Phase IV Atlantic Fleet Training and Testing SEIS/OEIS Supplement: Marine Habitat Database Technical Report

Inside seawall of the Mole Pier within Truman Harbor, showing the stony coral *Oculina* sp. And common sea fans (*Gorgonia ventalina*) growing on hard substrate

Prepared for:

Prepared by:

Draft Version Date: August, 2024

Cover art credits: Naval Facilities Engineering Command Atlantic. (2013). *Benthic habitat characterization of Naval Air Station, Key West, Florida*. Final Project Report prepared by HDR Environmental, Operations, and Construction, Inc. in collaboration with CSA Ocean Sciences, Inc.

Table of Contents

Table of Figures

Table of Tables

1 INTRODUCTION

This document provides a detailed description of the marine habitat database, the data sources it currently contains, and the ranking scheme used to prioritize overlapping mapping sources for analysis in the Atlantic Fleet Training and Testing (AFTT) Phase IV Supplemental Environmental Impact Statement (SEIS)/Overseas EIS (OEIS) and associated environmental compliance documents. Note that the actual mapping of habitat types is reserved for the SEIS/OEIS and associated environmental compliance documents that reference this report for metadata.

Geographic information system (GIS) data sources representing the marine habitat types present within the AFTT study area ("Study Area") are variable by location, resolution, classification criteria, and accuracy. To ensure that the best available data is used in the SEIS/OEIS analyses and associated environmental compliance documents (e.g., Essential Fish Habitat Assessments, Endangered Species Act Biological Assessments), the database underlying this technical report includes fields for each category of criteria (e.g., primary mapping method, validation methods, spatial resolution) which helps prioritize potentially overlapping data sources and show only the best available data for a given location. The resulting refinement of "surveyed" habitat areas better reflect where different habitat types occur, improving the impact analysis within subsequent environmental compliance documents.

The "Habitats" resource section in the SEIS/OEIS focuses primarily on subsurface topography and abiotic substrates, with other resource sections focusing on biotic features of the water column (e.g., *Sargassum* in the "Vegetation" section) and/or seafloor (e.g., seagrass beds in the "Vegetation" section, coral reefs in the "Invertebrates" section). Accordingly, the current database contains mapping for both physical habitat features (e.g., bathymetry, circulation patterns, sea surface temperature) and biological habitat features (e.g., seagrass beds) assessed in the SEIS/OEIS sections and associated environmental compliance documents. However, the synthesis of habitat data presented herein is limited to what is biologically relevant (in terms of taxa habitat affinities), stressor sensitive (e.g., crater formation, burial of expended materials), and distinguishable using available mapping techniques.

2 CLASSIFICATION SYSTEM

Within the basic dimensions of habitat reported on in this document (Figure 2-1), overlapping data are ranked based on criteria for quality described in Section 3 (Data Source Qualities, Ranking Scheme, and Analysis Dimensions). The basic dimensions include abiotic substrate, bathymetry/topography, water flow/quality, and biotic features. Abiotic substrate forms the surface of bathymetric/topographic features (e.g., outcrops, ridges), and may have associated biotic features (e.g., seaweeds, corals, sponges, mussels). Water flow/quality (e.g., water column) has both horizontal (e.g., surface currents) and vertical dimensions (e.g., temperature stratification) with associated biotic features (e.g., floating *Sargassum*, phytoplankton biomass).

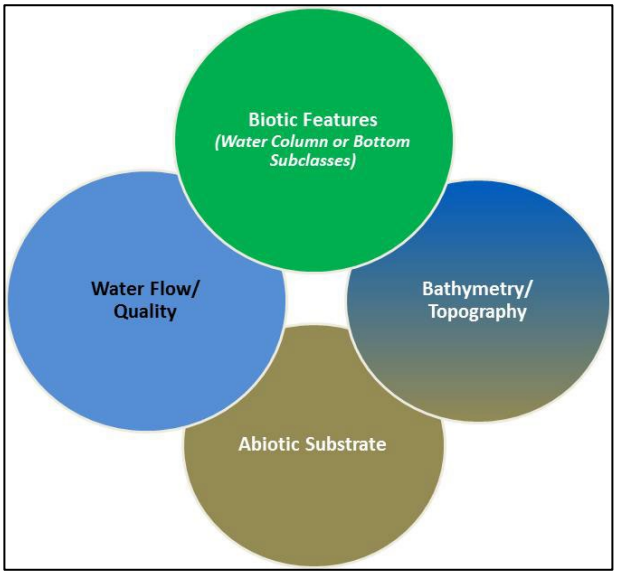


Figure 2-1. Basic themes/dimensions of marine habitat.

