

Draft
Environmental Impact Statement/Overseas Environmental Impact Statement
Atlantic Fleet Training and Testing

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3.10 CULTURAL RESOURCES

CULTURAL RESOURCES SYNOPSIS

The United States Department of the Navy considered all potential stressors that cultural resources could potentially be exposed to from the Proposed Action. The following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Explosive: Explosive stressors resulting from underwater explosions creating shock waves and cratering of the seafloor would not result in adverse effects to known submerged cultural resources. Therefore, no submerged cultural resources are expected to be affected.
- Physical Disturbance and Strikes: Physical disturbance and strike stressors resulting from in-water devices, military expended materials, seafloor devices, pile driving, and vibration from sonic booms during training and testing activities would not result in adverse effects to known or unknown submerged cultural resources. Therefore, no submerged cultural resources are expected to be affected.

3.10.1 INTRODUCTION AND METHODS

3.10.1.1 Introduction

Submerged cultural resources are found throughout the Atlantic Fleet Training and Testing (AFTT) Study Area. The approach for the assessment of submerged cultural resources includes defining the resource; presenting the regulatory requirements for the identification, evaluation, and treatment within established jurisdictional parameters; establishing the specific resources subtypes in the Study Area; identifying the data used to define the current conditions; and providing the method for impact analysis.

Cultural resources are defined as districts, landscapes, sites, structures, objects, and ethnographic resources, as well as other physical evidence of human activities that are considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources include archaeological resources, architectural resources, and traditional cultural properties related to pre-contact (prior to European contact) and post-contact periods.

Archaeological resources include prehistoric and historic sites and artifacts. Archaeological resources can have a surface component, a subsurface component, or both. Prehistoric resources are physical properties resulting from human activities that predate written records and can include village sites, temporary camps, lithic scatters, roasting pits, hearths, milling features, petroglyphs, rock features, shell mounds, and burials. Historic resources postdate the advent of written records in a region and include building foundations, refuse scatters, wells, cisterns, and privies. Submerged cultural resources include historical shipwrecks and other submerged historical materials, such as sunken airplanes and prehistoric cultural remains. Architectural resources are elements of the built environment consisting of standing buildings or structures from the historic period. These resources include existing buildings, dams, bridges, lighthouses, and forts. Traditional cultural properties are resources associated with beliefs and cultural practices of a living culture, subculture, or community. These beliefs and practices must be rooted in the group's history and must be important in maintaining the cultural identity of the group. Prehistoric archaeological sites and artifacts, historic and contemporary locations of traditional events, sacred places, landscapes, and resource collection areas, including fishing, hunting, or gathering areas, may be traditional cultural resources.

3.10.1.2 Identification, Evaluation, and Treatment of Cultural Resources

Procedures for identifying, evaluating, and treating cultural resources within state territorial waters (within 3 nautical miles [NM] of the coast) and United States (U.S.) territorial waters (within 12 NM of the coast) are contained in a series of federal and state laws and regulations, and agency guidelines. Archaeological, architectural, and cultural (including Native American and Native Hawaiian) resources are protected by a variety of laws and their implementing regulations: the National Historic Preservation Act of 1966 as amended in 2006, the Archeological and Historic Preservation Act of 1974, the Archaeological Resources Protection Act of 1979, the American Indian Religious Freedom Act of 1978, the Native American Graves Protection and Repatriation Act of 1990, the Submerged Lands Act of 1953, the Abandoned Shipwreck Act of 1987, and the Sunken Military Craft Act of 2004. The Advisory Council on Historic Preservation further guides treatment of archaeological and architectural resources through the regulations, Protection of Historic Properties (36 Code of Federal Regulations [CFR] part 800). The category of “historic properties” is a subset of cultural resources that is defined in the National Historic Preservation Act (54 United States Code [U.S.C.] section 300308) as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (National Register), including artifacts, records, and material remains related to such a property or resource.

Section 106 of the National Historic Preservation Act requires federal agencies to consider the effects of their actions on cultural resources listed in or eligible for inclusion in the National Register of Historic Places. The regulations implementing Section 106 (36 CFR part 800) specify a consultation process to assist in satisfying this requirement including efforts in identification of historic places. Consultation with the appropriate State Historic Preservation Offices, the Advisory Council on Historic Preservation, Native American tribes and Native Hawaiian organizations, the public, and state and federal agencies is required by Section 106 of the National Historic Preservation Act. Scoping letters for this Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) were sent to appropriate State Historic Preservation Offices and appropriate federally recognized Native American tribes (refer to Chapter 8, Public Participation) on November 12, 2015.

Additional regulations and guidelines for submerged historical resources include 10 U.S.C. section 113, Title XIV for the Sunken Military Craft Act; the Abandoned Shipwreck Guidelines prepared by the National Park Service (National Park Service, 2007); and, for the purposes of conducting research or recovering U.S. Department of the Navy (Navy) ship and aircraft wrecks, the Guidelines for Archaeological Research Permit Applications on Ship and Aircraft Wrecks under the Jurisdiction of the Department of the Navy (32 CFR part 767) overseen by the Naval History and Heritage Command. The Sunken Military Craft Act does not apply to actions taken by, or at the direction of, the United States. In accordance with the Abandoned Shipwreck Act, abandoned shipwrecks in state waters are considered the property of the U.S. government; however, the federal government may transfer titles to abandoned shipwrecks to a state where shipwrecks fall within the jurisdiction of the state (Barnette, 2010). Warships or other vessels used for military purposes at the time of their sinking retain sovereign immunity (e.g., German U-boats). According to the principle of sovereign immunity, foreign warships sunk in U.S. territorial waters are protected by the U.S. government, which acts as custodian of the sites in the best interest of the sovereign nation (Neyland, 2001). In addition, the National Park Service Archeology Program, developed as a result of a presidential order, includes a collection of historical and archaeological resource protection laws to which federal managers adhere.

The addendum to the National Historic Preservation Act (54 U.S.C. section 307101(e)) requires an assessment by federal agencies of project effects to resources located outside U.S. territorial waters that are identified on the World Heritage List or on the applicable country's equivalent of the National Register of Historic Places. Eight resources listed on the World Heritage List and four resources listed on Canada's Historic Places Register are located adjacent to but not within the AFTT Study Area. No resources listed on the World Heritage List or on Canada's Historic Places Register occur in the AFTT Study Area.

No specific procedures for the identification and protection of cultural resources within the open ocean have been defined by the international community (Zander & Varmer, 1996). No treaty offering comprehensive protection of submerged cultural resources has been developed and implemented. However, a few international conventions prepared by the United Nations Educational, Scientific, and Cultural Organizations are applicable to submerged cultural resources, including the 1970 Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property; the 1972 Convention Concerning the Protection of the World Cultural and Natural Heritage; the 1982 Convention on the Law of the Sea; and the 2001 Convention on the Protection of the Underwater Cultural Heritage. Only the 1970 and 1972 conventions have been fully ratified by the United States. Individual submerged resources may be protected by international agreements, such as the RMS Titanic Maritime Memorial Act of 1986. The RMS Titanic Maritime Memorial Act of 1986 established the RMS Titanic as an international maritime memorial and gravesite.

3.10.1.3 Methods

3.10.1.3.1 Approach

The approach for establishing current conditions is based on different regulatory parameters defined by geographical location. Within U.S. territorial waters (within 12 NM of the coast), the National Environmental Policy Act (NEPA) is the guiding mandate. Areas beyond 12 NM in the open ocean will not be analyzed because obtaining data beyond 12 NM and at those depths are not practicable, they are not associated with any state, and there are no State Historic Preservation Office consultation requirements beyond 3 NM in some cases and beyond 9 NM for some Gulf coast states. As such, impacts on potential cultural resources in the open ocean are discussed as a programmatic analysis in terms of the potential impact a stressor could have on a historic property within the Study Area beyond 12 NM.

The implementing regulations of Section 106 of the National Historic Preservation Act require federal agencies to take into account the effects that a proposed action would have on cultural resources included in or eligible for inclusion in the National Register of Historic Places. "Historic properties" is synonymous with National Register-eligible or -listed archaeological, architectural, or traditional resources. Cultural resources that have not been formally evaluated (i.e., have not had a Consensus Determination in consultation with the State Historic Preservation Office) may be considered potentially eligible, and thus are afforded the same regulatory consideration as resources listed in the National Register. Evaluations and determinations of historic properties within the Study Area are the responsibility of the federal agency, in consultation with the appropriate State Historic Preservation Office (Alabama, Connecticut, Delaware, Florida, Georgia, Louisiana, Maine, Maryland, Massachusetts, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Puerto Rico, Rhode Island, South Carolina, Texas, Virginia, and U.S. Virgin Islands).

Properties are evaluated for nomination to the National Register and for National Register eligibility using the following criteria (36 CFR section 60.4(a)–(d)):

- Criterion A: Be associated with events that have made a significant contribution to the broad patterns of American history
- Criterion B: Be associated with the lives of persons significant in the American past
- Criterion C: Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction
- Criterion D: Yield, or may be likely to yield, information important in prehistory or history

A historic property also must possess the following aspects of integrity: location, design, setting, materials, workmanship, feeling, and association to convey its significance and to qualify for the National Register. These seven aspects, in various combinations, define integrity. To retain integrity, a property will always possess several, and usually most, of these aspects.

Cultural resources in U.S. territorial waters (within 12 NM of the coast) are as follows:

- Resources listed in or eligible for listing in the National Register of Historic Places (Section 106 of the National Historic Preservation Act)
- Resources entitled to sovereign immunity (e.g., German U-boats)

3.10.1.3.2 Data Sources

Cultural resources information relevant to this EIS/OEIS was derived from a variety of sources, including previous environmental documents, previous technical memoranda on submerged cultural resource predictive models (Krivor, 2009; Southeastern Archaeological Research, 2009a, 2009b, 2009c), national and international shipwreck databases, the National Register Information System (managed by the National Park Service), information repositories associated with State Historic Preservation Offices, online maps and data, and published sources, as cited.

