer and producer surplus. Generally, time series data is needed to generate a demand curve for consumer surplus, and the costs of production and revenues from heritage services are needed to calculate producer surplus. Subsequently, cost-benefit analysis can be calculated. Another application is thought to lie in the market pricing of real estate (Serageldin 1999: 29; Benhamou 2003: 257). For example, value can be derived by comparing the market price for a historic property to be used for commercial purposes (e.g., Bed & Breakfast Inn) and its related consumer surplus (i.e., WTP to stay at a historic B&B) and producer surplus (i.e., maintenance costs for an old building), to the market price and economic surplus of similar but non-historic or newly-constructed service properties.

The demand for a good or service is often reflected in the price that people are willing to pay for their associated characteristics, such as the proximity of a house to the coast or a home with unique historical characteristics. The ‘Hedonic Pricing’ method typically analyzes observable residential housing market prices, and can be used to estimate the value of cultural heritage attributes (i.e., aesthetic and historical
characteristics) and how they affect the price of marketed goods. By holding some characteristics constant, estimates of residual attributes (e.g., listing on the National Register of Historic Places) are possible. An example might be an estimation of value based on the comparison of similar houses in a neighborhood, where some homes have access to a historic waterfront and others do not. A breakdown of the various attributes of the homes may show that homes with access to the historic waterfront have a higher price and thus a greater value. The application has shown merit in valuing commercial and residential properties that are listed on national historic property registers or designated part of a historic district (Moorehouse and Smith 1994; Abelson 2000; Creigh-Tyte 2000).

The ‘Travel Cost Method’ can be used to measure the time spent and travel costs related to visit a heritage site from variable locations. The cost associated with travel to a heritage site, such as a monument, museum, or archaeological site, can be assumed to reflect the maximum willingness of visitors to pay to receive heritage benefits. Traditionally, this method is used to estimate the economic value of recreational sites. It can also be used to measure the costs and benefits of changes in access to cultural heritage, as well as the value incurred from the loss or addition of a heritage site, monument, or museum. Travel cost collects observed behavioral data from visitors. This data can range from basic regional data (e.g., postal codes of visitors) to more specific survey information such as the socio-economic characteristics of visitors, the amount of time spent at heritage sites, whether trips are made to visit one particular heritage site or if the trip had several purposes, visitor perceptions of authenticity and environmental quality, travel expenses incurred, etc. There are several travel cost techniques used by
economists including zonal travel cost, individual travel cost, and a random utility approach (King and Mazzotta 2004).

Travel cost method is rarely used to estimate the benefits of cultural heritage sites in the U.S. Poor and Smith (2004), however, study the uses of the zonal travel cost methodology to assess the consumer surplus benefits of Historic St. Mary’s City in Maryland. The study revealed that increases in admission prices to the site will likely result in a reduction of revenue, and it determined that visitors from high income zones are more likely to spend money on cultural activities other than travel to Historic St. Mary’s City (Poor and Smith 2004: 227). Although the results are perhaps not what were hoped for, they do effectively assist site managers in decision-making, for example, in providing information about to whom and where marketing efforts should focus. Travel cost is an indirect market valuation technique that can be used to estimate willingness to pay for the use of a site by visitors. Results from travel cost surveys might also indirectly reveal non-use values important to heritage visitors. However, economists warn that travel cost methods are problematic (Throsby 2001; Navrud and Ready 2002; Throsby and Rizzo 2004), however, there are other revealed preference methods, albeit uncertain, which could be tested in application to cultural heritage, such as Avoided Cost (or Damage Cost Avoided), Replacement Cost and Factor Impact (de Groot et al. 2002: 404).

**Stated Preference Methods**

‘Contingent Valuation’ (CV) is the most commonly employed valuation method to estimate non- or passive-use values related to ecosystem and environmental services as well as cultural heritage. Although infrequently used in the U.S., numerous European
studies have successfully applied CV in order to assess the non-use (as well as use) values of cultural heritage and preservation projects (see e.g. case studies in Navrud and Ready 2002). In principle, CV is a simplistic approach that asks the willingness of people to pay (WTP) for the benefits afforded by cultural heritage. CV may also be used to determine the amount of compensation people are willing to accept for the loss or destruction (WTA) of tangible as well as intangible cultural heritage goods and services. The CV method involves the presentation of one or more hypothetical scenarios in which an individual identifies, usually in the form of currency, how much they are WTP or WTA for preservation or loss of a particular heritage resource. Because the method is based on what people say they would do, as opposed to actual observed behavior, economists and psychologists have disputed the validity of CV studies (Garrod and Willis 1999: 125-175). However, a blue-ribbon panel study by NOAA has determined “that CV studies can produce estimates reliable enough to be the starting point of a judicial process of damage assessment, including lost passive-use values” (Arrow et al. 1993: 43).

Contingent or Discrete Choice methods, though rarely applied in cultural resource assessments, are similar to CV in that they build hypothetical scenarios, but instead provide a series of options where an individual is asked to assess the tradeoffs between sums of money relative to changes in the condition of environmental or cultural goods or services. Group Valuation, also a stated preference approach, establishes resource value by coming to consensus in open public debate in lieu of measuring an individual’s WTP or WTA (de Groot et al. 2002: 404). This democratic method is occasionally used in cultural resource management decisions, but such deliberations are generally
unstructured, ad hoc, and do not assess ‘value’ to inform decision-making or the
development of cultural heritage policy (King 2000: 103).

**Significance v. Value**

Currently, in the U.S., the determination of whether a cultural resource will be
conserved or nominated to the National Register is based primarily on historical
significance assessments by preservation specialists such as archaeologists, architectural
historians, and cultural resource managers. These experts may involve public
participation (referred to as ‘consultation’ within cultural resource management) in order
to reach consensus among interested parties and determine economic costs and benefits
of a preservation project, but most do not, as there are no formal rules or guidelines for it
in the regulations that govern the NHPA Section 106 review process. Subsequently, when
preservationists determine the impact of a federal action upon an archaeological site it is
usually without public consultation and results in recommendations of avoidance,
minimization or mitigation (King 1998: 118).

The lack of a bottom-up or participatory process limits state and federal historic
preservation officers from determining to whom resources are significant. Additionally,
federal law limits assessments to ‘nationally’ significant resources, excluding resources
that may be significant or of value to a specific populace at a regional, state, or local
level. Although exceedingly rare, evaluations of cultural heritage resources important to
minority groups and local communities in terms of social and civic, spiritual or religious,
and natural values are increasingly considered, particularly in significance determinations
of Native American cultural landscapes and properties (Downer 2003). However,
consultation is generally avoided by preservation agencies and officials, as it is the path of least resistance and conflict in their decision-making. Government agencies and officials ultimately rely on their own judgment, as to what is significant and to whom it is significant.

Contemporary cultural heritage management and preservation scholarship has suggested abandonment of the term ‘significance’ for ‘value,’ claiming that “cultural significance” does not account for the full range of attributes that embody heritage resources (Mason and Avrami 2002: 23). There are no explicit rules within the Section 106 process of NHPA to conduct economic analyses or valuation studies, yet preservationists have long recognized that in “the basic sequence of steps of the preservation process, one must also recognize that preservation always has been, presently is, and always will be primarily a matter of market economics” (Stipe 2003: 32). Combining the traditional approach of significance determination with economic valuation, in a formalized way, can provide government and the public with a substantially more transparent and inclusive process that considers both top-down, expert opinion and bottom-up, community interests and values. Exactly how ‘value’ and public participation can be managed and implemented within existing preservation law and procedures is outlined in the following chapter.

**Summary**

In this chapter I have laid out the fundamental principles on which to base maritime cultural heritage and resource management in the Gulf of Maine. Foremost is the notion of sustainable development, which posits that the cultural resources of today
should be managed in a way that ensures conservation for current generations without sacrificing access to and appreciation of cultural heritage for future generations. In the event that human and environmental actions impact cultural resources, management decisions should be made that consider not only national historical significance but also socio-cultural as well as economic values relevant to regional, state, and local populations and communities. Consciousness of and sensitivity to the principles of equity, precaution, and cultural diversity will provide the basis for long-term sustainability of cultural heritage resources.

Ecological economics can be utilized to assess the market and non-market, or use and non-use, values associated with maritime cultural heritage. Valuation tools and techniques can help to addresses exactly what heritage is worthy of protection, to whom it is significant, and how resources managers can best develop and interpret that heritage for the public. Valuations determine historical significance and intrinsic values of maritime historical and archaeological resources, and assess opportunities for use, enjoyment, education, and community engagement. By acknowledging the existence of 'cultural capital' and the interconnectedness of natural and human systems, government, resource managers and the public can conceptualize cultural heritage as a product of human interaction with the natural environment, analyze the goods and services provided by cultural assets, encourage science and educational activities contributing to the well-being of coastal communities, and support economic activities such as recreation, tourism, and growth in market economies such as real estate. Overall, the objectives of valuation are to improve quality of life by maintaining the historical and cultural integrity
of coastal communities, protecting culturally or historically diverse and sensitive areas, and sustaining traditional ways of life and the natural areas within which humans live.
CHAPTER 6

A POLICY FRAMEWORK FOR CONSERVATION OF
MARITIME CULTURAL HERITAGE

Existing legislation and regulatory regimes, however well-intended, are ineffective at protecting the public’s interest and stake in maritime cultural heritage. Policy is needed to protect maritime culture from a plethora of anthropogenic and environmental threats, as well as to improve the social and economic development opportunities it can offer. While there are numerous and specific issues, questions and procedures that must be addressed in any policy improvements for maritime cultural resources, the three main policy recommendations deduced from this study include the following:

1. Federal government should assert ownership and declare submerged cultural heritage to be public goods and property.

2. U.S. Commission on Ocean Policy or the Committee on Ocean Policy should draft legislation and regulations to institute a national and regional governance structure to manage and develop maritime cultural resources for the public.

3. NHPA and NEPA regulations should be amended to require ‘valuation’ assessments for cultural resources, and establish regional cultural resource councils as consultative authorities.

These policy and governance recommendations are based upon the review of existing state and federal laws and regulations, historical and cultural contexts, and
sustainable development principles and definitions, I presented in the previous chapters of this study. This chapter outlines a policy for regional maritime cultural resource management that is also supported by recommendations of the U.S. Commission on Ocean Policy:

"The new coordinated offshore management regime should incorporate a comprehensive policy on submerged cultural resources, including shipwreck sites. The offshore regime will need to balance the historical importance of certain sites with their potential recreational and economic value, preserving the most significant sites for future generations while leaving room for the recreational use and salvage of others. The establishment of a comprehensive national policy will also help in promoting an international regime for the use and protection of submerged cultural resources." (2004: 102).

In keeping with the U.S. Commission on Ocean Policy recommendations, a policy framework is put forth that includes protection of offshore cultural resources with a regional governance network of cultural resource councils. It also explicates how ecosystem or resource service valuation methods can be incorporated into NEPA and NHPA review and compliance procedures. Finally, this chapter categorizes near-shore and off-shore threats to maritime cultural resources in the Gulf of Maine, and provides examples of management responses and needs regarding these threats.

**U.S. Ocean Policy**

The Oceans Act of 2000 (P. L. 106-256) authorized the U.S. Commission on Ocean Policy (or U.S. Commission on Ocean Policy), a 16-member committee appointed by the President, to provide advice for a comprehensive national ocean policy. The final recommendations in the report, *An Ocean Blueprint for the 21st Century* (2004),
incorporated the opinions of hundreds of pre-eminent American scholars in ocean law, policy, science, and education. The commission recommended instituting a National Ocean Policy Framework that addresses the current lack of coordination, communication and partnerships among federal, state, local, tribal, territorial governmental agencies, non-governmental organizations, and private industry. The primary goals of this framework are to build effective governance structures, improve science and its use in decision-making, and strengthen education programs. These goals are framed further around an ecosystem-based management approach, which "considers human activities, their benefits, and their potential impacts within the context of the broader biological and physical environment" (U.S. Commission on Ocean Policy 2004: 63).