The physical dimensions of habitat include abiotic substrate, bathymetry/topography, and the water column itself. These features, as resources, are covered in the "Sediment and Water Quality" and "Habitat" sections of the Phase IV AFTT Supplemental EIS/OEIS. The physical dimensions of habitat also include mapping descriptors such as Essential Fish Habitat (EFH) used in the Essential Fish Habitat Assessments (EFHAs) and potential habitat for ESA-listed coral species referenced in the Biological Assessment (BA) for the National Marine Fisheries Service (e.g., shallow-water coral reefs). Refer to Section 4.2 (Description of Non-overlapping Mosaics – Physical Habitat Dimensions) for more information on the categories of physical habitat.

The subcategories of biotic features include "Vegetated Habitats", "Invertebrate Beds/Reefs", and "Live Hard Bottom" (described in Section 4.1, Description of Non-overlapping Mosaic – Biogeographic Dimensions/Biotic Features) consistent with the organization and content of the Phase IV AFTT environmental compliance documents.

3 DATA SOURCE QUALITIES, RANKING SCHEME, AND ANALYSIS DIMENSIONS

3.1 DATA SOURCE QUALITIES

The Navy acquires mapping of marine habitats from various government (federal, state, and local), academic, or private sources including but not limited to the National Oceanographic and Atmospheric Administration (NOAA), United States Geological Survey (USGS), Bureau of Ocean Energy Management (BOEM), state resources management agencies, government-funded marine laboratories, universities, and private contractors working on projects with a federal nexus. The Navy has also conducted its own habitat mapping for specific projects and created some datasets based on expert knowledge of selected features (e.g., oyster restoration site in Little Creek Harbor). The data sources are referenced in the section entitled "Summary of Data Sources."

The mapping data sources were compiled, and qualities of the data were documented in a database. Microsoft Access was used to create a form for documenting the variables needed to rank data quality (refer to Section 3.2, Data Quality Ranking Scheme, for details). The data table can also be linked to an ArcGIS geodatabase for mapping sources to query for data quality attributes.

Description of Fields in Database Tables

1. Source/Text Citation Table
    a. Source/Text Citation – shows how a data source would be cited in the text and links to "child" table for habitat dimensions/feature classes table
    b. Basic Metadata/Literature Cited – Full bibliographic citation for source
    c. Multi-dimensional – Displays if the source mapped multiple dimensions of the habitat (e.g., bathymetry/topography, abiotic substrate, and biotic features)
2. Habitat Dimensions/Feature Classes Table
    - Map_id – unique identifier linking GIS data with MS Access record
    - Text Citation – shows how the data source would be cited in text and links to "parent" table for source references
    - Habitat Dimension (pick only one – a single source can have multiple features classes and geometries)
        - 4.1.1-Biotic Features/Vegetated Habitats – selected if the feature theme(s) depicts a vegetated habitats of the water column or bottom (e.g., floating *Sargassum*, seagrass beds, coastal wetlands)
        - 4.1.2-Biotic Features/Invertebrates Beds and Reefs – selected if the feature theme(s) depicts a habitat-forming invertebrate (e.g., shallow-water coral reefs, oyster beds/reefs)
        - 4.2.1-Physical/Abiotic Substrate – selected if the feature theme(s) depicts a substrate classification (e.g., silt, sand, gravel, cobble, boulder/bedrock)
        - 4.2.2-Physical/Bathymetry and Topography – selected if the feature theme(s) depicts depth of the water column or topographic features of the bottom (e.g., outcrops, shelf breaks)
        - 4.2.3-Physical/Water Flow and Quality – selected if the feature theme(s) depict characteristics of the water column (e.g., temperatures, salinities)
        - 4.3-Management Areas – selected if the feature depicts artificial reef boundaries.