National and international shipwreck databases researched included the National Oceanic and Atmospheric Administration Advanced Wreck and Obstruction Information System, National Oceanic and Atmospheric Administration Aids to Navigation, the United States Coast Guard Hazards to Navigation, the General Dynamics Global Maritime Wrecks Database, the Northern Shipwrecks Database, accessible state archaeological master site files (Alabama, Florida, Georgia, Mississippi, North Carolina, and Virginia), and secondary sources of historic (older than 50 years) shipwreck information such as the Lytle-Holdcamper List, Shipwrecks in the Americas, and the Encyclopedia of American Shipwrecks (Burns, 2011). Many of the shipwreck databases and secondary sources overlap, generating data repetition. Many federal agencies “share” data as well as secondary sources. The intent of this analysis is not to provide a definitive number of shipwrecks, obstructions, or hazards within a defined area, but rather to provide an overview of potential resources within an area.

The online National Register Information System was reviewed to identify National Register of Historic Places-listed resources, historic districts, and National Historic Landmarks. Appropriate information repositories associated with the State Historic Preservation Offices were contacted and online databases reviewed for information on the location of submerged resources, type, and eligibility for listing on the state registers and National Register of Historic Places.

3.10.1.3.3 Cultural Context

Several types of cultural resources are associated with the Study Area: submerged prehistoric sites along the continental shelf, submerged historic resources and manmade obstructions, and historic architectural resources (e.g., Fort Jefferson in the Dry Tortugas). No Native American traditional use areas (e.g., fishing grounds) have been identified in the Study Area. The context within which these types of resources were formed provides an understanding of the overall development of the resource base and information on relative locations.

About 20,000 years ago, at the height of the last major glaciation (the Late Wisconsinan), sea level was as much as 328–393 feet (ft.) lower than present. Throughout the Holocene (since about 10,000 years ago), sea level has undergone a net rise, the rate of which has varied from as much as 0.39 inch per year to as little as 0.04 inch per year. The Holocene transgression has resulted in the landward migration of coastal habitats across the shelf and, in some cases, submergence and preservation of geomorphic features and landforms. Relative sea level varied considerably along the Atlantic and Gulf coasts. In the Northeast, paleo-landscapes were depressed by glacial isostatic pressure; in the Gulf of Mexico, paleo-landscapes were depressed by tectonic processes and sediment loading associated with the abandoned lobes of the Mississippi River delta.

The lower sea level during and following the Wisconsinan glaciation is an important factor for determining the potential for prehistoric sites on drowned continental shelf surfaces. Development of vegetation and adaptation of natural resources would have made the exposed continental shelf attractive to human populations. Those paleo-environmental conditions provide the basis for theories concerning prehistoric subsistence and settlement patterns that are extrapolated for the continental shelf.

The potential for prehistoric and historic archaeological sites has been the subject of hypothesis and a number of detailed studies (Bourque, 1979; Coastal Environments, 1977; Garrison et al., 1989; Pearson et al., 2003; Science Applications International Corporation, 1981). These studies were commissioned to establish baselines for submerged cultural resource management policy by agencies responsible for those resources (Research Planning Inc. et al., 2004). The North Atlantic cultural resources baseline study covered the continental shelf between Cape Hatteras, North Carolina and the Bay of Fundy just over the U.S. border in Canada. The report identified high-probability areas for both prehistoric and submerged historic resources (Bourque, 1979). The South Atlantic cultural resources baseline study covered the continental shelf between Cape Hatteras, North Carolina and Key West, Florida. The research and predictive models for South Atlantic submerged cultural resources were published in 1979 (Science Applications International Corporation, 1981). The Gulf of Mexico cultural resources baseline study was carried out for the National Park Service and published in 1977. One of the most important management tools produced by this study was identification of high-probability areas for both submerged prehistoric and historic resources (Coastal Environments, 1977).

Submerged prehistoric archaeological sites most likely represent Paleoindian (late Pleistocene) and Early Archaic to Middle Archaic (early Holocene) occupations on the continental shelves, when the post-glacial sea level rise inundated low-lying areas (Faught, 2004) (Figure 3.10-1). Submerged prehistoric sites are most likely associated with relic landforms such as relic rivers and stream channels; relic estuary complexes; and relic berms, dunes, and hummocks.



Source: Florida Division of Historical Resources (2011)

Figure 3.10-1: Artifacts from a Submerged Prehistoric Resource

The Atlantic and the Gulf of Mexico continental shelves have become repositories for the remains of the entire spectrum of vessels that supported development of the Western Hemisphere from the early 16th century to modern day. While the distribution of shipwreck sites on the continental shelf cannot be associated specifically with the submerged ridge and swale features that currently represent major sources of sand, those deposits lie amid the historic routes of navigation. Although shipwrecks are somewhat random in their areal distribution, it is generally accepted that higher densities exist in association with established navigation routes, with environmental obstructions to navigation, and by inshore areas (Research Planning Inc. et al., 2004).

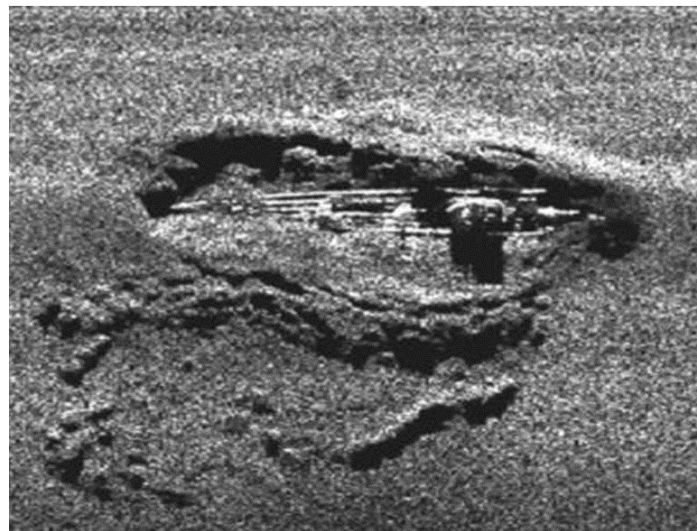
Historic shipwrecks (example provided in Figure 3.10-2 and Figure 3.10-3), classified as archaeological resources, are numerous in the Study Area (53,436 known wrecks, obstructions, occurrences, or “unknowns”) (Burns, 2011). As the result of mechanical, chemical, and biological erosion and decay, shipwrecks exhibit differential preservation. Shipwrecks in high-energy zones, such as in shallow waters along the coastlines, are generally less well preserved because they have been scoured by the abundant fluvial sediments driven by coastal currents and heavy wave action (Pearson et al., 2003). However, if portions of the shipwreck are buried in sediment and protected from scouring, preservation may be high. Ferrous metal oxidation is accelerated by elevated seawater temperature, and shipworms consume wooden ship members. Deep-water wrecks may be better preserved because the lower seawater temperatures at depth slow the oxidation of ferrous metals and reduce the number of wood eating shipworms; however, preservation of deep-water shipwrecks does vary (Pearson et al., 2003).

In accordance with the Abandoned Shipwreck Act, abandoned shipwrecks in state waters on the Atlantic coast and in the Gulf of Mexico are considered the property of the U.S. government (Barnette, 2010). According to the principle of sovereign immunity, foreign warships sunk in U.S. territorial waters are protected by the U.S. government, which acts as custodian of the sites in the best interest of the sovereign nation (Neyland, 2001).



Source: Florida Division of Historical Resources (2011)

Figure 3.10-2: Submerged Historic Resource (Spanish Galleon)



Source: Warren (2004)

Figure 3.10-3: High-Resolution Side-Scan Sonar Image of Submerged Historic Resource (World War II Vessel)

Estimated numbers of historic submerged resources used in this EIS/OEIS are compiled from information obtained from various databases. Because no comprehensive survey or evaluation of submerged historic resources has occurred in the entire Study Area and because some areas (e.g., coastal zones and continental shelf) are considered high probability for historic shipwrecks, discoveries of additional historic shipwrecks may occur. Additionally, some existing and unrecorded historic shipwrecks could be considered eligible for the National Register of Historic Places.

3.10.1.4 Methods for Impact Analysis

Impact analysis for cultural resources is based on different parameters defined by geographical location. Within U.S. territorial waters, Section 106 of the National Historic Preservation Act and NEPA evaluation are the guiding mandates. In general, impacts are assessed by the importance of the resource, the sensitivity of the resource to the proposed activities, and the duration of the effects on the environment.

3.10.2 AFFECTED ENVIRONMENT

Seven large marine ecosystems are located entirely or partially within the Study Area: the West Greenland Shelf, the Newfoundland-Labrador Shelf, the Scotian Shelf, the Northeast U.S. Continental Shelf, the Southeast U.S. Continental Shelf, the Caribbean Sea, and the Gulf of Mexico. These ecosystems exhibit similar types of cultural resources in similar submerged settings.

3.10.2.1 Submerged Prehistoric Resources

Submerged prehistoric sites have been documented in shallow offshore areas in the Northeast U.S. Continental Shelf and the Gulf of Mexico Large Marine Ecosystems.

Submerged prehistoric sites have been identified offshore in southern New England (Merwin et al., 2003). Submerged prehistoric sites are most likely associated with relic landforms such as relic rivers and stream channels; relic estuary complexes; and relic berms, dunes, and hummocks (Research Planning Inc. et al., 2004), and may occur in the Northeast U.S. Continental Shelf Large Marine Ecosystem.

Geologic features in the eastern Gulf of Mexico (karst topography, relic barrier islands with back barrier bays and lagoons, and coastal dune lakes) are used as indicators of potential cultural resources and have a high probability of containing prehistoric sites. Sites in high-probability zones may date from the Paleoindian to the Archaic periods. Submerged prehistoric sites have been identified offshore in northwestern Florida (Faught, 2004). Submerged prehistoric archaeological sites have been identified out to a distance of 9 NM in Florida (Faught, 2010), but sites are predicted as far as 85 linear miles offshore at a depth of 130 ft., along the inundated Paleoindian or Clovis Shoreline (Faught, 2010).