Essential to the proposed National Ocean Policy Framework is the development of a governance structure that establishes a National Ocean Council (NOC) and a non-federal Council of Advisors on Ocean Policy (CAOP) (FIG. 17). The primary goals of the framework and priorities of the councils are to 1) strengthen NOAA, 2) create regional ocean councils, 3) develop an offshore management regime, 4) identify a stable funding stream, and 5) integrate the principles of ecosystem-based management into ocean policies. In the recommendation, the NOC is composed of cabinet secretaries and federal agency directors, is specifically tasked to 1) develop national goals for governance, 2) make recommendation to the president, 3) coordinate federal agencies to meet goals, 4) identify statutory or regulatory redundancies and omissions, 5) provide guidance for use of science in policy-making, 6) develop and support partnerships, 7) expand education and outreach, 8) build a voluntary process to establish voluntary regional ocean councils, and 9) periodically assess the state of the oceans and coasts. CAOP advisors, appointed
by the president, are to consist of government representatives such as governors of coastal states, and individuals from the private sector, NGOs, and research and educational communities. CAOP will also advise the President on policy matters and serve as a principal link to regional ocean councils.

Figure 17. Governance structure proposed by the U.S. Commission on Ocean Policy (After Appendix E: Proposed Structure for Coordination of Federal Ocean Activities, 2004: E3). Shaded boxes indicate new government entities. Dashed lines indicate communication lines, solid lines are reporting lines, and double lines are advisory lines.

A critical component of the framework proposed by the commission is the development of voluntary regional councils that can respond to ocean and coastal issues and cross-boundary threats, facilitate stakeholder responses to issues and threats, and provide ecosystem assessments according to regional rather than existing state and federal boundaries. The commission recommends further that regional councils should serve to 1) coordinate activities, 2) reduce duplicative efforts, 3) minimize conflict, 4)
maximize limited resources, and 5) promote stewardship. Alternatively, the Pew Oceans Commission in its final report, *America's Living Oceans: Charting a Course for Sea Change*, recommended mandatory regional councils as part of a new National Ocean Policy (2003: 26). The primary task of the regional councils as envisioned in this case is to "develop and oversee the implementation of comprehensive regional ocean governance plans" (Pew Oceans Commission 2003: 103).

Comments by the governors of Maine and Massachusetts agreed with the U.S. Commission on Ocean Policy’s overarching recommendations for a regional, ecosystem-based management approach. Massachusetts Governor Romney “strongly support[s] the Commission’s focus on regional, ecosystem-based management and governance approaches” and Maine Governor Baldacci “concurs with the Commission’s recommendations regarding development of a regional approach to respond to the many ocean and coastal issues that transcend the borders of individual states” (U.S. Commission on Ocean Policy, Special Addendum, 2004). However, Baldacci voiced concern that the regional framework was overly ‘top-down’ and oriented more toward federal needs, goals and priorities (U.S. Commission on Ocean Policy, Special Addendum, Governor Baldacci, 2004: 7). He affirmed further that “the role of the Regional Ocean Councils should be to bring collective resources of federal agencies together with states and stakeholders to address significant issues identified at the state, local, and regional level, rather than issues identified by federal agencies,” and “any new regional organization should build from this grassroots effort in order to be responsive to the needs of the diverse regions” (U.S. Commission on Ocean Policy, Special Addendum,
Governor Baldacci, 2004: 4, 7). New Hampshire did not respond to the Ocean Commission’s request for comments.

In 2004, the Bush Administration responded to the commission’s recommendations and report with the “U.S. Ocean Action Plan” (http://ocean.ceq.gov/actionplan.pdf). In lieu of accepting the governance framework proposed by the commission, President Bush established by Executive Order 13366 a cabinet-level “Committee on Ocean Policy” that is chaired by the chairman of the Council on Environmental Quality (CEQ) (FIG. 18). While short-term issues are considered such as strengthening NOAA, accession of the U.N. Convention on the Law of the Sea, support for a Global Ocean Observing System (GOOS), improvements in
fisheries management, and pollution reduction, the plan does not explicitly support the regional, ecosystem-based management approach put forth by the commission. Historic preservation actions supported by the plan included the implementation of the “International Agreement Concerning the Shipwreck Vessel RMS Titanic”, enacting the *Sunken Military Craft Act* as part of the Ronald W. Reagan National Defense Authorization Act (2005), and funding for a Maritime Heritage Center at NOAA’s Thunder Bay National Marine Sanctuary and Underwater Preserve in Alpena, MI (Council on Environmental Quality 2004: 24-25). However, these activities were not the result of any governance framework enacted by the President’s Executive Order.

Although the initial Action Plan for cultural heritage does not address the need for a cultural resources management regime to protect and develop maritime heritage in nearshore state waters or offshore federal waters, a recent report by the Joint Subcommittee on Ocean Science and Technology (JSOST), specifically calls for the stewardship of cultural resources in *Charting the Course for Ocean Science in the United States for the Next Decade: An Ocean Research Priorities Plan and Implementation Strategy* (2007). JSOST acknowledges that the “ocean preserves a record of the nation’s cultural past,” supports the preservation of cultural sites, and recommends further research into decision-support tools such as market and non-market valuation techniques for resource evaluation (JSOST 2007: 13-14). While stressing the importance of collaboration between federal, state, tribal, regional and international organizations, the report does not define a regional or ecosystem governance approach to resource management.
Who Owns Maritime Cultural Heritage?

The U.S. Commission on Ocean Policy has recognized that there are "unacceptable gaps" in NEPA to manage federal waters including cultural resources (2004: 98). However, this should not be taken to mean that NEPA, or NHPA, for that matter, are inadequate legislative mechanisms for the protection and management of maritime cultural resources. The statutes of both these laws explicitly address the need to "preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice" (NEPA: Sec. 101 [42 USC § 4331]); and that "the preservation of this irreplaceable heritage is in the public interest so that its vital legacy of cultural, educational, aesthetic, inspirational, economic, and energy benefits will be maintained and enriched for future generations of Americans" (NHPA: Sec. 1(b)(4), [16 U.S.C. 470]). The jurisdiction of these laws extends to any lands where federal activities occur, including the continental shelf and the Exclusive Economic Zone (0-200 nm).

Currently, admiralty law allows claims to 'abandoned' cultural resources in federal and international waters as potentially and privately owned resources. The Abandoned Shipwreck Act (ASA) of 1987 asserted public ownership of shipwrecks in state waters, but it did not extend to waters under federal jurisdiction (3-200 nm and EEZ). In order to gain property rights and regulatory authority over maritime cultural resources in federal waters, it is critical that the U.S. federal government assert direct and explicit ownership. If the government (or the public) does not claim ownership of cultural resources in federal waters, it will not invest in their protection or development. Federal
regulation may require private actors to mitigate adverse effects even without public ownership of heritage resources. However, a lack of public property rights to maritime cultural heritage is likely to continue to result in resource management that is viewed (and not incorrectly) as interfering with private property and as over-regulatory. In past court cases, admiralty law and jurisdiction has held sway over federal as well as state title to shipwrecks, and has led to litigation contesting ownership and undue interference in private property interests (see e.g., Florida Department of State v. Treasure Salvors, Inc. [1982], California and State Lands Commission v Deep Sea Research, Inc. [1998]).

The current open-access market to maritime cultural resources, from an economic point of view, is a failure. Few opportunities have been created by the existing, private property market. The service values of these resources, identified in chapter 5, are either under-utilized or unrealized, or when heritage is discovered, it is overused and exploited. There has been no consideration for their maintenance or sustainable development and no distribution of their socio-economic benefits to the public. Acknowledgement of maritime cultural resources as public goods, and with the assumption that the government will assert legal ownership of these resources in federal waters as recommended by the U.S. Commission on Ocean Policy (2004: 102), can lead to equitable distribution of benefits among stakeholders. As public property, the government may define the rights, rules and liabilities for these resources. Regulations can then be developed that consider ‘value’ within cultural resource significance determinations. By asserting the public’s interest in maritime cultural heritage, accounting methods such as ecosystem or cultural heritage valuations can be utilized within existing regulatory frameworks such as NHPA and NEPA to assess the social and economic benefits of maritime preservation projects.
Furthermore, by creating public markets (use and non-use) for cultural heritage, investment and development opportunities will arise for communities that outperform existing markets of, for example, shipwreck salvage and sale of antiquities for private and individual financial benefit. Development of such a market can result in long-term, compounded, inter-generational social and economic benefits that exceed the purely financial gains of archaeological site looting and antiquities trade.

The U.S. Commission on Ocean Policy has suggested “leaving room” in an offshore management regime “for the . . . salvage” of shipwrecks (2004: 102). This study does not concur with or defend this finding. The goals of shipwreck and treasure salvage are antithetical to the principles of sustainable development and the public’s (property) rights to cultural heritage. Treasure and shipwreck salvage operations exclude any notion or consideration of service values associated with cultural heritage and limits access of the public to maritime cultural heritage to only those who can afford to purchase antiquities and pieces of the past. If cultural heritage is acknowledged as a public good, and ownership asserted by the federal government for the people, an added benefit will be elimination of costly litigation as a result of admiralty claims as well as costs associated with state administrative efforts to regulate and manage treasure salvor operations.

**Framework for Regional Governance**

Maritime cultural heritage and archaeological resources comprise a special group of resources with unique ecosystem services. Their management typically requires unique treatments and conservation methods that are limited to the expertise and knowledge of
maritime archaeologists. Additionally, in order to fully understand the threats to cultural resources necessitates sub-regional and local knowledge. The lack of governance structure and legislative mechanisms to protect and manage maritime cultural resources in the Gulf of Maine, therefore, requires "comprehensive, single-purpose ocean governance structures," which as indicated by the U.S. Commission on Ocean Policy, could be implemented by an NOC or the existing Committee on Ocean Policy (2004: 103). Of primary importance is the development of legislation to improve protection of cultural resources by way of explicit statements of jurisdiction and property rights over submerged cultural resources; however, the development of a regional governance structure and regulatory process is also needed to ensure mitigation of activities that may impact the condition of such resources.

Figure 19. Proposed regional governance structure for management of maritime cultural resources in the Gulf of Maine.
As the current governmental structure "hinders the ability of federal agencies with ocean- and coastal-related responsibilities to effectively interact on a regional basis with each other and with state, territorial, tribal, and local entities," a regional governance approach is needed to improve communication capabilities of various governmental levels and agencies (U.S. Commission on Ocean Policy 2004: 93). This approach should incorporate a place-based, bottom-up hierarchical model (FIG. 19). In this way, the impacts of regional development activities and their effects upon local communities can be assessed. The regime gives authority and allows for decision-making on a sub-regional or local level, rather than decisions imposed solely by state or federal agencies, which are bound to comply with laws and regulations that only assess national significance of historic properties under a limited set of criteria.

Cultural resource councils are organized here to support decision-making and management at the sub-regional, regional, and national levels. The regional cultural resources council should participate in a regional ecosystem-based management and planning council, such as the Gulf of Maine Council (http://gulfofmaine.org/council/mission.php), as well as a network of regional cultural resource councils throughout the U.S. that form the base of a National Ocean Cultural Resources Council. The national council would advise a ‘Council of Advisors on Ocean Policy’, as recommended by the U.S. Commission on Ocean Policy, or the newly established Bush administration’s Committee on Ocean Policy.