- Legend Label – Select option for how a feature will be labeled on figures
- Feature Class – Select option for name of a feature in geodatabase that will be sourcing the EIS/OEIS, EFHA, and BA figures
- Geometry – specify if a feature class is represented by point, line, polygon, or raster geometry
- Year Data Collected– this is the year(s) that the mapping data were collected (in the field) by the source reference and not necessarily the year of publication. The data could be a range (data collected every year), multiple non-consecutive years, or a single year.
- Method (Mapping) – methods that cover largest area of mapping theme
    - Acoustic Sensor – includes use of devices that detect sound reflectance (e.g., side-scan sonar, single or multi-beam vertical sonar, sub-bottom profiler)
    - Bathymetry – reference to bottom type designated from navigation charts (typically combined with modeling/interpolation using validation methods)
    - Benthic Sampler – includes use of devices that extract a sample of the bottom composition, including sedentary or very slow-moving organisms (e.g., benthic grab, sediment core, dredge)
    - Expert Knowledge – includes use of hand-drawn or digitized boundaries based on expert experience and local ecological knowledge
    - Modeling/Interpolation – Typically a combination of bathymetry, expert knowledge and some validation data in the form of points, lines, and/or polygons that do not cover the entire study area
    - Nekton Sampler – includes use of devices that captures large-mobile organism in the water column or on the bottom (e.g., trawl, trap). Some organisms can be indicators of persistent-marine-habitat features (e.g., hard bottom).
    - Other sensor – includes any technology not specifically covered by the previously specified methods (e.g., magnetometer).
    - Plankton Sampler – includes use of devices that capture tiny organisms drifting in the water column
    - Point-based Interpolation – includes polygons interpolated among point samples. These points samples contain data but the area in-between the points are modeled and interpolated based on the points around them.
    - Visual Observation (direct) – includes direct observation by divers or use of a device that captures video or photographic footage at a resolution similar to direct observation by divers (e.g., underwater video camera, remotely operated vehicle)
    - Spectral Sensor (remote) – includes use of devices that detect some part of the light spectrum from a remote platform (e.g., aerial photography, satellite multispectral scanner)
    - Water Flow/Quality Meters – includes use of devices that measure flow velocities or water quality parameters (e.g., temperature, salinity, turbidity, dissolved oxygen)
- Method (Validation) – methods used to validate classification by the primary method, if validation is needed (see mapping methods for listing)
- Minimum Mapping Unit (m) – smallest area or resolution of the mapped classifications
- Assemblage Data –selected if the data represents a compilation of different data sources
- Subset Data – selected if the data represents part of a set of data from the same data source. This is usually the result of mapping at different spatial scales within the same overall study area.

- Data Rank by Theme(s) – a ranking from 0 (lowest quality) to 100 (highest quality) for the sources mapping a feature theme(s) in the database - See section below (Data Quality Ranking Scheme) for more information.
- Data Preparation/Processing Notes – Documentation for the conversion of data source classification into standard abiotic substrate categories described in Section 4.2.1, Abiotic Substrate.

3.2 DATA QUALITY RANKING SCHEME

Each source of polygon data was given a rank from 0 (lowest quality) to 100 (highest quality) in order to determine the highest quality data in a given location so that it could be used for subsequent analyses. The rank is based on a combination of minimum mapping unit (i.e., mapping resolution), mapping and validation method(s), compatibility of native classification system, and noted adjustments.

Note that: (1) only the abiotic substrate data are ranked due to the number and extensive overlap of data sources, and (2) equivalent ranks are allowed where polygon data sources do not overlap. The latest polygon data for biotic features generally did not overlap, though there are exceptions for incomplete data assemblages described in their respective sections. Point and line data sources are not ranked because they are inherently non-overlapping, unless they are converted to polygons.

Mapping resolution is straight forward in terms of superiority: smaller minimum mapping units provide a better resolution of data. The minimum mapping units are ranked from 1 (lowest resolution/largest minimum mapping unit) to not greater than the number of datasets (highest resolution/smallest minimum mapping unit) if all the minimum mapping units are different. Data sources with equal minimum mapping units are given the same rank for mapping resolution.

As a comparison of mapping and validation method(s), consider a typical point-based interpolation compared to a highly detailed multibeam sonar, benthic grab, and remote operated vehicle (ROV) survey [e.g., (U.S. Department of the Navy, 2010; 2011a; 2011b)]. When data are available for the same location, the highly detailed survey data (with a higher-ranking score) would be used in the non-overlapping mosaic. Although, point-based interpolation data could be better than multibeam sonar if the points were close enough together, multibeam sonar data is generally considered to be of higher quality because it has a higher resolution overall than an interpolated map based on point data. The mapping and validation methods are ranked from 1 to 4, with four being the highest and best methods.