3.10.2.2 Known Wrecks, Obstructions, Occurrences, or “Unknowns”

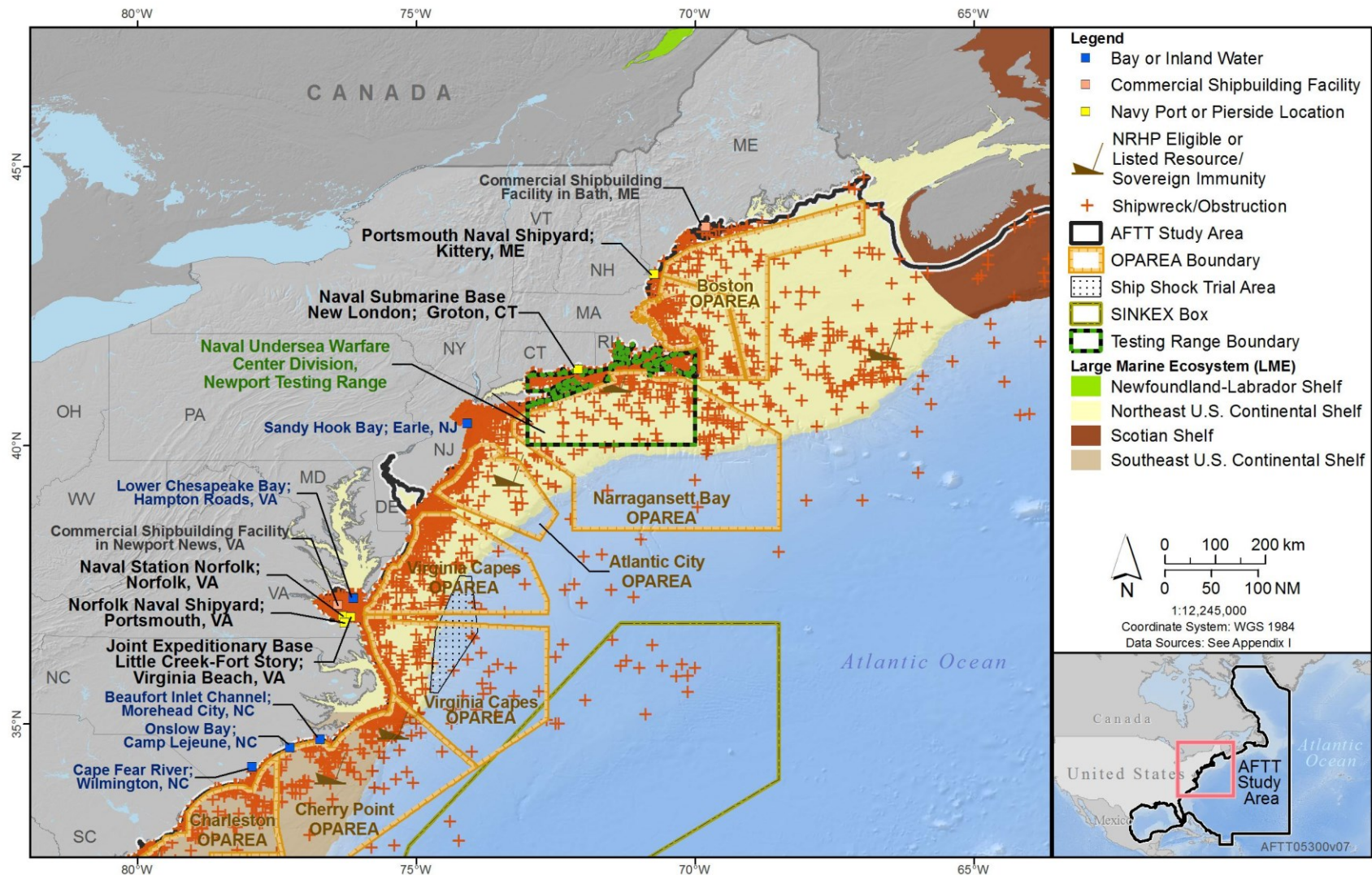
Freighters, tankers, ships-of-war, passenger ships, submarines, and fishing vessels have been sunk, lost, or run aground. Natural activities and features have played important roles in creating submerged cultural resources; those include powerful currents (e.g., the Labrador Current), winds (including cold fronts), rough seas (gales, hurricanes, blizzards), coastal topography (e.g., Cape Cod, Vineyard Sound, Cape Hatteras, Cape Fear), and shallow water and sandbars (Isles of Shoals, Nantucket Shoals, Diamond Shoals, Lookout Shoals, and Frying Pan Shoals). The Revolutionary War, the War of 1812, and the Civil War contributed to numerous ship losses from the northeast to the Gulf of Mexico. World Wars I and II used submarine warfare, which destroyed numerous cargo ships. Wrecks are concentrated in the Cape Hatteras area, where the intersection of cold northern currents and the northbound Gulf Stream forms shoals and submerged shifting sandbars that, in combination with powerful currents, treacherous seas, and wind, create hazards for mariners.

Review of all databases indicates the presence of 13,606 known wrecks, obstructions, occurrences, or sites marked as “unknown” in U.S. territorial waters in the seven large marine ecosystems, and 3,774 resources beyond U.S. territorial waters (outside 12 NM) (Figure 3.10-4, Figure 3.10-5, and Figure 3.10-6). Most “unknown” obstructions tend to be modern debris but cannot be ruled out as potential cultural resources.

Because no comprehensive survey or evaluation of submerged historic resources has occurred in the Study Area, additional shipwrecks may exist, and some existing and newly discovered shipwrecks could be considered eligible for the National Register of Historic Places. A predictive model was used to determine the probability of encountering additional shipwrecks in portions of the Study Area (Burns, 2011; Roberts, 2012). The predictive model is based on a point system, where the higher point assumes a higher probability for submerged cultural resources. This model assigns points to various factors, including ports/anchorages, obstructions/hazards, shipping routes, and known shipwreck locations; the model assumes there is a higher probability of vessel loss near a port/anchorage, near an obstruction/navigational hazard, or near a designated shipping route. This model also acknowledges that if other known shipwreck sites are nearby, the probability increases for additional sites within that area. Results of the predictive model indicate that the portions of the Study Area within the large marine ecosystems exhibit moderate to high potential to contain submerged cultural resources (Burns, 2011; Roberts, 2012).

3.10.2.2.1 Cultural Resources Eligible for or Listed in the National Register of Historic Places

There are three National Historic Landmarks or monuments and two National Register of Historic Places historic districts or Multiple Property Sites within the Study Area. In addition, there are three resources listed in the National Register of Historic Places, and 14 resources that are considered eligible for the National Register of Historic Places within the Study Area (Table 3.10-1).



Notes: AFTT = Atlantic Fleet Training and Testing, NRHP = National Register of Historic Places, OPAREA = Operating Area

Figure 3.10-4: Known Shipwrecks, Obstructions, Occurrences, or Sites Marked as “Unknown” in the Northeast United States Continental Shelf Large Marine Ecosystem

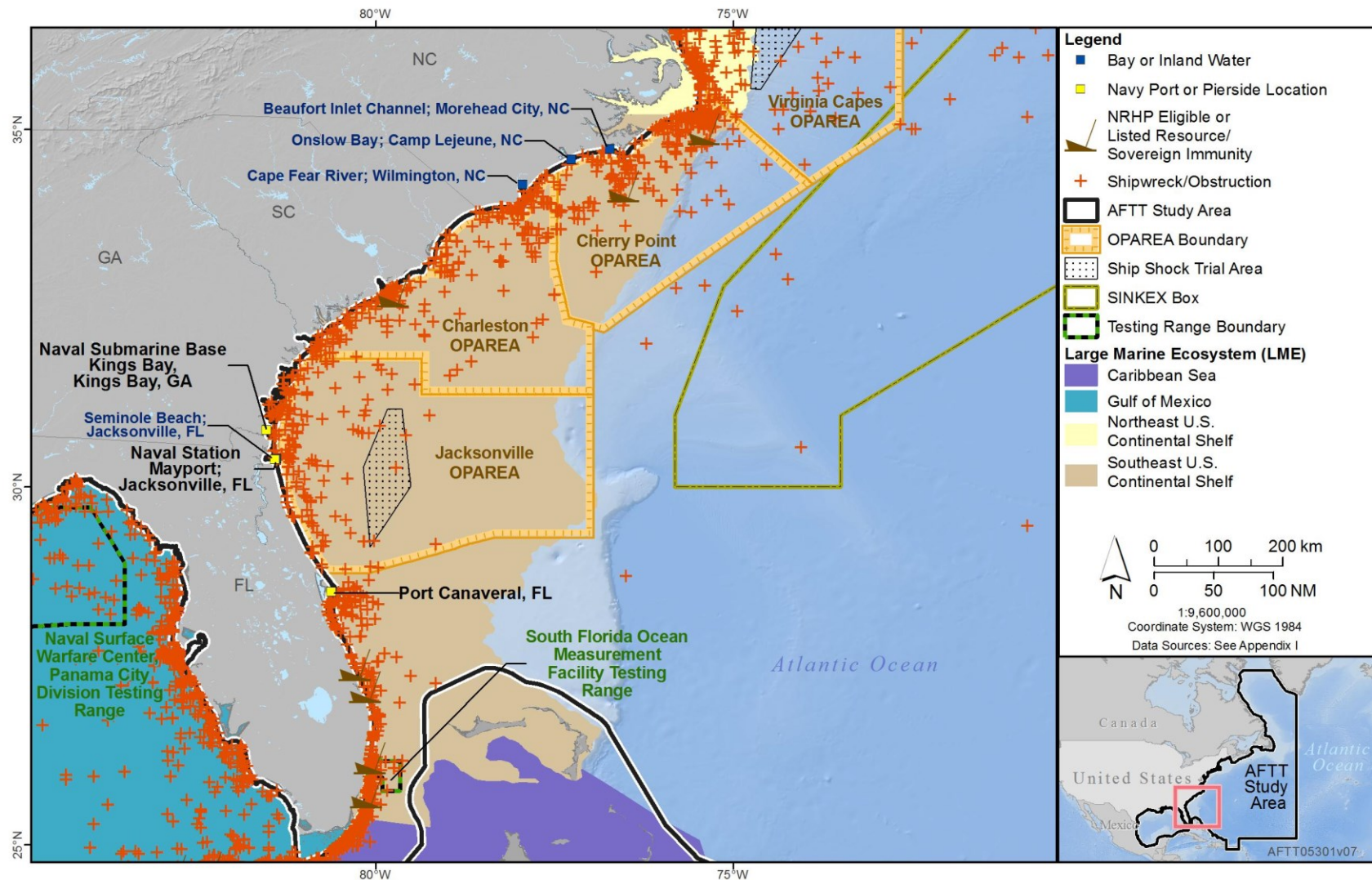


Figure 3.10-5: Known Shipwrecks, Obstructions, Occurrences, or Sites Marked as “Unknown” in the Southeast United States Continental Shelf Large Marine Ecosystem