In this model, sub-regional councils are to provide on-the-ground assessments, predictions, day-to-day operations, fund research, and develop educational outreach opportunities. Each one of these councils should maintain a committee comprised of
individuals from various governmental, non-profit and educational institutions, private sector and stakeholder groups that assists with setting goals and priorities, review threats and impacts to resources, create cultural heritage development opportunities, and provide comments on development projects initiated by NEPA or NHPA. Moreover, the council should support research, foster public participation, partnerships, and volunteerism. The chair of each committee should be responsible for meeting priorities and goals and reporting on progress to the regional council (e.g., 'Gulf of Maine Cultural Resources Council'). Hypothetically, the areas delineated in chapter 4 could be developed as sub-regional councils.

Finally, each sub-region should maintain a cultural resources database that is also part of a regional or national ocean observation system, from which regional assessments may be derived. A clearinghouse or integrated database is needed for offshore regional cultural resource assessments. Cultural resource inventories should contribute toward ecosystem assessments via a central geographic database of information as recommended by the Joint Subcommittee on Ocean Science and Technology (JSOST 2007: 17), as well as incorporated into the Integrated Ocean Observing System (IOOS) or Global Ocean Observing System (GOOS) recommended by the U.S. Commission on Ocean Policy and the Bush Administration’s Committee on Ocean Policy. Furthermore, there should be mandatory reporting requirements to a centralized database for marine environmental surveys and seafloor mapping projects that detect cultural resources. Such a database can facilitate the NEPA process directly by contributing to regional assessments and serve as a basis for environmental impact statements (Joint Ocean Committee Initiative 2007: 16-17).
A regional council, such as a 'Gulf of Maine Cultural Resources Council', could develop regional goals and priorities, collaborate in response to regional issues, conduct regional assessments, authorize creation of sub-regions, determine funding and grants to sub-regions, and communicate assessments and needs to a National Ocean Cultural Resources Council. The regional council, comprised of the committee chairs of each sub-region, as well as state (e.g., SHPO, CZM) and federal agency representatives (e.g., NOAA, EPA, DOI, MMS), could provide a forum for conflict resolution within or across sub-regions. The regional council should have consultative authority to review regional projects initiated by NEPA and NHPA, or provide consultations requested by sub-regional councils. The chair of the committee should also have representation on a regional management council, such as the Gulf of Maine Council in order to communicate cultural resource management needs and concerns.

A National Ocean Cultural Resources Council, as proposed in this framework, would advise the President’s Council on Ocean Policy, or Committee on Ocean Policy. A national council comprised of representatives from each regional cultural resource council and federal agencies would be authorized to designate regional councils, make policy recommendations, draft legislation and guidelines, determine participation in or adoption of international instruments, identify funding mechanisms, set performance measures for regional councils, and establish workgroups in technology and research. Furthermore, the council should provide national cultural resource assessments, identify goals and priorities, and set national directives for maritime heritage conservation. Finally, the national council should have the authority to resolve disputes and issue
decisions within the regulatory processes of NEPA and NHPA, as well as any offshore laws that are relevant to heritage conservation.

**Recommendations for Amendments to Regulatory Procedures**

New national laws that improve protection and management of maritime cultural resources in state and federal water are needed. However, existing environmental laws can continue to play a primary role provided that their existing regulatory toolbox is expanded to include value assessments as described in Chapter 5. Value assessments can occur in the review and compliance processes of NEPA and NHPA, namely in the development of NEPA Environmental Assessments (EA) or Environmental Impact Statements (EIS), and within NHPA Section 106 procedures.

NEPA and NHPA regulations and procedures do not explicitly require assessment of values or maintenance of service values into the future, but doing so would not be inconsistent within the scope of their statutes. Although NEPA regulations do not prevent federal activities from going forward, they do present the potential impacts of proposed actions, which typically lead to selection of the action with the least worst net effect. This type of assessment is not much different from a market or non-market valuation approach (e.g., contingent or discrete choice valuation) that examines trade-offs in choices or scenarios. The decision-making process within Section 106 of NHPA, however, is generally limited to the National Register Criteria of Eligibility, which do not explicitly consider socio-economic factors or to whom cultural resource are valued.

How can a regional governance structure facilitate such a management regime for near- and off-shore resources? And, how can cultural resource valuation fit into NHPA
Section 106 and NEPA environmental regulatory procedures? Within 36 CFR 800 of NHPA, section 800.8(c) states that federal agencies may use the “NEPA process for Section 106 purposes” and “to comply with Section 106 in lieu of the procedures set forth in Sections 800.3 through 800.6” of NHPA. Technically, federal agencies must receive a review and response to activity from a State Historic Preservation Officer (SHPO), Tribal Historic Preservation Officer (THPO), or any other group identified for consultation, before proceeding with any mitigation measures. If the SHPO or THPO objects to the EA or EIS, the objection is brought to the President’s Advisory Committee on Historic Preservation (ACHP). The ACHP then proposes a resolution to the objection. While such a process can and is occasionally implemented for waters under state jurisdiction, there are no checks and balances for offshore, federally permitted activities that may affect submerged cultural resources. A Regional Cultural Resources Council (RCRC) or Regional Historic Preservation Officer (RHPO) could provide consultation and issue Findings of No Significant Impact (FONSI), Records of Decision (ROD), and Memorandums of Agreement (MOA) to federal agencies, which heretofore, have had no or at most very limited stakeholder review of offshore federal activities that may impact cultural resources (FIG. 20).

Regional governance can provide the consultation needed to review federal activities in nearshore and offshore environments to support compliance with NEPA and NHPA. Service and value assessments should be an integral part of the baseline information gathering process for Section 106 (NHPA) or EA or EIS (NEPA) compliance as well as for regional ecosystem assessments. Regional or sub-regional councils, however, need explicit guidelines to assess not only impacts to National Register eligible
Figure 20. NHPA Section 106 process showing integration of Regional Cultural Resource Council consultation and valuation assessment within adverse effect assessments. NEPA review procedures, which may act a surrogate for Section 106, are included as parenthetical statements within the flowchart.
properties, but also examine human uses as well as non-market values associated with
cultural resources. Because Section 211 of NHPA gives the ACHP “rulemaking authority
for Section 106, and can issue regulations for compliance, which a federal agency must
follow,” the ACHP may amend existing regulations to conduct cultural resource
assessments beyond register eligibility criteria and resource integrity to include analyses
of service values (market and non-market) related to Recreation and Tourism; Research,
Science, Education, Knowledge; Sense of Place, Identity; Spiritualism, Religion; Social
and Civic Relations; Symbolism, Artistic Inspiration; Aesthetics, Authenticity (see CH. 5,
TAB. 26). With such an amendment, federal, state and regional agencies will have clear
and explicit guidelines to assess resources, and as recommended by the U.S. Commission
on Ocean Policy, “balance the historical importance of certain sites with their potential
recreational and economic value,” in a way that ensures their protection for future

Assessment of Threats to Maritime Cultural Resources

Knowledge of the distribution and abundance of cultural resources is critical to
identification of where and the degree to which human and environmental actions may
impact their condition. The classification and understanding of human-use patterns and
natural threats, or specific drivers, is also needed in order to trigger review of potentially
harmful human activities through a regulatory process such as NEPA, as well as
minimize damage caused by environmental phenomena. Up-to-date identification of
offshore threats is particularly significant as “interest in the use of federal waters is
growing and activities farther offshore are expected to multiply” (U.S. Commission on
Examples of the types and sources of human and natural impacts that have effects upon the stability and sustainability of historic maritime and archaeological sites are classified in the following sub-sections.

**Coastal Development and Economic Growth**

The coasts of the Gulf of Maine are highly favorable for industrial and commercial, residential and recreational development. With deep-water bays, ports and rivers, beaches and wetlands, proximity to fishing grounds, and a rich natural resource base, there are few places along the coast of New England that have not been settled or developed. Coastal development is the primary threat to maritime archaeological resources that can lead to their disturbance and destruction. Alteration to historic and cultural landscapes, and encroachment upon and modification of historic buildings, monuments, and waterfront structures by commercial and residential developments are all activities that commonly impact cultural resources along the Gulf of Maine shoreline.

Coastal residential and commercial development on the Kennebunk River in Maine, for example, in recent years has resulted in the destruction of historic waterfront properties. Although federal action was required in most development cases because of disturbance to the intertidal zone, no historic preservation action was initiated because the presence of archaeological and historical resources along the waterway was unknown. Consequently, shipwrecks and historic waterfronts were damaged or lost to steel and concrete bulkhead construction, and rip-rap and wetland infilling (FIG. 21). If state and federal agencies adhered to precaution, particularly in light of the Kennebunk River's well-known shipbuilding history, a cultural resources survey would have been issued via
Figure 21. Unchecked federal activities and coastal development in the Gulf of Maine has damaged maritime cultural resources. Re-development of waterfront properties in Kennebunkport, Maine, has resulted in the loss of public access and damage to intertidal resources, such as abandoned shipwrecks and derelict vessels. A. The archaeological site of the 19th-century schooner Ella Clifton damaged by condominium construction in 2002. B. An unidentified wreck site severely damaged by residential seawall construction in 1998 (From Claesson 2001).
NHPA in order to reduce uncertainty in final decision-making. Also, if sub-regional councils were in place, council members could provide on-the-ground, initial assessments of coastal development projects. Moreover, following the discovery and baseline documentation of maritime archaeological sites and historic waterfront properties, a valuation study could examine the scenarios and trade-offs of various development actions upon these cultural resources.

Development of port and harbor facilities for trade, fishing, shipbuilding and passenger service including wharves, docks, piers and landings all have the potential to disturb prehistoric and historic archaeological sites. Land-based transportation and infrastructure projects such as building of coastal roads, bridges and railways directly impact cultural resources, but increased traffic and access to coastal areas for recreation and tourism may also negatively impact the cultural value of these resources (e.g., authenticity or aesthetic qualities). Waves generated by increased navigation and seagoing transport can expose and erode coastal archaeological sites. These latter impacts often have cumulative effects over long periods of time.

Hydro-electric and tidal dams, wind energy, and nuclear power plants (e.g., Seabrook, NH, Plymouth, MA, and Wiscasset, ME nuclear power plants), which are often located near the coast for power generation and cooling functions, may directly impact archaeological sites. Infrastructure such as fuel supply lines, discharge outlets, undersea cables and overhead power lines that span rivers, estuaries and the seafloor may also damage coastal and underwater archaeological sites. Although satellite and remote communications are now commonplace, the laying, maintenance and removal of submersible cable is a significant hazard to submerged cultural resources. The use of
submersible plows, sub-sea trench excavations, cable removal operations, as well as survey and testing (e.g., coring) prior to cable installation may disturb archaeological sites.

**Sediments and Shorelines**

Physical modification of shorelines and sediment disturbance projects significantly impact near- and offshore maritime cultural resources. Coastal engineering projects and structures built to protect the coast from erosion or flooding such as sea walls, dams, dikes, breakwaters, and storm barriers typically have direct as well as indirect effects. Sea wall construction typically requires installation of deep foundations. These structures may protect upland and coastal archaeological sites from erosion, but may also directly impact cultural resources. Furthermore, they may shorten wavelengths along the foreshore that cause scouring, lowers beach levels, and expose archaeological sites.