1. Point-based interpolation using benthic sampler validation or bathymetric interpolation and expert knowledge;
2. Line-based interpolation (e.g., depth or reflectance profiles) and validation by direct visual observation;
3. Bathymetric interpolation/modeling using validation from acoustic sensors, benthic samplers and direct visual observations or acoustic sensor/remote spectral sensor without validation; and
4. Acoustic sensor or remote spectral sensor using validation from direct visual observation or benthic samplers

Compatibility of original classification system with the standardized system was ranked from 1 (lowest rank) to 3 (highest rank) based on the following descriptions of original bottom-type classifications:

1. Bottom classifications are all based on geological terms that suggest abiotic substrate types [e.g., (Todd, 2006)];

2. Bottom classifications can be directly translated into standardized categories or there is a strong correlation of stationary biota (e.g., hard corals, live hard bottom organisms) to a set of factors including hard substrate [e.g., (Kinlan et al., 2013a; 2013b; 2013c)];
3. Bottom classification can be directly translated into standardized categories and there is reference to topography (e.g., high relief hard bottom) and relatively high concentration of stationary biota [e.g., (Skidaway Institute of Oceanography, 2004)].

The component ranks are combined to yield a total rank from 0-100; where 0 is a low-quality data set and 100 is a high-quality data set. The following component rank equation was used to make this assessment and assumed the following:

• 50% of a data set's rank is based on resolution (R). The higher the resolution the better the component rank.

• 30% of the data set's rank is based on mapping and validation methods (M). The better the mapping and validation, the higher the component rank is for that data set.

• 20% of the data set's rank is based on compatibility of native classification system (C). The more compatible the information to support the classification rank, the higher the component rank is for that data set.

• A bonus or penalty may also be added for additional factors considered for overlapping data (e.g., minimum age of data).

$$DR = ((R/RH*0.5) + (M/MH*0.3) + (C/CH*0.2))*100$$

R = Resolution rank for individual source x

RH = Highest rank for resolution in the dataset

M = Methods rank for individual source

MH = Highest rank for method in the dataset

C = Classification rank for individual source

CH = Highest classification rank in the dataset

DR = Data Rank

The criteria percentages and data rank for each dataset are provided in Table 5.2.

3.3 DATA SOURCE SUMMARY

For the Study Area, there were 14-point-data sources, 20-line data sources, and 140-polygon data sources (including synthesis works integrating numerous constituent data sources) representing biotic features, abiotic substrates, bathymetry/topography, and water flow/quality (Table 3-1).

Table 3-1. Mapping data source for marine habitat types in the AFTT Phase IV study area.

Habitat Dimension	Legend Label	Geometry	Number of Sources
Biotic Features: Bottom	Shallow-water Coral Reefs	Polygon	6
	Oyster Beds/Reefs	Polygon	10
	Seagrass Beds	Polygon	15
	Coastal Wetlands	Line	11
		Polygon	3
	Worm Reefs	Polygon	1
Biotic Features: Water Column	Floating *Sargassum*	Polygon	1
Physical: Bottom	Bottom Substrate	Polygon	89
	Oil and Gas Platforms	Point	1
	Seafloor Pipeline	Line	1
	Shipwrecks	Point	11
	Shoreline Substrate	Line	11
	Towers (Air Force and Navy)	Point	1
	Wind Turbines	Point	1
Physical: Water Column	Average Sea Surface Temperature	Raster	1
	Bathymetry	Raster	2
	Currents	Polygon	1
	Dead Zones	Polygon	1
Management Areas	Artificial Reefs	Polygon	17

4 DESCRIPTION OF NON-OVERLAPPING MOSAICS

The marine habitat database has a separate mosaic for each dimension of marine habitat that is generally non-overlapping, as illustrated in Figure 2-1. The dimensions of a habitat are grouped into biogeographic/biotic features, physical, and management categories consistent with the resource organization and content of the AFTT Supplemental EIS/OEIS and associated environmental compliance documents. The mapping for different habitat categories is described and depicted in various documents where they apply. For example, the EFHA contains maps that depict various biological habitats (e.g., seagrass beds, wetlands, oyster reefs, etc.). This document should be referenced for more information on the data sources used in the maps.

The link between features depicted in the AFTT environmental compliance documents and the metadata documented in this report is the legend label used in Section 5.1 (Source Data Tables).