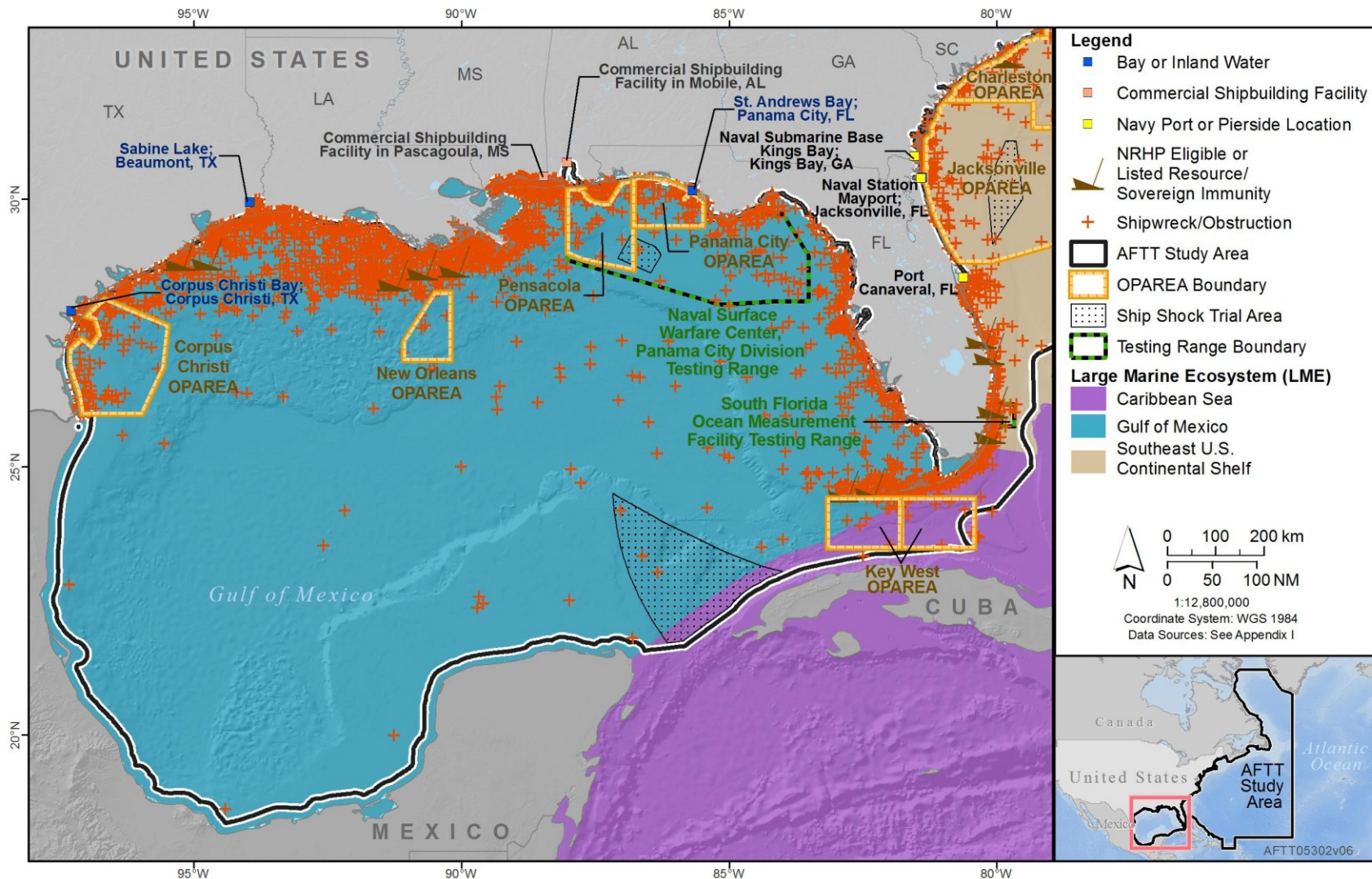


Table 3.10-1: National Historic Landmarks, Monuments, and Cultural Resource Listed in the National Register of Historic Places

<i>Resource</i>	<i>Large Marine Ecosystem</i>	<i>Description</i>	<i>National Register of Historic Places</i>	<i>National Historic Landmark/Monument</i>	<i>Reference</i>
<i>HMS Orpheus</i>	Northeast U.S. Continental Shelf	British vessel, 1773–1778	Listed	No	(National Park Service, 2010)
<i>USS Cumberland</i>	Northeast U.S. Continental Shelf (pierside)	Wooden frigate, 1842–1862	Listed	No	(Judge, 2007; National Park Service, 2010; Virginia Department of Historic Resources, 2010)
<i>CSS Florida</i>	Northeast U.S. Continental Shelf (pierside)	Three-masted, wooden-hulled vessel, 1864	Listed	No	(Judge, 2007; Virginia Department of Historic Resources, 2010)
<i>USS Monitor</i>	Southeast U.S. Continental Shelf	Ironclad Civil War gunship, 1862	Listed	Yes	(National Park Service, 2008; National Register Information System, 2008; Naval Historical Center, 2008; Neyland, 2001; USS Monitor Center, 2008)
<i>USS Huron</i>	Southeast U.S. Continental Shelf	Iron vessel, 1875–1877	Listed	No	(National Register Information System, 2010; North Carolina Office of State Archaeology, 2010)
Cape Fear Civil War Shipwrecks Discontiguous District	Southeast U.S. Continental Shelf	Civil War shipwrecks, 1861–1864 (16 blockade-running steamers, 4 Union vessels, and 1 Confederate vessel)	Historic District	No	(Wilde-Ramsing & Angley, 1985)
Barge Wreck	Southeast U.S. Continental Shelf	19th-century barge	Listed	No	(Burns, 2011)

**Table 3.10-1: National Historic Landmarks, Monuments, and Cultural Resource Listed in the National Register of Historic Places
(continued)**

<i>Resource</i>	<i>Large Marine Ecosystem</i>	<i>Description</i>	<i>National Register of Historic Places</i>	<i>National Historic Landmark/Monument</i>	<i>Reference</i>
<i>Cape Gull</i>	Southeast U.S. Continental Shelf	United States Coast Guard cutter	Listed	No	(Burns, 2011)
1733 Spanish Plate Fleet Shipwrecks	Southeast U.S. Continental Shelf	Spanish Fleet, 1733 (<i>Angustias, Chavas, El Gallo Indiano, El Infante, El Rubi, Herrera, Populo, San Felipe, San Francisco, San Jose, San Pedro, Sueco de Arizon, and Tres Puentes</i>)	Multiple Property Site	No	(McKinnon et al., 2006)
<i>General C.B. Comstock</i>	Southeast U.S. Continental Shelf	A U.S. hydraulic hopper dredge, 1913	Listed	No	(National Register Information System, 2016)
<i>SS Antonio Lopez</i>	Caribbean	Spanish blockade runner, 1989	Listed	Yes	(National Register Information System, 2016)
Fort Jefferson	Gulf of Mexico	Third System seacoast fortification, 1846	Listed	Yes	(Clark, 2008; Morrison et al., 1974)
<i>Henrietta Marie</i>	Gulf of Mexico	English merchant/slave ship, 1700	Eligible	No	(Mel Fisher Maritime Heritage Society, 2001)
<i>Vamar</i>	Gulf of Mexico	Reinforced metal hulled vessel, 1919–1942	Listed	No	(Burns, 2011)
<i>SS Tarpon</i>	Gulf of Mexico	Cargo ship, 1896–1937	Listed	No	(Florida Department of State, 1997, 2007)
<i>USS Massachusetts</i>	Gulf of Mexico	Battleship, 1896–1921	Listed	No	(Florida Department of State, 2008)

**Table 3.10-1: National Historic Landmarks, Monuments, and Cultural Resource Listed in the National Register of Historic Places
(continued)**

<i>Resource</i>	<i>Large Marine Ecosystem</i>	<i>Description</i>	<i>National Register of Historic Places</i>	<i>National Historic Landmark/Monument</i>	<i>Reference</i>
<i>USS Hatteras</i>	Gulf of Mexico	Iron-hulled, side-wheel steamer, 1861–1863	Listed	No	(Bureau of Ocean Energy Management & Regulation and Enforcement, 2011)
<i>R.M. Parker, Jr.</i>	Gulf of Mexico	Tanker, 1919–1942	Eligible	No	(Enright et al., 2006)
<i>Castine</i>	Gulf of Mexico	Steel-hulled gunboat, 1892–1924	Eligible	No	(Enright et al., 2006)
<i>Sheherazade</i>	Gulf of Mexico	French tanker, 1935–1942	Eligible	No	(Enright et al., 2006)

Note: U.S. = United States

3.10.2.2.2 Resources with Sovereign Immunity

Sovereign immunity is an international law which preserves each nation's title in their governmental ships and property. German U-boats retain sovereign immunity and include the U-869 (Uboat.net, 2010c) and the U-853 (Uboat.net, 2010a) in the Northeast U.S. Continental Shelf Large Marine Ecosystem, U-352 (North Carolina Wreck Diving, 2008) in the Southeast U.S. Continental Shelf Large Marine Ecosystem, and U-166 (Warren, 2004) and U-157 (Uboat.net, 2010b) in the Gulf of Mexico Large Marine Ecosystem.