Storm barriers, such as the New Bedford /Fairhaven Hurricane Protection Barrier, may lower sea-level inside the barrier, which dry out wetland areas and preserved archaeological sites. Barriers and breakwaters may also cause wave refraction and sea-level rise on their seaward side that contribute to erosion of adjacent coastal lands. Barriers built to contend with longshore drift may consequently promote down-drift erosion or offshore erosion and expose archaeological sites. Flood bank protection may limit soil deposition from freshwater inputs resulting in desiccation or oxidation of organic archaeological materials. Flood control may also constrict water channels increasing tidal flow causing erosion thereby exposing buried cultural material. Dredging
operations to widen and deepen harbors and navigational channels directly impact
cultural resources. Beach recharge or nourishment projects that involve dredging may
also expose, disturb or remove cultural resources. Moreover, scouring can result from
hydraulic pumping and heavy machinery used to move sand may compact sites.
Construction of drainage systems for erosion and flooding prevention may also directly
impact archaeological sites.

These types of large-scale, waterfront engineering projects are likely to increase
with the threat of climate change and the need for coastal protection. In cases of direct
impact to cultural resources, mitigation efforts should result in complete excavation and
recovery of cultural material. Sub-regional councils in collaboration with coastal
communities, for example, could conduct valuation studies to examine the economic
costs and benefits of long-term maintenance of archaeological material as well as
developing material for museum display to attract tourists. Alternatively, sub-regional
councils, armed with federal, state as well as local cultural resource inventory data, could
propose alternative site locations to avoid cultural and historic properties. Valuation
studies of coastal engineering projects, such as construction of the New Bedford
Fairhaven Hurricane Protection Barrier, might also assess the aesthetic impact and
proffer recommendations for integration of architectural and landscape elements that
complement or even enhance a community’s cultural heritage and tourism industry.
Additionally, a valuation study might relay the public’s interest and concern in access to
the coast for recreation and fishing. These types of impacts and community concerns may
be accounted for in the NHPA or NEPA evaluation process, but there are no explicit
mandates, guidelines or direction for preservation officers to review the impact of such activities to service values associated with maritime cultural resources.

**Natural Hazards**

Natural hazards such as flood and storm damage, climate and sea level change, as well as human responses to natural disasters, have both major event-period and long-term consequences for maritime heritage. Sea level rise threatens coastal archaeological sites by relatively slow and steady erosional processes, but recent sea-level rise forecasts resulting from global warming may amplify this threat (Church and White 2006). Sea level rise along the Downeast coast of Maine is of particular concern because of subsidence and a local relative sea level rise of nearly 1 cm annually over the past 350 years (Sanger and Kellogg 1989). Rivers and streams that flood may erode river banks and intertidal flats or sandbars exposing and damaging buried archaeological sites. Recent increased storm strength and frequency, particularly ‘Nor’easters’ and hurricanes can cause widespread beach erosion and damage to historic waterfront structures (Keim et al. 2005). Reconstruction and cleanup projects following storms may cause further damage to historic and archaeological sites from infrastructure improvement and rebuilding.

**Habitat Conservation**

Environmental remediation projects that involve activities such as dam removal, wetland restoration, and dune and beach replenishment may conflict with historic preservation interests, particularly in wetland areas, estuaries and tidal rivers. Dam
removal to improve fish migration may have significant upriver and downriver consequences. In addition to destruction of a structure of possible historical significance, lower water levels and desiccation of soils upriver may expose and cause oxidation of archaeological sites once submerged. Simultaneously, dam removal may increase water flow and volume resulting in erosion of riverbanks and archaeological sites downriver. Stream enhancement and riverbank stabilization projects may also alter water flow and volume with negative consequences for archaeological sites. Although no longer a method for mosquito control in the Gulf of Maine, the practice of trenching salt marshes to facilitate drainage of salt panes has significantly scarred the estuarine landscape and likely damaged cultural resources. Efforts to dam these trenches or ditches may directly impact littoral prehistoric archaeological sites as well as historic shipwrecks and waterfront sites. Vegetation planting is useful for limiting erosion of dunes and coastal areas as well as protecting archaeological sites; however, fragile organic and prehistoric sites may be impacted by root disturbance. Dune and beach restoration may also require movement of sand with heavy machinery that could expose or damage archaeological sites.

Pollution

Pollution can have a detrimental effect for maritime cultural resources through chemical and physical alteration to cultural materials as well as damaging effects to aesthetic and recreational qualities or values associated with historic coastal landscapes and properties. Oil and chemical spills by coastal industry or from shipwrecks are a significant threat to maritime cultural resources. In addition to possible chemical
alteration of preservation environments, cleanup of oil and chemical spills by suction
dredge, high-pressure hoses and chemical washes may expose and damage historic
structures and archaeological sites. Moreover, offshore cultural resources may be
impacted by construction of sewage outfall pipes and dumping of pollution cleanup
materials or sewage sludge at sea.

Construction of treatment facilities for waste water, typically situated along rivers
and coasts, directly impact coastal archaeological resources. For example, the 18th-
century, Fort Washington in Portsmouth, NH, was partially destroyed for placement of
the town’s wastewater treatment plant in the 1960s. The treatment plant effectively
prevented public access to the waterfront, depreciated historic and natural scenic views of
the Piscataqua River, and due to sewage outfall, has lessened water quality for marine
recreation activities such as swimming, surfing, snorkeling, SCUBA, and fishing. Upriver
pollution sources such as wastewater outflow, and agricultural and industrial pollutants,
may similarly impact the value of downstream cultural resources. Additionally, acidic
rain and poor air quality may exacerbate deterioration of maritime-related monuments
and buildings (Kucera and Fitz 1995; Meierding 1993).

**Fishing**

Commercial and recreational fin- and shell-fishing, however, which is conducted
today with a variety of fishing gear and technologies, significantly impacts cultural
resources (de Groot 1984). Scallop dredging, in particular, which may intrude sediments
up to 20 cm (8 in) depth, may directly impact buried archaeological sites under water.
Otter trawling for demersal fish with a cone-shaped net spread by steel or wooden doors
that are connected by steel cables or chains also disturbs the sea bottom and may cause
extensive damage to shipwreck sites, as seen on the shipwrecks *Paul Palmer* and
*Portland* in SBNMS
(<http://www.whoi.edu/sbl/liteSite.do?litesiteid=2740&articleId=4965>). Historic
artifacts and ship-timbers have been recovered from net trawls in the Gulf of Maine (see
e.g., Switzer 1988), and prehistoric artifacts, Pleistocene animal remains and peat
deposits have also been recovered from net trawls and scallop drags (see e.g., Price and
Spiess 2007). Recreational shellfishing and commercial operation that drag or dredge for
shellfish bait may damage intertidal and submerged archaeological sites. Aquaculture,
and the setting of pens, anchoring of nets, buoys, construction of weir and traps in
intertidal areas, and associated infrastructure (e.g., underwater supply pipes, docking and
processing facilities) may directly impact maritime cultural resources.

Federal preservation programs and agencies that regulate offshore activities in the
Gulf of Maine, such as the Minerals Management Service (MMS), rarely include
consulting parties in the NHPA process. On the other hand, the National Marine Fisheries
Service (NMFS), which is mandated by Section 110 of NHPA to designate a federal
preservation officer, has neither a preservation program nor does it assess the impact of
its regional fisheries management plans upon cultural resources. In either case, regional
councils could provide consultation and the ‘checks and balances’ needed for review and
compliance with NHPA and NEPA in regards to submerged cultural resources.
Recreation and Tourism

Direct impact to cultural resources by recreation and tourism include facilities and infrastructure development for resource access, visitation and accommodations. Construction of museum visitor centers, parking lots, hotels and food services, roads, footpaths, and boat ramps, may negatively impact cultural resources (see e.g., Jennings 2007). Recreational boating may cause waves that erode coastal sites, and noise pollution may depreciate the aesthetic value of maritime cultural sites and properties. Off-road recreational vehicles may damage archaeological sites via erosion to fragile ecosystems such as the dune and beach systems on Cape Cod and Sandy Neck (Barnstable, MA). Diving of itself is relatively harmless unless individuals and groups are intent upon vandalizing, disturbing or salvaging artifacts from archaeological sites. Economic growth resulting from tourism may cause a shift from a traditional economic base and subsistence activities toward service-related industries that result in the deterioration of social and cultural capital of coastal communities.

Oil, Gas, and Minerals Management

Oil and gas prospecting is a rapidly growing industrial sector in the Gulf of Maine. Currently, the Offshore Continental Shelf (OCS) of the Gulf of Maine, which is managed by the Mineral Management Service (MMS), is off limits for oil and gas leasing and energy development. However, MMS programs and assessments for obtaining marine minerals and aggregates from state and federal waters for public works projects are ongoing (see e.g., http://www.mms.gov/sandandgravel/NewHampshire1.htm).

Proposals for building onshore and offshore LNG terminals are currently
underway in Passamaquoddy and Massachusetts Bay. Mineral extraction activities and
gas terminal projects directly impact coastal and submerged cultural resources through
survey operations, anchoring and setting of platforms and offshore storage facilities,
dredging, pipeline construction, erosion from wave and scour from increased sea traffic,
and waste production from offshore facilities. Although marine mineral mining as well as
bio-prospecting is currently negligible in the Gulf of Maine, careful attention must be
paid to ensuring protection of cultural resources from these marine activities. Aggregates,
rock, mineral sand, phosphates, metals, coastal quarrying of granite, sand removal from
beaches for construction material can cause irreversible damage to large areas of
submerged and coastal cultural landscapes and archaeological sites. In addition, areas of
massive sand, soil, and rock displacement can cause significant sediment drift and
slumping that exposes archaeological sites. Mineral extraction by dredges can alter water
flow and disturbance of natural offshore barriers such as sandbars, which act as naturally
protective coastal features, and if removed, may exacerbate erosion of nearshore
archaeological resources.

In 2005, the proposal for an LNG facility offshore Gloucester, MA, evaluated the
direct impact of facility development upon underwater cultural resources such as
shipwrecks and submerged prehistoric sites, but did not consider the potential impacts of
chemical, gas or petroleum accidents to nearby National Register properties in the
Stellwagen Bank National Marine Sanctuary, nor does it consider such impact to Cape
Ann historic waterfront properties (Lydecker 2005). Additionally, because the federal
government has not asserted ownership of cultural resources as public property, LNG
could claim ownership of shipwrecks by filing a claim of possession under Admiralty
law. This could feasibly allow the LNG company to sell or trade any maritime cultural heritage found by them outside of federal marine sanctuary and state waters. An assertion of ownership by the federal government would negate this possibility and ensure that the benefits of any maritime heritage discovered belong to the public. The Massachusetts Historical Commission and Massachusetts Coastal Zone Management reviewed the project as part of a NEPA Environmental Impact Statement (EIS), but the direct project impacts fall outside of Massachusetts’ jurisdiction (Lydecker 2005: 47). A sub-regional cultural resources council would provide consultation, comment, ‘checks and balances’ in the review process of federal agency preservation programs such as MMS, consider indirect impacts to shipwreck SCUBA diving communities, identify coastal and submerged cultural resources, and establish protocols for responses to spills or accidents.

**Emergency Response and Naval/Military Activities**

Shipping accidents, and oil and chemical spills, as previously discussed, may result in direct and indirect impacts to coastal and underwater archaeological resources. Clean-up of man-made disasters may impact archaeological resources directly by physical removal of contaminated soils, excavation of contaminant pits, or dumping of cleaned or dredged materials at sea. Naval and military installations and operations such as disposal of naval ships, military equipment and ordnance dumps, testing and artillery ranges, and construction and maintenance of coastal facilities and fortifications directly impact cultural resources.

There are currently no plans in place to minimize impacts during major reconstruction following military conflicts, and no regional strategies to abate damage to
cultural resources from oil and chemical spills. Furthermore, there are currently no
guidelines in place to identify cultural resources that are vulnerable to climate change and
environmental impacts, no action plan for how to protect these resources, and no strategy
to minimize impacts during emergency response or to re-develop cultural resources
following natural disasters and reconstruction efforts.