4.1 BIOTIC FEATURES

Biotic features of marine habitat are generally non-overlapping and mostly confined to state or foreign coastal waters (e.g., seagrass beds, oyster reefs, shallow coral reefs), with exceptions described in this section (e.g., floating *Sargassum*, live hard bottom).

4.1.1 VEGETATED HABITATS

Vegetated habitats include seagrass beds, coastal wetlands, and other habitat-forming vegetation (e.g., floating *Sargassum*, seaweed attached to live hard bottom), as defined in the AFTT Supplemental EIS/OEIS.

4.1.1.1 Seagrass Beds

The current distribution of seagrass beds is represented by 15 (mostly state-level) data sources tabulated in Section 5.1. Whereas UNEP-WCMC and Short (2021) provide a global synthesis of seagrass mapping, they do not include all the latest U.S. data sources. As such, this data source provided only seagrass data coverage for areas not covered by other data sources (e.g., New York, Puerto Rico, foreign coastal waters). The latest data sources for the Gulf of Mexico were a combination of state and federal mapping (Florida Fish and Wildlife Conservation Commission Fish and Wildlife Research Institute, 2021b; Texas Parks and Wildlife Department, 2012; National Park Service, 2011; Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2014) with an assemblage effort that covered multiple states including Mississippi and Alabama (Handley, 2011). The need to reconcile overlapping data sources came about with the uneven assemblage effort and lack of any defined study areas; Handley (2011) contained both up-to-date (Mississippi and Alabama) and out-of-date sources (other U.S. states around the Gulf of Mexico) and no indication for where seagrass beds did not occur (a defined Study Area would indicate this). The combined polygon data from these sources was then clipped to within 500 m of the Study Area boundary to ensure inclusion of all seagrass beds mapped in the Study Area despite the coarse resolution shoreline.

4.1.1.2 Coastal Wetlands

The current distribution of saltmarshes and mangroves is represented by two primary data sources (Mcowen et al., 2017; Spalding et al., 2010). The combined polygon data from these sources was clipped to within 500 m of the Study Area boundary. A buffer was used because the Study Area boundary is much lower resolution than the mapping for coastal wetlands, allowing the wetland areas to be greater than the Study Area. For the inshore training areas, the distribution of coastal wetland shorelines

includes more detailed state- and regional-level datasets from NOAA's Office of Response and Restoration (refer to Section 4.2.1.2, Abiotic Substrate Lines, for more information regarding the processing of this data).

4.1.1.3 Other Habitat-forming Vegetation

The current distribution of floating *Sargassum* in the North Atlantic and Gulf of Mexico is depicted in Gower and King (2008). The recent infusions of floating *Sargassum* in the Caribbean Sea documented in Wang et al., (2019) are mostly outside the Study Area. The general distribution of benthic macroalgae is approximated by live hard bottom (refer to Section 4.1.3, Live Hard Bottom, for details) in water less than approximately 95 m deep. Refer to Section 3.4 (Vegetation) in the AFTT Supplemental EIS/OEIS for why benthic macroalgae is not expected below this depth.