3.10.2.3 Tortugas Military Operations Area

The Tortugas Military Operations Area is not a traditional military operating area but rather an air exclusion zone established to protect Fort Jefferson and Dry Tortugas National Park. Tactical maneuvers resulting in supersonic flight are not conducted in the Tortugas Military Operations Area above Fort Jefferson and Dry Tortugas National Park between 5,000 ft. and 18,000 ft. The Tortugas Military Operations Area is the airspace within an area bounded by a line 12 NM from and parallel to the shoreline of the Dry Tortugas Islands, creating a circular area (Federal Aviation Administration, 2009).

Previous research indicates that fragile mortar in the brick masonry at Fort Jefferson may be susceptible to damage from sonic booms (Hanson et al., 1991; James et al., 2009). No supersonic flight activity is authorized in the Tortugas Military Operations Area; therefore, no sonic booms are intentionally generated below 18,000 ft. and within 12 NM from the shoreline of all the islands encompassing Fort Jefferson. Sonic booms are occasionally generated by military aircraft and are logged by National Park Service staff at Fort Jefferson. Due to the increase in sonic booms logged at Fort Jefferson in 2008 and early 2009, the Navy took precautionary measures to minimize the number of sonic booms reaching Fort Jefferson. In April 2009, the Naval Air Station Key West Air Operations Department incorporated Tortugas Military Operations Area flight avoidance awareness briefings into pre-flight planning guidance provided to all aircrew. Increased awareness of the airspace restrictions helps minimize inadvertent supersonic flight in the vicinity of Dry Tortugas. Additionally, air combat maneuver engagement zones and basic fighter maneuvering areas have been modified in W-174 so that the resulting flight activities generate fewer sonic booms in the airspace adjacent to Fort Jefferson. Furthermore, training flights predisposed to supersonic conditions are segregated and only conducted in redesignated airspace at least 30 NM from Fort Jefferson. Avoidance and mitigation measures were enacted in May 2009.

3.10.3 ENVIRONMENTAL CONSEQUENCES

This section evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) could impact cultural resources within U.S. territorial waters and World Heritage sites located in the Study Area. Tables 2.3-1 through 2.3-6 present the proposed training and testing activities and locations for each alternative. Additional details of the proposed training and testing activities are provided in Appendix A (Navy Activity Descriptions). Appendix B (Activity Stressor Matrices) describes the warfare areas and associated stressors that were considered for analysis of cultural resources. The stressors vary in intensity, frequency, duration, and location within the Study Area. The stressors applicable to cultural resources in the Study Area that are analyzed include:

- **Explosives** (explosives – shock [pressure] waves from underwater explosions, explosives – cratering)
- **Physical Disturbance and Strikes** (in-water devices, military expended materials, seafloor devices, pile driving, and vibration from sonic booms)

The use of sonar does not affect the structural elements of historic shipwrecks. Archaeologists regularly use multi-beam sonar and side-scan sonar to explore shipwrecks without disturbing them. Based on the physics of underwater sound, the shipwreck would need to be very close (less than 22 ft.) to the sonar sound source for the shipwreck to experience any slight oscillations from the induced pressure waves. Any oscillations experienced at a depth of less than 22 ft. would be negligible up to within a few yards from the sonar source. This distance is smaller than the typical safe navigation and operating depth for most sonar sources, and is not expected to impact historic shipwrecks. Therefore, sonar is not considered a stressor that would result in an impact on cultural resources and will not be analyzed further in this document.

The analysis includes consideration of the mitigation that the Navy will implement to avoid potential impacts on cultural resources from explosives and physical disturbance and strike stressors. Mitigation will be coordinated through the consultation processes. In the event the Navy impacts a submerged historic property, it will immediately commence consultation with the appropriate State Historic Preservation Officer in accordance with 36 CFR section 800.13(a)(3).

3.10.3.1 Explosive Stressors

Explosive stressors that could impact cultural resources are vibration and shock waves from underwater explosions. A shock wave and oscillating bubble pulses resulting from any kind of underwater explosion, such as explosive torpedoes, missiles, bombs, projectiles, mines, and certain sonobuoys and explosive sonobuoys, could impact the exposed portions of submerged historic resources if such resources were located nearby. Shock waves (pressure) generated by underwater explosions would be periodic rather than continuous, and could create overall structural instability and eventual collapse of architectural features of submerged historic resources. The amount of damage would depend on factors such as the size of the charge, the distance from the historic shipwreck, the water depth, and the topography of the ocean floor.

In addition, impacts from aircraft noise (i.e., vibration from sonic booms) could create increased structural instability and damage to Fort Jefferson, a fragile historic architectural resource in the Gulf of Mexico Large Marine Ecosystem (Hanson et al., 1991; James et al., 2009).

3.10.3.1.1 Impacts of Explosives — Shock Waves from Underwater Explosions

Anti-surface missiles and projectiles explode at or immediately below the ocean surface (within 1 meter). Shock waves (pressure) from these types of explosions within the water column would not reach historic resources on the ocean floor. Underwater detonations of explosive sonobuoys would occur below the surface and detonate in the mid-water column. Shock waves from nearby underwater detonations may affect the exposed portions of historic shipwrecks if such resources were located in the area and near the depth of the explosive. Impacts on previously identified cultural resources from underwater explosions generating vibration and shock waves within the Study Area are not anticipated because (1) detonations at or near the surface from missiles and projectiles all occur in deep water, and the shock waves would not reach historic resources on the seafloor, and (2) detonations that occur in the mid-water column from explosive sonobuoys, which are much smaller explosive charges than missiles and projectiles, would also occur in deep water, well above the seafloor, so the shock waves would not reach historic resources on the seafloor, and (3) underwater detonations placed by Navy divers occur only in specially designated areas (see Section 2.3.3.9, Underwater Detonation Safety), far from any historic resources.

3.10.3.1.1.1 Impacts of Explosive Shock Waves from Underwater Explosions under Alternative 1

Impacts of Explosive Shock Waves from Underwater Explosions under Alternative 1 for Training Activities

Under Alternative 1, training activities (including the use of explosives) would continue within the Northeast U.S. Continental Shelf (Virginia Capes Range Complex), the Southeast U.S. Continental Shelf (Navy Cherry Point and Jacksonville Range Complexes), the Gulf of Mexico (Key West and Gulf of Mexico Range Complexes), and the Caribbean (Key West Range Complex) Large Marine Ecosystems. Because no comprehensive survey or evaluation of submerged historic resources has occurred in the Study Area, unrecorded historic resources could be disturbed by underwater detonations. However, because the Navy routinely avoids locations of known obstructions which include submerged historic resources, and because overall types and locations of training activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-20), no impacts on submerged historic resources located in the Study Area are expected from shock waves created by underwater explosives. As discussed in Section 5.4.5 (Seafloor Resource Mitigation Areas), the Navy will implement mitigation to avoid impacts from explosives on seafloor resources in mitigation areas throughout the Study Area. For example, the Navy will not conduct explosive mine countermeasure and neutralization activities within a specified distance of shipwrecks.

Impacts of Explosive Shock Waves from Underwater Explosions under Alternative 1 for Testing Activities

Under Alternative 1, testing activities (including the use of explosives) would continue within the Northeast U.S. Continental Shelf Large Marine Ecosystem (Naval Undersea Warfare Center Division, Newport Testing Range; Virginia Capes Range Complex) and the Gulf of Mexico Large Marine Ecosystem (Naval Surface Warfare Center, Panama City Division Testing Range). Because no comprehensive survey or evaluation of submerged historic resources has occurred in the Study Area, unrecorded historic resources could be disturbed by underwater detonations. However, because the Navy routinely avoids locations of known obstructions which include submerged historic resources and overall types and locations of testing activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-21), no impacts on submerged historic resources located in the Study Area are expected from shock waves created by underwater explosives. As discussed in Section 5.4.5 (Seafloor Resource Mitigation Areas), the Navy will implement mitigation to avoid impacts from explosives on seafloor resources in mitigation areas throughout the Study Area. For example, the Navy will not conduct explosive mine countermeasure and neutralization activities within a specified distance of shipwrecks.

3.10.3.1.1.2 Impacts of Explosive Shock Waves from Underwater Explosions under Alternative 2

Impacts of Explosive Shock Waves from Underwater Explosions under Alternative 2 for Training Activities

Under Alternative 2, training activities (including the use of explosives) would remain the same as those described under Alternative 1 and would continue to occur within the Northeast U.S. Continental Shelf (Virginia Capes Range Complex), the Southeast U.S. Continental Shelf (Navy Cherry Point and Jacksonville Range Complexes), the Gulf of Mexico (Key West and Gulf of Mexico Range Complexes), and the Caribbean (Key West Range Complex) Large Marine Ecosystems. Because no comprehensive survey or evaluation of submerged historic resources has occurred in the Study Area, unrecorded historic

resources could be disturbed by underwater detonations. However, because the Navy routinely avoids locations of known obstructions which include submerged historic resources and overall types and locations of training activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-20), no impacts on submerged historic resources located in the Study Area are expected from shock waves created by underwater explosives. As discussed in Section 5.4.5 (Seafloor Resource Mitigation Areas), the Navy will implement mitigation to avoid impacts from explosives on seafloor resources in mitigation areas throughout the Study Area. For example, the Navy will not conduct explosive mine countermeasure and neutralization activities within a specified distance of shipwrecks.