**Summary**

Setting priorities is a first critical step in order to improve protection, long-term
sustainability and management of maritime cultural resources in the Gulf of Maine. In the
near-term, based on the regional cultural resource and statutory and regulatory
assessments in this study, and incorporating the above policy recommendations, the
following actions and components are needed to establish a sustainable and ecosystem-
based management strategy in the Gulf of Maine: 1) development of federal legislation
for protection of offshore cultural resources, 2) establishment of a regional governance
framework, 3) amendment of NHPA and NEPA regulatory procedures, 4) and threat
identification and assessment. Long-term priorities may include building partnerships for
resource stewardship, improving education, development and access to maritime cultural
resources, and engagement in international communities and conventions that serve to
strengthen conservation and improve global understanding and appreciation of the Gulf
of Maine’s maritime cultural heritage.
The Gulf of Maine's historically abundant and diverse marine resources and ecosystems have produced an equally diverse and predominantly marine-oriented human environment. This environment comprises a finite and non-renewable cultural resource base that includes Native American archaeological sites, historic waterfront structures, historic seagoing vessels, and maritime traditions and lifeways of the past and present. To date, cultural resource management laws and regulations in the region have been ineffective for the protection and development of these resources. Of the potential 10-20,000 shipwrecks and derelict vessels that are dispersed across the seafloor of the Gulf of Maine, only four have undergone excavation and publication by archaeologists. Study, conservation, re-development and public access to historic waterfronts (e.g., landings, wharves, piers, shipyards, fishing stations, etc.) is also extremely limited and social and economic opportunities have gone unrealized.

Coastal Native American archaeological sites have received considerable study and conservation in the region. However, climate change (particularly sea level rise and erosion) increasingly threatens many of these fragile archaeological sites. Although the loss of this archaeological record is recognized by state and federal agencies, there is no government mandate or funding initiative for the conservation of coastal Native American properties. Such an initiative is desperately needed to document, recover, or
stabilize these properties before they are lost to erosion from coastal storms and rising tides. In addition, despite the recovery of early prehistoric artifacts by Gulf of Maine fishermen at depths up to 60 m below sea level, state preservation agencies have yet to fully recognize the potential for the presence and preservation of intact, submerged Paleo-Indian or Early Archaic-period archaeological sites. Precautionary measures and protocols should be established within government agencies in order to explore, preserve and manage these potential cultural resources.

Fortunately, maritime archaeology has evolved from a field that has traditionally focused solely on the study of shipwrecks and the recovery of artifacts for museum display into an interdisciplinary field of research that interprets the cultural remnants and traditions that result from human interaction with the marine environment. It has begun to shift away from antiquarian notions of extraction towards interpretation of prehistoric coastal landscapes, adaptive re-use of historic waterfronts, and in situ preservation of shipwrecks (Flatman and Staniforth 2006: 178). Moreover, the maritime archaeological record, which may contain preserved organic materials rarely found in the terrestrial archaeological record, is now acknowledged as an important contributor toward documenting past coastal and marine habitats and climate conditions (Coles 2001: 1-6).

With the rapid expansion of global markets, increased demand for discovery and extraction of natural resources in the sea, and development of marine remote sensing technologies, there is also now worldwide recognition of the need for conservation directives and protection of maritime cultural heritage from marine development and unscrupulous treasure salvors (e.g., UNESCO's Convention on the Protection of Underwater Cultural Heritage). Yet, adoption is lagging for international treaties,
legislation, governance schemes and management tools in the U.S. to protect coastal and marine archaeological sites from private treasure salvors, infrastructure and development projects, as well as climate change impacts. Existing laws and regulations for maritime cultural resources are largely reactions or responses to the loss of cultural heritage rather than ‘pro-active’ solutions used to mitigate impacts and create socio-economic opportunities. Although more than a dozen federal laws and numerous federal and state regulatory schemes exist, the dearth of successful maritime heritage conservation projects in the Gulf of Maine indicates that these laws and regulations are insufficient.

After 20 years of governance and resource protection under the Abandoned Shipwrecks Act, it is clear that the current law does not effectively assert public ownership of maritime heritage nor does it provide adequate protection for shipwrecks from salvage. Legislation is needed that affirms maritime heritage as a public good and resource, establishes this good as property of the citizens of the U.S., protects maritime cultural heritage in federal waters from Admiralty law claims, and authorizes the government on behalf of its citizens to regulate all activities that may affect or impact maritime cultural heritage on the continental shelf and within the Exclusive Economic Zone. This declaration would place the protection of cultural resources in federal waters on par with resources on federal lands. Additionally, new governance structures, following the tenets of ecosystem-based management, must be funded and implemented in order to protect, manage and develop these resources effectively. This governance structure should consist of sub-regional and regional councils that have the authority to review the impacts of development projects and create social and economic opportunities for coastal communities through conservation activities. Finally, market and non-market
valuation techniques should be integrated into the environmental and historic preservation regulations and assessment procedures of NEPA and NHPA. In this way, decision-making can include assessments of short- as well as long-term tradeoffs of human actions, as well as examine the socio-economic costs and benefits of development and conservation projects.

While non-profit, educational, research, and voluntary organizations, as well as the support of the general public, are essential to the conservation of cultural heritage, it is unlikely that concerned and interested citizens can accomplish the task on their own. Government plays a key role in providing incentives, disincentives, information, and infrastructure to manage and protect cultural resources. This study has outlined policy directions for the management of the Gulf of Maine’s maritime cultural heritage based on sustainable development principles that are in line with current ocean and ecosystem-based management initiatives and policies. With a sustainable approach to cultural resource management, the U.S. government and its regulatory agencies will be better able to make informed decisions to preserve the tangible aspects of the region’s maritime cultural heritage. The foresight to preserve the Gulf of Maine’s significant but vanishing maritime heritage will help keep future generations connected to the cultural traditions of the region’s formative period, as well as encourage socio-economic growth, community development, and stewardship.
LIST OF REFERENCES


---. "Formerly Machegonne, Dartmouth, York, Stogummor, Casco, and Falmouth: Portland as a Contested Frontier in the Seventeenth Century." Creating Portland:


Berkes, Fikret, and Carl Folke. "A Systems Perspective on the Interrelations between


Bourque, Bruce J., and Steven Cox. *1985 Field Season, Lazygut Island*. Augusta, ME:


Chilton, Elizabeth S., and Dianna L. Doucette. "The Archaeology of Coastal New


de la Torre, Marta, ed. Assessing the Values of Cultural Heritage. Los Angeles: Getty


---. "Fluted Points in the Eastern Forest." From Kostenki to Clovis: Upper Paleolithic


Drisko, George W. Narrative of the Town of Machias, the Old and the New, the Early and Late. Machias, ME: Press of the Republican, 1904.


Food and Agriculture Organization of the United Nations (FAO). Precautionary Approach to Capture Fisheries and Species Introductions: Elaborated by the Technical Consultation on the Precautionary Approach to Capture Fisheries


Galtsoff, Paul S. *The Story of the Bureau of Commercial Fisheries Biological Laboratory, Woods Hole, Massachusetts*. Washington, DC: U.S. Department of
the Interior, 1962.


Goodwin, Lorinda B. R. *An Archaeology of Manners: The Polite World of the Merchant Elite in Colonial Massachusetts*. Contributions to Global Historical Archaeology.


---. "Sea Tenure in Seventeenth-Century New Hampshire: Native Americans and


Hayward, John. The New England Gazeteer: Containing Descriptions of All the States, Counties and Towns in New England; Also Descriptions of the Principal Mountains, Rivers, Lakes, Capes, Bays, Harbors, Islands, and Fashionable Resorts within That Territory. 9th ed. Concord, NH: Israel S. Boyd and William White, 1839.


Johnson, David Ashby. "Unconsolidated Sediments in the Offshore Zone near Plum Island, Massachusetts." M.S., Massachusetts Institute of Technology, 1966.


Little, Elizabeth A. *An Inventory of Indian Sites on Nantucket.* Boston: Massachusetts Historical Commission, 1979.


Luedtke, Barbara E. "The Calf Island Site and the Late Prehistoric Period in Boston


Rhodes, Eugene G. Pleistocene-Holocene Sediments Interpreted by Seismic Refraction and Wash-Bore Sampling, Plum Island - Castle Neck, Massachusetts. Coastal

Riess, Warren C. Possible Shipwreck and Aboriginal Sites on Submerged Land in Fall River, Massachusetts. Walpole, ME: Darling Marine Center, University of Maine, 1998.


Smith, Joseph W. Gleanings from the Sea: Showing the Pleasures, Pains and Penalties of Life Afloat, with Contingencies Ashore. Andover, MA: J. W. Smith, 1887.


Smith, Joshua C. "Humbert's Paradox: The Global Context of Smuggling in the Bay of Fundy." New England and the Maritime Provinces: Connections and


APPENDIX A:

FEDERAL HISTORIC PRESERVATION LAW
<table>
<thead>
<tr>
<th>Legislation</th>
<th>Authority</th>
<th>Overview</th>
<th>Marine Jurisdiction</th>
<th>Applicable Regulations</th>
<th>Incentives &amp; Penalties</th>
</tr>
</thead>
</table>
| National Historic Preservation Act (1966)             | 16 U.S.C. § 470a, Section 101  | • Allows for the nomination of archaeological sites and historic structures or buildings to the National Register of Historic Places and National Historic Landmarks.  
• Declares the establishment of State Historic Preservation programs and officers.  
• Certifies local governments to carry out provisions of act.  
• Authorizes the establishment of programs and regulations to assist Indian tribes.  
• Authorizes use of grants for preservation activities.  
• Develops preservation standards for federally-owned properties and technical advice for federal agencies.  
• Mandates the development and implementation of comprehensive preservation education and training programs. | • In practice, the act is generally not exercised beyond the submerged lands of the territorial sea (0-12 nm). However, its authority extends to any lands where federal activities occur, which may include activities on the continental shelf and within the Exclusive Economic Zone (0-200 nm).  
• Addendum sections 401 and 402 states that federal activities should avoid adverse impact to archaeological sites that are on the World Heritage List or on national registers of foreign nations. | • Historic Preservation Certifications Pursuant to Section 48(g) and Section 170(h) of The Internal Revenue Code of 1986 (36 CFR 67)  
• National Historic Landmarks Program (36 CFR Part 65)  
• Procedures for State, Tribal, and Local Government Historic Preservation Programs (36 CFR Part 61)  
• Protection of Historic and Cultural Properties (36 CFR Part 800) | • Related to NHPA, the Tax Reform Act of 1986, PL 99-514 IRS Code Section 47, provides tax credits up to 20% for rehabilitation of historic structures (maximum $100,000 per taxpayer annually). This incentive is applicable to adaptive re-use and rehabilitation of waterfront structures, although it is rarely used for such purposes. |
| 16 U.S.C. § 470f, Section 106                         |                                 | • Requires that all federal and federally-permitted activities are reviewed for their impact to cultural resources that are included or eligible for inclusion on the National Register.  
• Agencies must allow the President’s Advisory Committee on Historic Preservation (ACHP) reasonable opportunity to comment on federal undertakings that effect cultural resources. |                                                                                                                                            |                                                                                                          |                                                                                                          |
<table>
<thead>
<tr>
<th>Reference</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 U.S.C. § 470h-2, Section 110</td>
<td>Requires federal agencies to identify, evaluate, and nominate cultural resources to the National Register. Requires federal agencies to designate preservation officers. Requires agencies to record historic properties before demolition. Section requirements may be waived for major natural disasters or imminent threats to national security.</td>
</tr>
<tr>
<td>16 U.S.C. § 470h-4, Section 112</td>
<td>Encourages the protection of Native American and Hawaiian material culture and traditional properties. Mandates that archaeological investigations meet federal standards and that access to artifacts is granted for research purposes.</td>
</tr>
<tr>
<td>16 U.S.C. § 470w-3, Section 304</td>
<td>Allows the location of sensitive historic and cultural resources to remain confidential.</td>
</tr>
<tr>
<td>16 U.S.C. § 470w-7, Section 308</td>
<td>Establishes the National Historic Light Station Program to encourage education and research of lighthouses. Permits the conveyance of light stations to private entities for education, recreation, cultural or historic purposes.</td>
</tr>
<tr>
<td>16 U.S.C. § 470x-x-5, Sections 401-405</td>
<td>Establishes and provides funding for the National Center for Preservation, Technology, and Training in order to develop preservation technology, training and conservation skills for cultural resources.</td>
</tr>
<tr>
<td>16 U.S.C. § 470a-1-a-2, Sections 401-402</td>
<td>Authorizes Secretary of the Interior to make nominations to the World Heritage List. Mandates federal agencies</td>
</tr>
</tbody>
</table>
| National Environmental Policy Act (1969) | 42 U.S.C. § 4321 et seq. | • Main goals of the act include the preservation of important, historic, cultural, and natural aspects of U.S. heritage, and necessitates that federal agencies consider the effects of their actions on cultural resources.  
• The process and documentation required for preparation of an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI), or Environmental Impact Statement (EIS) and Record of Decision (ROD), can be used instead of NHPA Section 106 process, if the federal agency notifies the SHPO/THPO and the ACHP that it intends to do so.  
• Any EA/FONSI or EIS/ROD must include scoping, identification of historic properties, assessment of effects, and provide consultation leading to resolution of any adverse effects to cultural resources.  
• If a federal activity is excluded under NEPA, it may not preclude review under Section 106 of NHPA. | • Jurisdiction extends to any lands where federal activities occur, including the continental shelf and the Exclusive Economic Zone (0-200 nm). | • Council on Environmental Quality (40 CFR 1500 et seq.)  
• Procedures for Implementing the Requirements of the Council on Environmental Quality on the National Environmental Policy Act (40 CFR Part 6, see Subpart C § 6.301-6.302) |
• Establishes standards for permitted excavation.  
• Prescribes civil and criminal penalties.  
• Requires agencies to identify archeological sites.  
• Encourages cooperation between Federal agencies and private individuals.  
• Protects archeological sites by exempting disclosure of site location from the Freedom of Information Act.  
• Paleo-ontological specimens are not considered archeological resources under the act.  | • Applies to federally controlled land such as national parks, forests, wildlife refuges and reserves, and Indian lands within 3 nm of the territorial sea. The act does not assert federal ownership of cultural resources in the Territorial Sea. The definition of “public lands” does not include the outer continental shelf.  | • Protection of Archaeological Resources (43 CFR 7) | • Criminal and civil penalties for looting or damaging sites that are 100 years or older on public and tribal lands.  
• Penalties against unauthorized excavation or damage to archeological resources, as well as trafficking in archeological resources, may result in fines not more than $10,000 or one year imprisonment, or both. However, if cost of restoration or repair to resources is more than $500, up to $20,000 fine and 2 years imprisonment or both. Subsequent violation cannot exceed $100,000 or five years imprisonment, or both. This does not apply to the removal of arrowheads from the surface of the ground.  
• Secretary of the Treasury is directed to pay from penalties and fines collected, resulting in a civil or criminal violation, in an amount equal to one-half of such a fine or penalty, but not to exceed $500, to any person who furnishes information which leads to a conviction.  
• Forfeiture of archeological resources and any equipment used in connection with any violation of the act. Restitution may include transfer of title of property and equipment to Indian tribe used in violation, if such a violation occurred on Indian lands. |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>States that ownership or control of Native American human remains, funerary objects, and cultural patrimony objects, which are excavated or discovered on Federal or tribal lands, is the property of Native Americans.</td>
<td>Requires consultation with Native Americans about permits to excavate on Federal or Tribal lands.</td>
<td>Mandates that all museums identify, inventory, and repatriate their Native American cultural items.</td>
</tr>
<tr>
<td>Requires consultation with Native Americans about permits to excavate on Federal or Tribal lands.</td>
<td>Mandates that all museums identify, inventory, and repatriate their Native American cultural items.</td>
<td>Enhances public awareness, understanding, appreciation and wise and sustainable use of the marine environment, and the natural, historical, cultural, and archaeological resources of the national Marine Sanctuary System.</td>
</tr>
<tr>
<td>Jurisdiction extends to the continental shelf and the Exclusive Economic Zone (0-200 nm).</td>
<td>Jurisdiction extends to the continental shelf and the Exclusive Economic Zone (0-200 nm).</td>
<td>Jurisdiction extends to the outer limit of State title and ownership under the Submerged Lands Act (43 U.S.C. 1301 et seq.) (0-3 nm).</td>
</tr>
<tr>
<td>Museums that fail to comply with the requirements of this chapter may be assessed a civil penalty. The amount of the penalty is based on the economic or non-economic damages suffered by the aggrieved party, and the number of violations that have occurred. Subpoenas may be issued for attendance and testimony of witnesses and the production of relevant papers, books, and documents.</td>
<td>A violation is subject to a civil penalty of not more than $100,000, and each day of a continuing violation constitutes a separate violation.</td>
<td>A violation is subject to a civil penalty of not more than $100,000. Each day of a continuing violation constitutes a separate violation.</td>
</tr>
<tr>
<td>Provides financial and technical incentives for coastal states to manage their coastal zones.</td>
<td>Provides financial and technical incentives for coastal states to manage their coastal zones.</td>
<td>Provides financial and technical incentives for coastal states to manage their coastal zones.</td>
</tr>
<tr>
<td>A state with a federally approved CZMP is eligible for financial assistance and is able to review federal permits and activities that affect the state’s coastal zone.</td>
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<td>A state with a federally approved CZMP is eligible for financial assistance and is able to review federal permits and activities that affect the state’s coastal zone.</td>
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</tbody>
</table>

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<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Abandoned Shipwreck Act (1987)</td>
<td>• Asserts the United States' title to shipwrecks located in submerged lands, and transfers title to states (according to the Submerged Lands Act) except when a shipwreck is located on public or Indian lands, or is a U.S. warship. • Definition of &quot;abandonment&quot; is problematic and courts have often ruled in favor of private claimants based on the Admiralty laws of finds and salvage.</td>
<td>• Applicable to state submerged lands (0-3 nm), territorial submerged lands (3-12 nm), federal intertidal lands (e.g., National parks, estuarine or wildlife reserve systems), and intertidal lands belonging to Indian tribes.</td>
<td></td>
</tr>
<tr>
<td>National Maritime Heritage Act (1994)</td>
<td>• Declares that it shall be the policy of the federal government, in partnership with State and local governments and private organizations and individuals, to support and encourage federal, state, and local governmental and private conservation of historic maritime resources. • Established the National Maritime Heritage Grants Program - a matching grants-in-aid program to State and local governments and private nonprofit organizations for maritime heritage education projects. However, funds for the program, which were attributed to the sale and scrapping of obsolete vessels of the National Defense Reserve Fleet did not adhere to environmental regulations and the grant program ended in 1998.</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>16 U.S.C. § 5401, 5405</td>
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<td></td>
</tr>
</tbody>
</table>
APPENDIX B:

MARINE PROTECTED AREAS IN THE GULF OF MAINE
<table>
<thead>
<tr>
<th>NAME</th>
<th>AGENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passamaquoddy Indian Reservation</td>
<td>Bureau of Indian Affairs</td>
</tr>
<tr>
<td>Penobscot Indian Reservation</td>
<td>Bureau of Indian Affairs</td>
</tr>
<tr>
<td>Brunswick Naval Air Station</td>
<td>Department of Defense</td>
</tr>
<tr>
<td>Otis Air Force Base</td>
<td>Department of Defense</td>
</tr>
<tr>
<td>South Weymouth Naval Air Station (Closed)</td>
<td>Department of Defense</td>
</tr>
<tr>
<td>U.S. Army Reserve Center</td>
<td>Department of Defense</td>
</tr>
<tr>
<td>U.S. Naval Radio Station</td>
<td>Department of Defense</td>
</tr>
<tr>
<td>Cross Island National Wildlife Refuge</td>
<td>Fish and Wildlife Service</td>
</tr>
<tr>
<td>Cross Island National Wildlife Refuge</td>
<td>Fish and Wildlife Service</td>
</tr>
<tr>
<td>Franklin Island National Wildlife Refuge</td>
<td>Fish and Wildlife Service</td>
</tr>
<tr>
<td>Great Bay National Wildlife Refuge</td>
<td>Fish and Wildlife Service</td>
</tr>
<tr>
<td>Mashpee National Wildlife Refuge</td>
<td>Fish and Wildlife Service</td>
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<tr>
<td>Monomoy National Wildlife Refuge</td>
<td>Fish and Wildlife Service</td>
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<tr>
<td>Monomoy Wilderness</td>
<td>Fish and Wildlife Service</td>
</tr>
<tr>
<td>Moosehorn Wilderness</td>
<td>Fish and Wildlife Service</td>
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<tr>
<td>Moosehorn Wilderness (Baring Unit)</td>
<td>Fish and Wildlife Service</td>
</tr>
<tr>
<td>Nantucket National Wildlife Refuge</td>
<td>Fish and Wildlife Service</td>
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<tr>
<td>Nomans Land Island National Wildlife Refuge</td>
<td>Fish and Wildlife Service</td>
</tr>
<tr>
<td>Parker River National Wildlife Refuge</td>
<td>Fish and Wildlife Service</td>
</tr>
<tr>
<td>Petit Manan National Wildlife Refuge</td>
<td>Fish and Wildlife Service</td>
</tr>
<tr>
<td>Pond Island National Wildlife Refuge</td>
<td>Fish and Wildlife Service</td>
</tr>
<tr>
<td>Rachel Carson National Wildlife Refuge</td>
<td>Fish and Wildlife Service</td>
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<tr>
<td>Seal Island National Wildlife Refuge</td>
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<td>Thacher Island National Wildlife Refuge</td>
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<td>Great Bay National Estuarine Research Reserve</td>
<td>National Oceanic and Atmospheric Administration</td>
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<td>Waquoit Bay National Estuarine Research Reserve</td>
<td>National Oceanic and Atmospheric Administration</td>
</tr>
<tr>
<td>Wells National Estuarine Research Reserve</td>
<td>National Oceanic and Atmospheric Administration</td>
</tr>
<tr>
<td>Stellwagen Bank National Marine Sanctuary</td>
<td>National Oceanic and Atmospheric Administration</td>
</tr>
<tr>
<td>Acadia National Park</td>
<td>National Park Service</td>
</tr>
<tr>
<td>Cape Cod National Seashore</td>
<td>National Park Service</td>
</tr>
</tbody>
</table>
APPENDIX C:

NAVAL AND MILITARY LOSSES IN THE GULF OF MAINE
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Date</th>
<th>State</th>
<th>Location</th>
<th>Cause</th>
</tr>
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<tbody>
<tr>
<td>O-9</td>
<td>SUBMARINE</td>
<td>1941</td>
<td>NH</td>
<td>PORTSMOUTH</td>
<td>ACCIDENT</td>
</tr>
<tr>
<td>WARREN</td>
<td>SCHOONER</td>
<td>1776</td>
<td>NH</td>
<td>PORTSMOUTH</td>
<td>ACCIDENT - GROUNDED</td>
</tr>
<tr>
<td>HMS ASTREA</td>
<td>20-GUN STORESHIP</td>
<td>1744</td>
<td>NH</td>
<td>PORTSMOUTH, PISCATAQUA RIVER</td>
<td>UNKNOWN</td>
</tr>
<tr>
<td>USS ATIK</td>
<td>CARGO SHIP</td>
<td>1942</td>
<td>NH</td>
<td>PORTSMOUTH</td>
<td>ENEMY ACTION - TORPEDO</td>
</tr>
<tr>
<td>USS YC-523</td>
<td>OPEN LIGHTER</td>
<td>1944</td>
<td>ME</td>
<td>PORTSMOUTH</td>
<td>ACCIDENT - GROUNDED</td>
</tr>
<tr>
<td>USS EAGLE BOAT NO 56</td>
<td>PATROL VESSEL</td>
<td>1945</td>
<td>ME</td>
<td>PORTLAND HARBOR</td>
<td>ENEMY ACTION - SUBMARINE</td>
</tr>
<tr>
<td>DILIGENT</td>
<td>BRIG - 12GUN</td>
<td>1779</td>
<td>ME</td>
<td>CASTINE, PENOBSCOT BAY</td>
<td>ENEMY ACTION - PREVENT CAPTURE</td>
</tr>
<tr>
<td>USS S-17</td>
<td>SUBMARINE</td>
<td>1945</td>
<td>ME</td>
<td>CASCO BAY</td>
<td>FLEET REDUCTION - DISPOSED OF</td>
</tr>
<tr>
<td>USS S-21</td>
<td>SUBMARINE</td>
<td>1945</td>
<td>ME</td>
<td>GULF OF MAINE</td>
<td>FLEET REDUCTION - TARGET/TEST</td>
</tr>
<tr>
<td>WARREN</td>
<td>FRIGATE - 32GUN</td>
<td>1779</td>
<td>ME</td>
<td>FRANKFORT, BAGADUCE RIVER, BAGADUCE PENINSULA</td>
<td>ENEMY ACTION - PREVENT CAPTURE</td>
</tr>
<tr>
<td>HAZARD</td>
<td>16-GUN</td>
<td>1863</td>
<td>ME</td>
<td>PENOBSCOT BAY</td>
<td>UNKNOWN</td>
</tr>
<tr>
<td>TYRANICIDE</td>
<td>14-GUN</td>
<td>1743</td>
<td>ME</td>
<td>PENOBSCOT BAY</td>
<td>UNKNOWN</td>
</tr>
<tr>
<td>HMS ASTREA</td>
<td>STORESHIP</td>
<td>1743</td>
<td>ME</td>
<td>PORTSMOUTH NH, PISCATAQUA RIVER</td>
<td>ENEMY ACTION</td>
</tr>
<tr>
<td>USRC CALEB CUSHING</td>
<td>SCHOONER</td>
<td>1863</td>
<td>ME</td>
<td>PORTLAND, CASCO BAY</td>
<td>ENEMY ACTION - PREVENT CAPTURE</td>
</tr>
<tr>
<td>USS ADAMS</td>
<td>FRIGATE - 28GUN</td>
<td>1814</td>
<td>ME</td>
<td>HAMPDEN, PENOBSCOT RIVER</td>
<td>ENEMY ACTION - PREVENT CAPTURE</td>
</tr>
<tr>
<td>PROVIDENCE</td>
<td>SLOOP - 12GUN</td>
<td>1779</td>
<td>ME</td>
<td>PENOBSCOT RIVER</td>
<td>ENEMY ACTION - PREVENT CAPTURE</td>
</tr>
<tr>
<td>DEFENCE</td>
<td>BRIGANTINE</td>
<td>1779</td>
<td>ME</td>
<td>STOCKTON SPRINGS HARBOR</td>
<td></td>
</tr>
<tr>
<td>USS GYPSY</td>
<td>MOTOR PATROL BOAT</td>
<td>1917</td>
<td>MA</td>
<td>NEPONSET RIVER</td>
<td>ACCIDENT</td>
</tr>
<tr>
<td>USS KATHERINE W CULLEN</td>
<td>BARGE</td>
<td>1918</td>
<td>MA</td>
<td>CAPE COD</td>
<td>ACCIDENT - LOST UNDER TOW</td>
</tr>
<tr>
<td>USS MOHAVE</td>
<td>OCEAN TUG</td>
<td>1928</td>
<td>MA</td>
<td>NANTASKET</td>
<td>ACCIDENT - GROUNDED</td>
</tr>
<tr>
<td>USS THRESHER</td>
<td>NUCLEAR POWERED SUBMARINE</td>
<td>1963</td>
<td>MA</td>
<td>ISLES OF SHOALS</td>
<td>ACCIDENT</td>
</tr>
<tr>
<td>U-234</td>
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<td>1947</td>
<td>MA</td>
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<tr>
<td>U-530</td>
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<td>MA</td>
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</tr>
<tr>
<td>U-805</td>
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</tr>
<tr>
<td>U-858</td>
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<tr>
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<tr>
<td>U-977</td>
<td>SUBMARINE</td>
<td>1946</td>
<td>MA</td>
<td>CAPE COD</td>
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</tr>
<tr>
<td>Name</td>
<td>Type</td>
<td>Year</td>
<td>Location</td>
<td>Fate</td>
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<tr>
<td>---------------------</td>
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</tr>
<tr>
<td>U-1228</td>
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<td>1946</td>
<td>MA</td>
<td>FLEET REDUCTION - TARGET/TEST</td>
<td></td>
</tr>
<tr>
<td>USS YANKEE</td>
<td>SCREW STEAMER</td>
<td>1908</td>
<td>MA</td>
<td>ACCIDENT - LOST</td>
<td></td>
</tr>
<tr>
<td>USS GROUSE</td>
<td>COASTAL MINESWEEPER (OLD)</td>
<td>1963</td>
<td>MA</td>
<td>ROCKPORT</td>
<td></td>
</tr>
<tr>
<td>USS C F SARGENT</td>
<td>BARGE</td>
<td>1918</td>
<td>MA</td>
<td>HEN AND CHICKEN SHOALS</td>
<td></td>
</tr>
<tr>
<td>USS BONITA</td>
<td>MOTOR PATROL BOAT</td>
<td>1918</td>
<td>MA</td>
<td>USCG STATION 2E, BOSTON HARBOR</td>
<td></td>
</tr>
<tr>
<td>HMS HAZARD</td>
<td>SLOOP - 14GUN</td>
<td>1714</td>
<td>MA</td>
<td>BOSTON, GREEN BAY</td>
<td></td>
</tr>
<tr>
<td>HMS BRITANNIA</td>
<td>TRANSPORT</td>
<td>0</td>
<td>MA</td>
<td>BOSTON HARBOR</td>
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<tr>
<td>HMS BLONDE</td>
<td>32-GUN</td>
<td>1782</td>
<td>MA</td>
<td>NANTUCKET SHOALS</td>
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<tr>
<td>HMS DIANA</td>
<td>Schooner</td>
<td>1775</td>
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<td>1799</td>
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<td>HMCs FRANCIS</td>
<td>DESTROYER</td>
<td>1945</td>
<td>MA</td>
<td>ACOAXET, RHODE ISLAND SOUND</td>
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<tr>
<td>USS EAGLE BOAT NO 42</td>
<td>PATROL VESSEL</td>
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<tr>
<td>HMCs SAINT CLAIR</td>
<td>DESTROYER</td>
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<td>MA</td>
<td>WESTPORT POINT, BUZZARDS BAY</td>
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<tr>
<td>USS EAGLE BOAT</td>
<td>PATROL VESSEL</td>
<td></td>
<td>MA</td>
<td>SOW AND PIGS REEF, BUZZARDS BAY</td>
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<tr>
<td>NAVY PATROL</td>
<td>TUG (SCREW)</td>
<td>1891</td>
<td>MA</td>
<td>RHODE ISLAND SOUND</td>
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</tr>
<tr>
<td>USS TRIANA</td>
<td>TUG (SCREW)</td>
<td>1870</td>
<td>MA</td>
<td>NANTUCKET SOUND</td>
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<tr>
<td>USS YSD</td>
<td>SEAPLANE WRECKING Derrick</td>
<td>1857</td>
<td>MA</td>
<td>OLD MAN ROCK</td>
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</tr>
<tr>
<td>USS VALOR</td>
<td>COASTAL MINESWEEPER</td>
<td>1844</td>
<td>MA</td>
<td>NEW BEDFORD</td>
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<tr>
<td>CG-58012</td>
<td>COAST GUARD VESSEL</td>
<td>1843</td>
<td>MA</td>
<td>MANOMET POINT, CAPE COD BAY</td>
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<tr>
<td>USS PT-200</td>
<td>MOTOR TORPEDO BOAT</td>
<td>1844</td>
<td>MA</td>
<td>NEW BEDFORD</td>
<td></td>
</tr>
<tr>
<td>USS MARIA</td>
<td>SCREW TUG</td>
<td>1870</td>
<td>MA</td>
<td>NANTUCKET SOUND</td>
<td></td>
</tr>
<tr>
<td>USS ALBERT GALLATIN</td>
<td>SCREW STEAMER</td>
<td>1892</td>
<td>MA</td>
<td>MANCHESTER - CAPE ANN</td>
<td></td>
</tr>
<tr>
<td>USS HOWELL COBB</td>
<td>Schooner</td>
<td>1861</td>
<td>MA</td>
<td>CAPE ANN</td>
<td></td>
</tr>
<tr>
<td>USS GUNBOAT NO 89</td>
<td>GUNBOAT</td>
<td>1815</td>
<td>MA</td>
<td>NEW BEDFORD, BUZZARD BAY</td>
<td></td>
</tr>
<tr>
<td>USS TORO</td>
<td>AUXILIARY SUBMARINE</td>
<td>1863</td>
<td>MA</td>
<td>CAPE COD</td>
<td></td>
</tr>
<tr>
<td>USS NEZINSCOT</td>
<td>TUG</td>
<td>1890</td>
<td>MA</td>
<td>ACCIDENT</td>
<td></td>
</tr>
<tr>
<td>USS YC-857</td>
<td>OPEN LIGHTER</td>
<td>1893</td>
<td>MA</td>
<td>CAPE COD</td>
<td></td>
</tr>
<tr>
<td>USS YF-415</td>
<td>COVERED LIGHTER</td>
<td>1894</td>
<td>MA</td>
<td>CAPE COD</td>
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<tr>
<td>USS YMS-14</td>
<td>AUXILIARY MINESWEEPER</td>
<td>1895</td>
<td>MA</td>
<td>BOSTON HARBOR</td>
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333
<table>
<thead>
<tr>
<th>Ship Name</th>
<th>Type</th>
<th>Year</th>
<th>State</th>
<th>Location</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>USS PC-1203</td>
<td>Submarine Chaser</td>
<td>1949</td>
<td>MA</td>
<td>Horseshoe Shoal</td>
<td>Fleet Reduction - Disposed Of</td>
</tr>
<tr>
<td>HMS Somerset</td>
<td>Frigate</td>
<td>1778</td>
<td>MA</td>
<td>Cape Cod, Nauset</td>
<td>Grounded in Storm</td>
</tr>
<tr>
<td>James Longstreet</td>
<td>Liberty Ship</td>
<td>1943</td>
<td>MA</td>
<td>Eastham, Curtis Creek</td>
<td>Fleet Reduction - Target/Test</td>
</tr>
<tr>
<td>USS Granite State</td>
<td>Ship of the Line</td>
<td>1922</td>
<td>MA</td>
<td>Boston, Massachusetts Bay</td>
<td>Accident - Caught Fire</td>
</tr>
</tbody>
</table>
APPENDIX D:

STATE HISTORIC PRESERVATION LAWS
<table>
<thead>
<tr>
<th>Legislation</th>
<th>Authority</th>
<th>Overview</th>
<th>Marine Jurisdiction</th>
<th>Applicable Regulations</th>
<th>Incentives &amp; Penalties</th>
</tr>
</thead>
</table>
| An Act Relating to Preserving Historical Materials by the State Museum (1969); An Act to Preserve Maine's Archaeological Heritage (1979) | 27 M.R.S.A.: Libraries, History, Culture, and Art; specifically, c. 13 § 361-378 | • Preserves the architectural, historic and environmental heritage of the people of Maine, and develops and promotes the cultural, educational and economic benefits of these resources.  
• Declares that it is the policy of Maine to preserve and protect archaeological sites for proper excavation and interpretation.  
• Maine State Museum holds title to all archaeological objects, materials and specimens found on, in or beneath state-controlled lands.  
• Requires permits for excavation of archaeological sites to protect such site from unlawful excavation or harm. | • Asserts the state's ownership of all artifacts on and in state-controlled lands, including submerged lands below the mean low-water mark (MLLW) to the seaward boundary of coastal waters (0-3 nm) and land beneath ponds and lakes that are 10 or more acres in size. |  | • Unlawful excavation will result in a fine of $250 and imprisonment up to one year, whereas every day of unlawful excavation constitutes a separate violation. | |
<table>
<thead>
<tr>
<th>Massachusetts Historical Commission, Historic District Act</th>
<th>M.G.L. c. 9: Massachusetts Historical Commission; specifically § 26-27D; M.G.L. c. 40C: Historic Districts</th>
<th>• Requires that a discoverer of a previously unknown historical site to apply for a permit to investigate an archaeological site. The discoverer of the site, whether on land or water, is entitled to 25% of the recovered material. However, the work must be performed according to the professional qualifications set by the commissioner of the Division of Historical Resources (DHR). • Endorses the collection of isolated finds if the finds are first brought to the DHR for identification.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Massachusetts Board of Underwater Archaeological Resources</td>
<td>M.G.L. c. 6: Board of Underwater Archaeological Resources; specifically, § 179 &amp; 180; M.G.L. c. 91: Waterways; specifically, § 63</td>
<td>• MBUAR is responsible for managing underwater historical and archaeological resources. The Board oversees the discovery, reporting, protection, and preservation of resources including abandoned properties, artifacts, treasure troves, and sunken ships that</td>
<td>• Properties located in Massachusetts that are on or eligible for listing on the National Register of Historic Places. Seaward jurisdiction from MLLW to 3 nm. • Massachusetts Historical Commission (950 CMR 70.00) • Protection of Properties Included on the State Register of Historic Places (950 CMR 71.00)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• All underwater archaeological resources within the coastal and inland waters of Massachusetts.</td>
<td>• 312 CMR 2.00: Massachusetts Underwater Archaeological Resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Violations of the board’s regulations are considered misdemeanors and may result in fines up to $1,000 and 6 months imprisonment. • Encourages interest in heritage resources through the creation of underwater archaeological preserves, presentations at</td>
</tr>
</tbody>
</table>
have remained unclaimed for 100 years or more, or which are valued at $5,000 or more.  
• Encourages the discovery, reporting, protection and preservation of historical, scientific and archaeological information about underwater archaeological resources.  
• Establishes a permitting process, which defines minimum documentation and qualification standards needed for investigation of archaeological sites.  
Permittees may retain 75% of the value of recovered cultural materials.  
• The board maintains a shipwreck inventory or database to assist the SHPO and environment department in NEPA and NHPA reviews, and forms programmatic agreements with state and federal agencies to study and protect maritime cultural resources.  
• Ensures that the exact location of archaeological sites is not made public in order to protect the resources from unauthorized excavation.  
• The board may designate "underwater archaeological preserves" to recognize historically-important resources.

archaeological conferences and for the general public, and the creation of a List of Exempt Shipwrecks that recreational divers can freely visit.
<table>
<thead>
<tr>
<th>Overview</th>
<th>Authority</th>
<th>Applicable Guidelines</th>
<th>Marine Jurisdiction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encourages states to nominate sites to the World Heritage List and encourages nations to support participation in conservation and education of heritage sites locally, nationally, and internationally.</td>
<td>Convention Concerning the Protection of the World Cultural and Natural Heritage (1972)</td>
<td><em>Operational Guidelines for the Protection of the Underwater Cultural Heritage (2005).</em></td>
<td><em>Non-specific.</em> The convention refers broadly to any property within a nation's territory.</td>
</tr>
<tr>
<td>Primary mission is &quot;the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution toward achieving sustainable development throughout the world.&quot;</td>
<td>Convention on Wetlands of International Importance Especially as Waterfowl Habitat (1971)</td>
<td><em>A Strategy for the Heritage Management of Wetlands in the Mediterranean Region.</em></td>
<td>Wetlands</td>
</tr>
<tr>
<td>Claims &quot;wetlands have special attributes as part of the cultural heritage of humanity - they are related to religious and cosmological beliefs and spiritual values, constitute a source of aesthetic and artistic inspiration, yield invaluable archaeological evidence from the remote past, provide wildlife sanctuaries, and form the basis of important local social, economic, and cultural traditions.&quot;</td>
<td>Convention on the Protection of the Underwater Cultural Heritage (2001)</td>
<td><em>International Charter on the Protection and Management of Underwater Cultural Heritage (1996).</em> International Council on Monuments and Sites.</td>
<td>Wetlands</td>
</tr>
<tr>
<td>Objectives include the protection of &quot;objects of an archaeological and historical nature found at sea.&quot;</td>
<td>A Strategy for the Heritage Management of Wetlands in the Mediterranean Region.</td>
<td><em>A Strategy for the Heritage Management of Wetlands in the Mediterranean Region.</em></td>
<td>Wetlands</td>
</tr>
</tbody>
</table>

**Legislation**

- **Convention Concerning the Protection of the World Cultural and Natural Heritage (1972)**
  - Adopted by the General Conference at its Seventeenth Session, Paris, 16 November 1972, UNESO, 1972

- **Convention on Wetlands of International Importance Especially as Waterfowl Habitat (1971)**
  - Adopted at Ramsar, Iran, 2 February 1971, Paris: UNESCO, 1972

- **Convention on the Protection of the Underwater Cultural Heritage (2001)**


**Overview**

- Encourages states to nominate sites to the World Heritage List and encourages nations to support participation in conservation and education of heritage sites locally, nationally, and internationally.
- Primary mission is "the conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution toward achieving sustainable development throughout the world." Wetlands have special attributes as part of the cultural heritage of humanity - they are related to religious and cosmological beliefs and spiritual values, constitute a source of aesthetic and artistic inspiration, yield invaluable archaeological evidence from the remote past, provide wildlife sanctuaries, and form the basis of important local social, economic, and cultural traditions.
- Affirms that underwater cultural heritage is not subject to the law of finds or salvage.
- Explicitly states that nations are authorized to regulate all activities affecting underwater cultural heritage on the continental shelf and the EEZ.
- Intends to raise public awareness of the value and significance of underwater cultural heritage.
- States that under the convention warships and military aircraft remain protected under the principle of sovereign immunity.
- Objectives include the protection of "objects of an archaeological and historical nature found at sea."
APPENDIX F:

NATIONAL AND INTERNATIONAL CULTURAL HERITAGE EVALUATION

CRITERIA
**National Register of Historic Places: Criteria of Eligibility**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Association with events that have made a significant contribution to the broad patterns of our history.</td>
</tr>
<tr>
<td>B</td>
<td>Associated with the lives of persons significant in our past.</td>
</tr>
<tr>
<td>C</td>
<td>Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.</td>
</tr>
<tr>
<td>D</td>
<td>Yielded, or may be likely to yield, information important in prehistory or history.</td>
</tr>
</tbody>
</table>

**Factors in Evaluating the Significance of Historic Vessels and Shipwrecks**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sole, best, or a good representative of a specific vessel type.</td>
</tr>
<tr>
<td>2</td>
<td>Associated with a significant designer or builder.</td>
</tr>
<tr>
<td>3</td>
<td>Involved in important maritime trade, naval, recreational, government, or commercial activities.</td>
</tr>
</tbody>
</table>
Marine Protected Areas: Criteria for Selection (World Commission on Protected Areas of IUCN -
The World Conservation Union [Kelleher 1999: 40-41])

<table>
<thead>
<tr>
<th>Biogeographic criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of rare biogeographic qualities or representative of a biogeographic “type” or types</td>
</tr>
<tr>
<td>Existence of unique or unusual geological features</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ecological criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological processes or life-support systems (e.g. as a source for larvae for downstream areas)</td>
</tr>
<tr>
<td>Integrity, or the degree to which the area, either alone or in association with other protected areas, encompasses a complete ecosystem</td>
</tr>
<tr>
<td>The variety of habitats</td>
</tr>
<tr>
<td>Presence of habitat for rare or endangered species</td>
</tr>
<tr>
<td>Presence of nursery or juvenile areas</td>
</tr>
<tr>
<td>Presence of feeding, breeding or rest areas</td>
</tr>
<tr>
<td>Existence of rare or unique habitat for any species</td>
</tr>
<tr>
<td>Degree of genetic diversity within species</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Naturalness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent to which the area has been protected from, or has not been subject to, human-induced change</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Economic importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing or potential economic contribution due to protection (e.g. protection of an area for recreation, subsistence, use by traditional inhabitants, appreciation by tourists and others, or as a refuge nursery area or source of economically important species)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing or potential value to local, national or international communities because of its heritage, historical, cultural, traditional, aesthetic, educational or recreational qualities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scientific importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value for research and monitoring</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>International or national significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existence of any national or international designation</td>
</tr>
<tr>
<td>Potential for listing on a national or international system</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Practicality or feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of insulation from external destructive influences</td>
</tr>
<tr>
<td>Social and political acceptability, degree of community support</td>
</tr>
<tr>
<td>Accessibility for education, tourism, recreation</td>
</tr>
<tr>
<td>Compatibility with existing uses, particularly by locals</td>
</tr>
<tr>
<td>Ease of management or compatibility with existing management regimes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duality or Replication</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPAs, particularly when small, can be subject to devastating destructive influences, either from humans or from nature, such as cyclones on coral reefs. It is therefore desirable that there should be more than one sample of every major ecosystem type in a representative system</td>
</tr>
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<tr>
<td>10</td>
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<tr>
<td>World Heritage List: Criteria for Selection</td>
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<tr>
<td>------------------------------------------</td>
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<tr>
<td>i</td>
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<tr>
<td>ii</td>
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<td>viii</td>
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<td>ix</td>
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<tr>
<td>x</td>
</tr>
<tr>
<td>Categories of the National Historic Landmarks thematic study, “The Maritime Heritage of the United States” (NPS 1988)</td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td>Large Vessels</td>
</tr>
<tr>
<td>Light Stations</td>
</tr>
<tr>
<td>Life-Saving Stations</td>
</tr>
<tr>
<td>Shipwrecks and Hulks</td>
</tr>
<tr>
<td>World War II Sites</td>
</tr>
<tr>
<td>Other Naval Battle Sites</td>
</tr>
<tr>
<td>Naval Facilities, Bases and Shipyards</td>
</tr>
<tr>
<td>Maritime Exploration</td>
</tr>
<tr>
<td>Canals and Waterways</td>
</tr>
<tr>
<td>People, Labor and Philanthropy</td>
</tr>
<tr>
<td>Other Maritime Districts, Buildings and Structures</td>
</tr>
</tbody>
</table>