4.1.2 Invertebrate Beds/Reefs

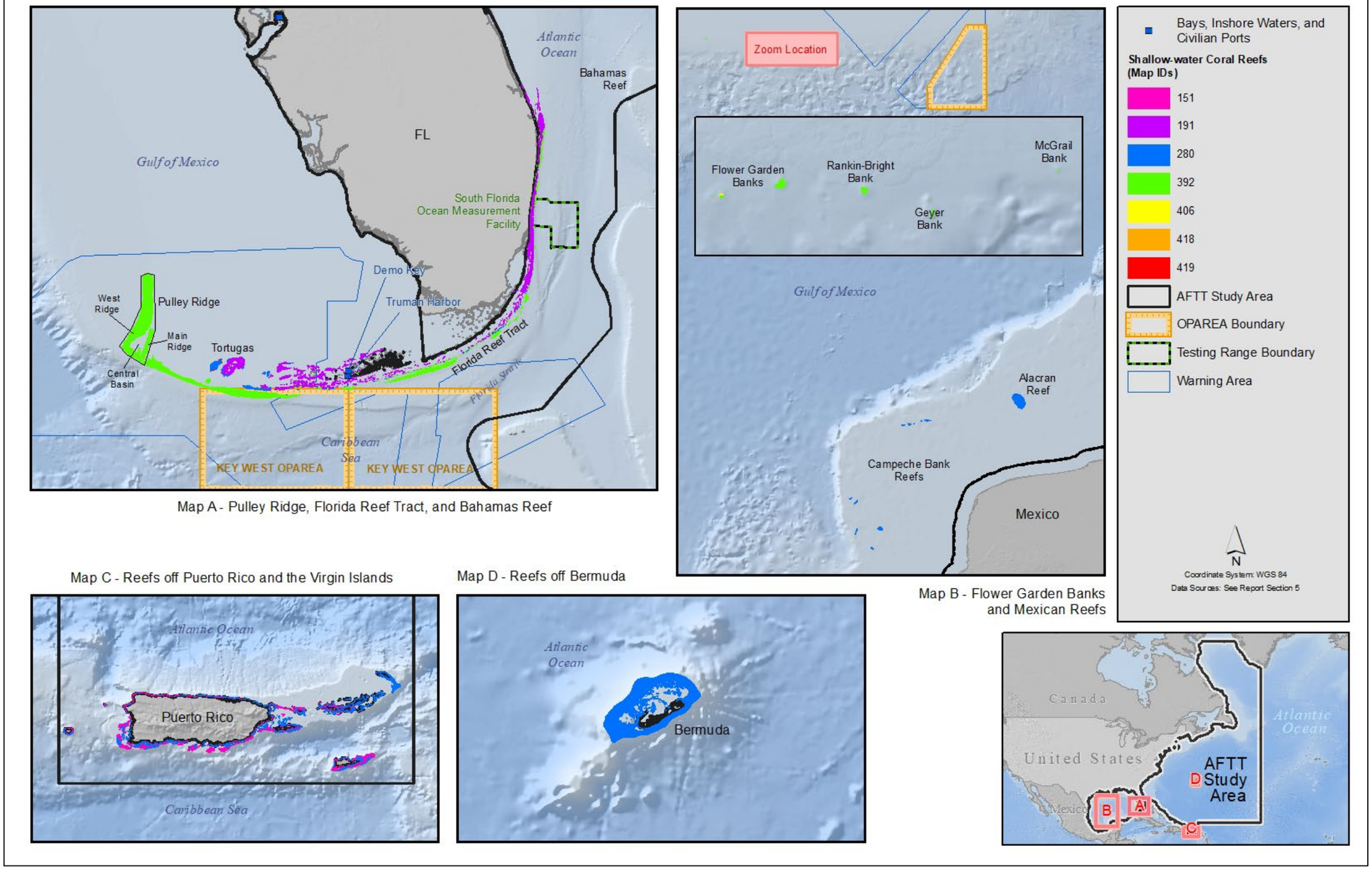
Invertebrate beds/reefs include shallow-water coral reefs and other reef- or bed-forming invertebrates (e.g., deep-water corals, oysters, worms), as defined in the AFTT Supplemental EIS/OEIS.

4.1.2.1 Shallow-water Coral Reefs

Almost all the datasets representing shallow-water coral reefs (i.e., warm-water reefs), as defined in the AFTT environmental compliance documents, were created from assemblages containing various qualities of data. As such, a ranking of data sources was not conducted due to the inherent complexity. However, Clark et al., (2014) [Map_id = 406], Franklin et al., (2003) [Map_id = 419], the Florida Fish and Wildlife Conservation Commission (2016) [Map_id = 191] and National Ocean Service (2001) [Map_id = 151] were considered the most current and highest quality assemblage for the area covered (e.g., Flower Garden Banks, Tortugas Bank, Florida Keys, and Puerto Rico, respectively). Other data sources included the following:

- UNEP-WCMC et al., (2021) [Map_id = 280]: Represented the latest global synthesis of warm-water coral reefs, including parts of the Gulf of Mexico that are outside the U.S. EEZ. However, the data source was missing some areas depicted in other data sources.
- Naval Facilities Engineering Command Atlantic (2022b) [Map_id = 392]: Represents a compilation of hard substrate mapping that coincides with habitat suitability modeling for ESA-listed, reef-building coral species around Florida and in the Gulf of Mexico (Gulf of Mexico Fishery Management Council, 2021). The selection of warm-water coral reefs was also limited to hard substrate areas within the areas considered suitable for shallow-water coral reefs:
    - with a data ranking of 49 or greater;
    - south of 30 degrees latitude;
    - within a Habitat Area of Particular Concern, Critical Habitat for ESA-listed coral species, or a National Marine Sanctuary protected reef ecosystems; and
    - between 30 and 52 or 30 and 105 meter depths in the northwestern Gulf of Mexico (Clark et al., 2014) or around Pulley Ridge (Reed et al. , 2019), respectively, using either GEBCO (2021) global bathymetry or higher resolution bathymetry data from NOAA Centers for Environmental Education (2022). The higher resolution data was used for Stetson Bank, Bright Bank, Geyer Bank, and McGrail Bank where shallow-water coral reef species have been documented (Hickerson et al., 2008). Also added hard bottom mapped on Riley's Hump (south of Tortugas) based on observations documented in Weaver et al. (2006).