Impacts of Explosive Shock Waves from Underwater Explosions under Alternative 2 for Testing Activities

Under Alternative 2, testing activities (including the use of explosives) would remain the same as those described under Alternative 1 and would continue to occur within Northeast U.S. Continental Shelf Large Marine Ecosystem (Naval Undersea Warfare Center Division, Newport Testing Range; Virginia Capes Range Complex) and the Gulf of Mexico Large Marine Ecosystem (Naval Surface Warfare Center, Panama City Division Testing Range). Because no comprehensive survey or evaluation of submerged historic resources has occurred in the Study Area, unrecorded historic resources could be disturbed by underwater detonations. However, because the Navy routinely avoids locations of known obstructions which include submerged historic resources and overall types and locations of testing activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-21), no impacts on submerged historic resources located in the Study Area are expected from shock waves created by underwater explosives. As discussed in Section 5.4.5 (Seafloor Resource Mitigation Areas), the Navy will implement mitigation to avoid impacts from explosives on seafloor resources in mitigation areas throughout the Study Area. For example, the Navy will not conduct explosive mine countermeasure and neutralization activities within a specified distance of shipwrecks.

3.10.3.1.1.3 Impacts of Explosive Shock Waves from Underwater Explosions under the No Action Alternative

Under the No Action Alternative, the Navy would not conduct the proposed training and testing activities in the AFTT Study Area. Various explosive stressors (e.g., explosive shockwaves) would not be introduced into the marine environment. Therefore, baseline conditions of the existing environment would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

3.10.3.1.2 Impacts from Explosives – Cratering

Underwater explosions near or on the seafloor could create sediment displacement in the form of cratering and could affect submerged prehistoric sites and unrecorded historic resources at or near the explosive impact. Cratering of unconsolidated soft bottom habitats would result from charges set on or near the bottom. For a specific explosive charge size, crater depths and widths would vary depending on depth of the charge and sediment type. However, crater dimensions generally decrease as bottom depth increases.

As discussed in Section 2.3.3.9 (Underwater Detonation Safety), underwater detonation training takes place in specially designated areas, and bottom-placed explosives are laid by divers who are able to observe bottom conditions and avoid sensitive areas. In addition, all other explosives would detonate near the surface and would occur in deep water.

3.10.3.1.2.1 Impacts from Explosives – Cratering under Alternative 1

Impacts from Explosives – Cratering under Alternative 1 for Training Activities

Under Alternative 1, mine warfare activities would occur within the Northeast U.S. Continental Shelf (Virginia Capes Range Complex), the Southeast U.S. Continental Shelf (Navy Cherry Point and Jacksonville Range Complexes), the Caribbean Sea (Key West Range Complex), the Gulf of Mexico (Key West and Gulf of Mexico Range Complexes), and the Caribbean (Key West Range Complex) Large Marine Ecosystems. Cratering created by deep underwater explosions is not expected to disturb or damage artifacts on the seafloor and archaeological deposits buried in the ocean sediments in the Study Area because bottom-placed explosives are laid by divers who are able to observe bottom conditions and avoid sensitive areas and all other explosives would detonate near the surface in deep water. Because standard operating procedures are implemented to protect submerged cultural resources, and overall types and locations of training activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-20), no impacts on submerged historic resources located in the Study Area are expected from cratering by underwater explosions. As discussed in Section 5.4.5 (Seafloor Resource Mitigation Areas), the Navy will implement mitigation to avoid impacts from explosives on seafloor resources in mitigation areas throughout the Study Area. For example, the Navy will not conduct explosive mine countermeasure and neutralization activities within a specified distance of shipwrecks.

Impacts from Explosives – Cratering under Alternative 1 for Testing Activities

Under Alternative 1, testing activities would occur within the Northeast U.S. Continental Shelf (Virginia Capes Range Complex) and the Gulf of Mexico (Naval Surface Warfare Center, Panama City Division Testing Range and Gulf of Mexico Range Complex) Large Marine Ecosystems. Cratering created by deep underwater explosions is not expected to disturb or damage artifacts on the seafloor and archaeological deposits buried in the ocean sediments in the Study Area because bottom-placed explosives are laid by divers who are able to observe bottom conditions and avoid sensitive areas and all other explosives would detonate near the surface in deep water. Because standard operating procedures are implemented to protect submerged cultural resources, and overall types and locations of testing activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-21), no impacts on submerged historic resources located in the Study Area are expected from cratering by underwater explosions. As discussed in Section 5.4.5 (Seafloor Resource Mitigation Areas), the Navy will implement mitigation to avoid impacts from explosives on seafloor resources in mitigation areas throughout the Study Area. For example, the Navy will not conduct explosive mine countermeasure and neutralization activities within a specified distance of shipwrecks.

3.10.3.1.2.2 Impacts from Explosives – Cratering under Alternative 2

Impacts from Explosives – Cratering under Alternative 2 for Training Activities

Under Alternative 2, the number of explosive rounds and locations associated with training activities are the same as under Alternative 1 and would occur within the Northeast U.S. Continental Shelf (Virginia Capes Range Complex), the Southeast U.S. Continental Shelf (Navy Cherry Point and Jacksonville Range Complexes), the Gulf of Mexico (Key West and Gulf of Mexico Range Complexes), and the Caribbean Sea (Key West Range Complex) Large Marine Ecosystems. Cratering created by deep underwater explosions is not expected to disturb or damage artifacts on the seafloor and archaeological deposits buried in the ocean sediments in the Study Area because bottom-placed explosives are laid by divers who are able to observe bottom conditions and avoid sensitive areas and all other explosives would detonate near the surface in deep water. Because standard operating procedures are implemented to protect submerged cultural resources and overall types, and locations of training activities are not expected to change from

those currently conducted by the Navy (refer to Table 3.0-20), no impacts on submerged historic resources located in the Study Area are expected from cratering by underwater explosions. As discussed in Section 5.4.5 (Seafloor Resource Mitigation Areas), the Navy will implement mitigation to avoid impacts from explosives on seafloor resources in mitigation areas throughout the Study Area. For example, the Navy will not conduct explosive mine countermeasure and neutralization activities within a specified distance of shipwrecks.

Impacts from Explosives – Cratering under Alternative 2 for Testing Activities

Under Alternative 2, the number of explosive rounds and locations associated with testing activities are the same as under Alternative 1 with the exception of neutralizers and would occur within the Northeast U.S. Continental Shelf (Virginia Capes Range Complex) and the Gulf of Mexico (Naval Surface Warfare Center, Panama City Division Testing Range and Gulf of Mexico Range Complex) Large Marine Ecosystems (refer to Table 3.0-21). Cratering created by deep underwater explosions is not expected to disturb or damage artifacts on the seafloor and archaeological deposits buried in the ocean sediments in the Study Area because bottom-placed explosives are laid by divers who are able to observe bottom conditions and avoid sensitive areas and all other explosives would detonate near the surface in deep water. Because standard operating procedures are implemented to protect submerged cultural resources, and overall types and locations of testing activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-21), no impacts on submerged historic resources located in the Study Area are expected from cratering by underwater detonations. As discussed in Section 5.4.5 (Seafloor Resource Mitigation Areas), the Navy will implement mitigation to avoid impacts from explosives on seafloor resources in mitigation areas throughout the Study Area. For example, the Navy will not conduct explosive mine countermeasure and neutralization activities within a specified distance of shipwrecks.

3.10.3.1.2.3 Impacts from Explosives – Cratering under the No Action Alternative

Under the No Action Alternative, the Navy would not conduct the proposed training and testing activities in the AFTT Study Area. Various explosive stressors (e.g., cratering) would not be introduced into the marine environment. Therefore, baseline conditions of the existing environment would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

3.10.3.2 Physical Disturbance and Strike Stressors

Any physical disturbance on the continental shelf and seafloor, such as ship anchoring, targets or mines resting on the seafloor, moored mines, bottom-mounted tripods, and bottom crawling unmanned underwater vehicles could inadvertently damage or destroy submerged prehistoric sites and historic resources. In-water devices are operated to avoid obstructions, such as submerged objects, to minimize damage to the device. Therefore, a towed system or vessel is very unlikely to encounter a submerged historic resource inadvertently. Expended materials such as chaff, flares, projectiles, casings, target or missile fragments, non-explosive practice munitions, rocket fragments, ballast weights, sonobuoys, torpedo launcher accessories, or mine shapes could be deposited on the ocean bottom on or near submerged prehistoric sites or historic resources. Heavier expended materials could damage intact fragile shipwreck features if they landed with velocity on a resource.

3.10.3.2.1 Impacts from In-Water Devices under Alternative 1

Impacts from In-Water Devices under Alternative 1 for Training Activities

Under Alternative 1, training activities using towed in-water devices would occur within the Northeast U.S. Continental Shelf (Virginia Capes Range Complex), the Southeast U.S. Continental Shelf (Navy Cherry Point and Jacksonville Range Complexes), and the Gulf of Mexico (Key West and Gulf of Mexico Range Complexes) Large Marine Ecosystems. Because no comprehensive survey or evaluation of submerged historic resources has occurred in the Study Area, unrecorded historic resources could be disturbed by in-water devices. However, because in-water devices are operated in a manner to avoid obstructions and overall types and locations of training activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-17), no impacts on submerged historic resources located in the Study Area are expected from in-water devices.

Impacts from In-Water Devices under Alternative 1 for Testing Activities

Under Alternative 1, testing activities using in-water devices would occur within the Northeast U.S. Continental Shelf (Northeast and Virginia Capes Range Complexes) and the Gulf of Mexico (Naval Surface Warfare Center, Panama City Division Testing Range) Large Marine Ecosystems. Because no comprehensive survey or evaluation of submerged historic resources has occurred in the Study Area, unrecorded historic resources could be disturbed by in-water devices. However, because in-water devices are operated in a manner to avoid obstructions, and overall types and locations of testing activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-17), no impacts on submerged historic resources located in the Study Area are expected from in-water devices.

3.10.3.2.1.1 Impacts from In-Water Devices under Alternative 2

Impacts from In-Water Devices under Alternative 2 for Training Activities

Under Alternative 2, the number of training activities using in-water devices is the same as under Alternative 1 and would occur within the Northeast U.S. Continental Shelf (Virginia Capes Range Complex), the Southeast U.S. Continental Shelf (Navy Cherry Point and Jacksonville Range Complexes), and the Gulf of Mexico (Key West and Gulf of Mexico Range Complex) Large Marine Ecosystems. Because no comprehensive survey or evaluation of submerged historic resources has occurred in the Study Area, unrecorded historic resources could be disturbed by underwater detonations. However, because in-water devices are operated in a manner to avoid obstructions, and overall types and locations of testing activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-17), no impacts on submerged historic resources located in the Study Area are expected from in-water devices.

Impacts from In-Water Devices under Alternative 2 for Testing Activities

Under Alternative 2, the number of testing activities using in-water devices is the same as under Alternative 1 and would occur within the Northeast U.S. Continental Shelf (Northeast and Virginia Capes Range Complexes) and the Gulf of Mexico (Naval Surface Warfare Center, Panama City Division Testing Range) Large Marine Ecosystems. Because in-water devices are operated in a manner to avoid obstructions, and overall types and locations of testing activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-17), no impacts on submerged historic resources located in the Study Area are expected from in-water devices.

3.10.3.2.1.2 Impacts from In-Water Devices under the No Action Alternative

Under the No Action Alternative, the Navy would not conduct the proposed training and testing activities in the AFTT Study Area. Various physical disturbance and strike stressors (e.g., in-water devices) would not be introduced into the marine environment. Consequently, no impacts on cultural resources are expected from underwater explosions. Therefore, baseline conditions of the existing environment would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

3.10.3.2.2 Impacts from Military Expended Materials

Deposition of non-explosive practice munitions, sonobuoys, and military expended materials may affect submerged cultural resources through possible impact of resources on the seafloor or the simple settling of military expended materials on top of submerged cultural resources. These potential impacts are combined in this discussion.

The large marine ecosystems that overlap the Study Area cover 1,255,365 square nautical miles (NM²), and contain records of 53,436 known wrecks, obstructions, occurrences, or sites that are marked as “unknown” are potential cultural resources. The large marine ecosystems have the potential to contain submerged prehistoric sites (on the continental shelf associated with the Northeast U.S. Continental Shelf and the Gulf of Mexico Large Marine Ecosystems). The highest density of historic resources ranges from one possible historic resource in 7 NM² (combined Newfoundland-Labrador Shelf and Scotian Shelf Large Marine Ecosystems) to one possible historic resource in 79 NM² (Southeast U.S. Continental Shelf Large Marine Ecosystem). The likelihood of expended materials either impacting or landing on submerged cultural resources is very low given the size of the regions.

Most of the anticipated expended munitions would be small objects and fragments that slowly drift to the seafloor after striking the ocean surface. Larger and heavier objects, such as non-explosive practice munitions, could strike the ocean surface with greater velocity, but their acceleration would slow as they move through the water. It is possible these larger and heavier objects could impact a submerged prehistoric site by creating sediment and artifact displacement. A historic resource could be impacted by damaging structural elements and the probability increases in areas where there is a higher density of resources. However, it is not anticipated because the Navy avoids areas with known submerged obstructions.

3.10.3.2.2.1 Impacts from Military Expended Materials under Alternative 1 **Impacts from Military Expended Materials under Alternative 1 for Training Activities**

Under Alternative 1, training activities would occur within existing designated areas in the Northeast U.S. Continental Shelf, the Southeast U.S. Continental Shelf, the Caribbean Sea, and the Gulf of Mexico Large Marine Ecosystems. Expended materials could be deposited on or in the vicinity of submerged prehistoric sites and known and unrecorded historic resources. However, the Study Area is so large and because the Navy avoids areas with known submerged obstructions, it is unlikely these materials would come into contact with a submerged prehistoric site or a historic resource. If they should sink on or in the vicinity of either type of cultural resource, the expended materials would not likely diminish the qualifying characteristics of the submerged prehistoric site or the historic resource.

Impacts from Military Expended Materials under Alternative 1 for Testing Activities

Under Alternative 1, testing activities would occur within existing designated areas in the Northeast U.S. Continental Shelf, the Southeast U.S. Continental Shelf, the Caribbean Sea, and the Gulf of Mexico Large

Marine Ecosystems. Under Alternative 1, expended materials could be deposited on or in the vicinity of submerged prehistoric sites and known and unrecorded historic resources. However, because the Study Area is so large, and because the Navy avoids areas with known submerged obstructions, it is unlikely these materials would come into contact with a submerged prehistoric site or a historic resource. If they should sink on or in the vicinity of either type of cultural resource, the expended materials would not likely diminish the qualifying characteristics of the submerged prehistoric site or the historic resource.

3.10.3.2.2.2 Impacts from Military Expended Materials under Alternative 2

Impacts from Military Expended Materials under Alternative 2 for Training Activities

Under Alternative 2, the number of expended materials from training activities would be the same as those described under Alternative 1. Expended materials could be deposited on or in the vicinity of submerged prehistoric sites and known and unrecorded historic resources. However, because the Study Area is so large and because the Navy avoids areas with known submerged obstructions, it is unlikely these materials would come into contact with a submerged prehistoric site or a historic resource. If they should sink on or in the vicinity of either type of cultural resource, the expended materials would not likely diminish the qualifying characteristics of the submerged prehistoric site or the historic resource.

Impacts from Military Expended Materials under Alternative 2 for Testing Activities

Under Alternative 2, the number of expended materials from testing activities would be the same as those described under Alternative 1. Expended materials could be deposited on or in the vicinity of submerged prehistoric sites and known and unrecorded historic resources; however, because the Study Area is so large and because the Navy avoids areas with known submerged obstructions, it is unlikely these materials would come into contact with a submerged prehistoric site or a historic resource. If they should sink on or in the vicinity of either type of cultural resource, the expended materials would not likely diminish the qualifying characteristics of the submerged prehistoric site or the historic resource.

3.10.3.2.2.3 Impacts from Military Expended Materials under the No Action Alternative

Under the No Action Alternative, the Navy would not conduct the proposed training and testing activities in the AFTT Study Area. Various physical disturbance and strike stressors (e.g., military expended material) would not be introduced into the marine environment. Therefore, baseline conditions of the existing environment would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

3.10.3.2.3 Impacts from Seafloor Devices

Physical disturbances on the continental shelf and seafloor, such as precision anchoring, targets or mines resting on the ocean floor, moored mines, bottom-mounted tripods, and bottom crawlers (unmanned underwater vehicles) could damage or destroy submerged prehistoric sites or historic resources if such resources are located nearby. If they should sink on or in the vicinity of either type of cultural resource, the seafloor devices would not likely diminish the qualifying characteristics of the submerged prehistoric site or the historic resource. Regarding targets, mines, and similar seafloor devices, because the Study Area is so large, and because the Navy avoids areas with known submerged obstructions, it is unlikely these materials would come into contact with a submerged prehistoric site or a historic resource. Because of their size and weight, if they should settle on or in the vicinity of either type of cultural resource, the seafloor devices would not likely diminish the qualifying characteristics of the submerged prehistoric site or the historic resource. The Navy operates bottom crawlers (unmanned underwater vehicles) only where the safety of the equipment and the success of the mission would be

assured. Therefore, the Navy does not deploy these devices where there is a risk of snagging the vehicle on obstacles, such as shipwrecks.

Impacts on previously identified cultural resources from seafloor devices within the Study Area are not anticipated because (1) precision anchoring does not occur near known historic shipwrecks, (2) obstructions, and archaeological sites are routinely avoided during training and testing, and (3) most shipwrecks are located at substantial depths and distributed over large areas of the seafloor.

3.10.3.2.3.1 Impacts from Seafloor Devices under Alternative 1

Impacts from Seafloor Devices under Alternative 1 for Training Activities

Under Alternative 1, training activities using seafloor devices would occur within the Northeast U.S. Continental Shelf (Virginia Capes Range Complex), the Southeast U.S. Continental Shelf (Navy Cherry Point and Jacksonville Range Complexes), and the Gulf of Mexico (Key West and Gulf of Mexico Range Complex) Large Marine Ecosystems. Because no comprehensive survey or evaluation of submerged historic resources has occurred in the Study Area, unrecorded historic resources could be disturbed by seafloor devices. The Navy would implement mitigation that includes not conducting precision anchoring (except in designated anchorages) within the anchor swing circle of shipwrecks to avoid potential impacts from seafloor devices on cultural resources in mitigation areas throughout the Study Area (see Section 5.4.1, Mitigation Areas for Seafloor Resources). However, because bottom and moored mine anchors are laid by divers who are able to observe bottom conditions and avoid sensitive areas, most seafloor devices would not be used in deep water, overall types and locations of training activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-26), and considering the implementation of mitigation for precision anchoring, no impacts on submerged historic resources located in the Study Area are expected from seafloor devices.

Impacts from Seafloor Devices under Alternative 1 for Testing Activities

Under Alternative 1, testing activities using seafloor devices would occur within the Northeast U.S. Continental Shelf (Northeast and Virginia Capes Range Complexes), the Southeast U.S. Continental Shelf (Navy Cherry Point and Jacksonville Range Complexes), and the Gulf of Mexico (Naval Surface Warfare Center, Panama City Division Testing Range) Large Marine Ecosystems. Because no comprehensive survey or evaluation of submerged historic resources has occurred in the Study Area, unrecorded historic resources could be disturbed by seafloor devices. However, because seafloor devices associated with testing activities would not be used in deep water and overall types and locations of testing activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-26), no impacts on submerged historic resources located in the Study Area are expected from seafloor devices.

3.10.3.2.3.2 Impacts from Seafloor Devices under Alternative 2

Impacts from Seafloor Devices under Alternative 2 for Training Activities

Under Alternative 2, the number of training activities using seafloor devices is the same as under Alternative 1 and would occur within the Northeast U.S. Continental Shelf (Virginia Capes Range Complex), the Southeast U.S. Continental Shelf (Navy Cherry Point and Jacksonville Range Complexes), and the Gulf of Mexico (Key West and Gulf of Mexico Range Complex) Large Marine Ecosystems. Because no comprehensive survey or evaluation of submerged historic resources has occurred in the large marine ecosystems, unrecorded historic resources could be disturbed by seafloor devices. The Navy will implement mitigation that includes not conducting precision anchoring (except in designated

anchorage) within the anchor swing circle of shipwrecks to avoid potential impacts from seafloor devices on cultural resources in mitigation areas throughout the Study Area (see Section 5.4.5, Seafloor Resource Mitigation Areas). Because most sea-floor devices would not be used in deep water, overall types and locations of training activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-26), and considering the implementation of mitigation for precision anchoring, no impacts on submerged historic resources located in the Study Area are expected from seafloor devices.

Impacts from Seafloor Devices under Alternative 2 for Testing Activities

Under Alternative 2, the number of testing activities using seafloor devices is the same as under Alternative 1 and would occur within the Northeast U.S. Continental Shelf (Northeast and Virginia Capes Range Complexes), the Southeast U.S. Continental Shelf (Navy Cherry Point and Jacksonville Range Complexes), and the Gulf of Mexico (Naval Surface Warfare Center, Panama City Division Testing Range) Large Marine Ecosystems. However, because seafloor devices associated with testing activities would not be used in deep water and overall types and locations of testing activities are not expected to change from those currently conducted by the Navy (refer to Table 3.0-26), no impacts on submerged prehistoric sites or submerged historic resources located in the Study Area are expected from the use of seafloor devices.

3.10.3.2.3.3 Impacts from Seafloor Devices under the No Action Alternative

Under the No Action Alternative, the Navy would not conduct the proposed training and testing activities in the AFTT Study Area. Various physical disturbance and strike stressors (e.g., seafloor devices) would not be introduced into the marine environment. Therefore, baseline conditions of the existing environment would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

3.10.3.2.4 Impacts from Pile Driving

3.10.3.2.4.1 Impacts from Pile Driving under Alternative 1

Impacts from Pile Driving under Alternative 1 for Training Activities

Under Alternative 1, a total of two Elevated Causeway System training events would occur in the Lower Chesapeake Bay and Navy Cherry Point Range Complex. Pile driving for elevated causeway system training would subject nearshore sediments to vibration, disruption, and compaction. Elevated causeway system training would not occur near known submerged cultural resources and the potential for encountering submerged historic resources in those areas is low. Surveys of the planned location of the elevated causeway system training would be conducted to ensure there are no obstructions prior to construction; this would prevent impacts to submerged resources.

Impacts from Pile Driving under Alternative 1 for Testing Activities

Pile driving is not associated with any testing activities under Alternative 1.

3.10.3.2.4.2 Impacts from Pile Driving under Alternative 2

Impacts from Pile Driving under Alternative 2 for Training Activities

Under Alternative 2, the number of elevated causeway system training events would not increase relative to Alternative 1. Therefore, the potential for affecting submerged historic resources would be the same as described under Alternative 1.

Impacts from Pile Driving under Alternative 2 for Testing Activities

Pile driving is not associated with any testing activities under Alternative 2.

3.10.3.2.4.3 Impacts from Pile Driving under the No Action Alternative

Under the No Action Alternative, the Navy would not conduct the proposed training and testing activities in the AFTT Study Area. Various physical disturbance and strike stressors (e.g., pile driving) would not be introduced into the marine environment. Therefore, baseline conditions of the existing environment would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

3.10.3.2.5 Impacts from Vibration from Sonic Booms

Impulsive noise, such as that resulting from supersonic overflights (sonic booms) can create intense shock waves that cause airborne vibration. Repeated vibration, over time, has the potential to degrade or destroy sensitive structural or cultural elements. Supersonic aircraft flights can occur and are usually limited to altitudes above 30,000 ft. and locations more than 30 NM from shore. Several factors influence sonic booms: weight, size, and shape of the aircraft; altitude; flight paths; and atmospheric conditions. A larger and heavier aircraft displaces more air and creates more lift to sustain flight, compared with small, light aircraft. Therefore, larger aircraft create sonic booms that are stronger and louder than those of smaller, lighter aircraft.

Vibration and shock waves from sonic booms could create increased structural instability and damage to a fragile historic architectural resource in the Study Area (Fort Jefferson in the Key West Range Complex) (Hanson et al., 1991; James et al., 2009).

3.10.3.2.5.1 Impacts from Aircraft Noise—Vibration from Sonic Booms under Alternative 1

Impacts from Vibration from Sonic Booms under Alternative 1 for Training Activities

Only the Key West Range Complex in the Gulf of Mexico Large Marine Ecosystem contains a cultural resource that could be susceptible to sonic booms; no other regions are associated with supersonic flight activities where susceptible cultural resources occur.

The Key West Range Complex contains a National Register of Historic Places-listed resource, Fort Jefferson, which is susceptible to damage from vibration and shock waves generated from sonic booms. A sonic boom study was conducted as part of the Key West Range Complex Environmental Assessment/Overseas Environmental Assessment (James et al., 2009). Fragile mortar in the brick masonry at Fort Jefferson may be susceptible to damage from sonic booms (Hanson et al., 1991; James et al., 2009); however, the study concluded that restored sections of Fort Jefferson are not susceptible to sonic boom damage (James et al., 2009). The exclusionary Tortuga Military Operations Area around the Dry Tortugas National Park, combined with the Navy's existing avoidance and protective measures enacted, means that sonic boom vibration has little potential for structural damage to historic structures and features associated with National Register of Historic Places-listed Fort Jefferson.

Impacts from Vibration from Sonic Booms under Alternative 1 for Testing Activities

No testing activities that could create sonic booms would occur in or near the Dry Tortugas National Park in the Gulf of Mexico Large Marine Ecosystem.

3.10.3.2.5.2 Impacts from Vibration from Sonic Booms under Alternative 2

Impacts Vibration from Sonic Booms under Alternative 2 for Training Activities

As indicated in Alternative 1, only the Key West Range Complex in the Gulf of Mexico Large Marine Ecosystem contains a cultural resource that could be susceptible to sonic booms; no other large marine ecosystems are either associated with activities generating sonic booms or contain susceptible cultural resources.

There would be no increase in aircraft activity in the Key West Range Complex under Alternative 2 compared with Alternative 1. The exclusionary Tortuga Military Operations Area around the Dry Tortugas National Park, combined with the Navy's existing avoidance and protective measures, means that sonic boom vibration has little potential for structural damage to historic structures and features associated with National Register of Historic Places-listed Fort Jefferson.

Impacts from Vibration from Sonic Booms under Alternative 2 for Testing Activities

No testing activities that could create sonic booms would occur in or near the Dry Tortugas National Park in the Gulf of Mexico Large Marine Ecosystem.

3.10.3.2.5.3 Impacts from Vibration from Sonic Booms under the No Action Alternative

Under the No Action Alternative, the Navy would not conduct the proposed training and testing activities in the AFTT Study Area. Various physical disturbance and strike stressors (e.g., vibration from sonic booms) would not be introduced into the marine environment. Therefore, baseline conditions of the existing environment would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

3.10.4 SUMMARY OF POTENTIAL IMPACTS ON CULTURAL RESOURCES

3.10.4.1 Combined Impacts of All Stressors under Alternative 1

Explosive and physical disturbance and strike stressors associated with training and testing activities would not impact cultural resources.

3.10.4.2 Combined Impacts of All Stressors under Alternative 2

Explosive and physical disturbance and strike stressors associated with training and testing activities associated with explosive and physical stressors would not impact cultural resources.

3.10.4.3 Combined Impacts of All Stressors under the No Action Alternative

Under the No Action Alternative, the Navy would not conduct the proposed training and testing activities. Baseline conditions of the existing environment would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

3.10.4.4 National Historic Preservation Act

Table 3.10-2 summarizes the potential effects of the Proposed Action on submerged resources in accordance with Section 106 of the National Historic Preservation Act for Alternative 1, Alternative 2, and the No Action Alternative. Consultation with the appropriate State Historic Preservation Office will continue, as needed, for cultural resources located within state territorial waters (within 3 NM) with the exception of Texas, Puerto Rico, and Florida (Gulf coast only), which have a 9 NM limit.

Table 3.10-2: Summary of Section 106 Effects of Training and Testing Activities on Cultural Resources

Alternative and Stressor	Section 106 Effects
Alternative 1	
Explosive Stressors	Explosive stressors resulting from underwater explosions creating shock waves and cratering of the seafloor would not affect known or unknown submerged cultural resources; mitigation measures would continue to be implemented to protect shipwrecks.
Physical Disturbance and Strike Stressors	Physical stressors resulting from in-water devices, military expended materials, seafloor devices, pile driving, and vibration from sonic booms during training and testing activities would not affect known or unknown submerged cultural resources; mitigation measures, would continue to be implemented to protect shipwrecks.
Regulatory Determination	<i>No adverse effects on submerged cultural resources would occur.</i>
Alternative 2	
Explosive Stressors	Explosive stressors resulting from underwater explosions creating shock waves and cratering of the seafloor would not affect known or unknown submerged cultural; mitigation measures would continue to be implemented to protect shipwrecks.
Physical Disturbance and Strike Stressors	Physical stressors resulting from in-water devices, military expended materials, seafloor devices, pile driving, and vibration from sonic booms during training and testing activities would not affect known or unknown submerged cultural resources; mitigation measures, would continue to be implemented to protect shipwrecks.
Regulatory Determination	<i>No adverse effects on submerged cultural resources would occur.</i>
No Action Alternative	
Explosive Stressors	Explosive stressors would not be introduced into the marine environment. Therefore, baseline conditions of the existing environment would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities
Physical Disturbance and Strike Stressors	Physical disturbance and strike stressors would not be introduced into the marine environment. Therefore, baseline conditions of the existing environment would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities.

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