The relatively complex distribution of data sources representing shallow-water coral reefs is depicted in Figure 4-1. Note that lower quality dataset generally overestimates the area of shallow-water coral reefs. For example, the Pulley Ridge area is comprised of the main ridge, central basin, and western ridge. Whereas the main ridge is represented by relatively high-quality data, the central basin and western ridge are not high-quality data (refer to Section 4.2.1 figures for distribution of data ranks).



Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = Operating Area

Figure 4-1. Extent and Data sources for Shallow-water Coral Reefs in the AFTT Study Area.

4.1.2.2 Other Reef-or Bed-forming Invertebrates

Other reef- or bed-forming invertebrates include deep-water corals (i.e., cold-water corals), oysters (*Crassostrea* species) and a type of worm (*Phragmatopoma* species).

The current distribution of deep-water corals (i.e., cold-water corals) and worm reefs, as defined in the EIS/OEIS invertebrate section, are represented by the location of "live hard bottom" as described in Section 4.1.3 (Live Hard Bottom).

Oyster reefs (or beds, depending on the layering) are depicted by 10 regional- or state-level datasets intersecting the Study Area (see Section 5.1 for details). The combined data were clipped to within 500 m of the Study Area, creating a buffer zone because the Study Area boundary is much lower resolution than the mapping for reef- or bed-forming invertebrates.

4.1.3 Live Hard Bottom

The term "live- hard bottom" refers to hard (and intermediate, to a lesser extent) substrate in the ocean environment that supports benthic macroalgae (i.e., seaweed) and/or habitat-forming invertebrates (e.g., sponges, hard corals). This habitat is referenced and further described in the vegetation and invertebrates sections of the AFTT Supplemental EIS/OEIS, respectively. The synthesis mapping for live-hard bottom is summarized in Section 4.2.1.3 (Physical Dimensions, Abiotic-Substrate Polygons). The mapping for live-hard bottom is limited to depths of less than 2,500 m in the northwestern Atlantic. Refer to Section 3.5 (Invertebrates) of the Supplemental EIS/OEIS for why substrate types deeper than 2,500 m are considered not applicable for hard corals and structure-forming sponges. The maximum depth for benthic macroalgae is indicated by the 95 m depth contour, which is derived from the bathymetry data described in Section 4.2.2, Bathymetry/Topography.

4.2 Physical Dimensions

The physical dimensions of habitat include abiotic substrate, bathymetry/topography, and water flow/quality, as defined in the EIS/OEIS.

4.2.1 Abiotic Substrate

Abiotic substrate is defined as the non-living material forming the topography of a submerged surface. Although many classification schemes are available that span a range of spatial dimensions and granularity (Allee et al., 2000; Cowardin et al., 1979; Federal Geographic Data Committee, 2012; Kendall et al., 2001; United Nations Educational Scientific and Cultural Organization , 2009; Valentine et al., 2005), three types of natural abiotic substrates are considered here based on the grain size of unconsolidated material and degree of consolidation: "soft", "intermediate", and "hard" substrates. Soft substrate areas are dominated by mud (including clay and silt) or sand – substrate often too unstable for colonization by habitat-forming invertebrates (e.g., hard corals, oysters) or attached seaweed. Hard substrate areas are dominated by cobbles, boulders or consolidated bedrock that is stable enough for colonization by habitat-forming invertebrates or attached seaweed. Intermediate substrate areas are dominated by unconsolidated material larger than sand but smaller than cobbles (e.g., gravel, shell fragments), covered by a thin layer of soft substrate over hard substrate, or described as coral rubble. These areas may or may not be stable enough for habitat-forming invertebrates or attached seaweeds. Artificial substrates (e.g., shipwrecks, artificial reefs) are another type of abiotic substrate that is based on material type and human origin. Spatial and temporal variation in abiotic substrate is created by the interplay of surficial geology, currents, and water quality at a location and across time.

4.2.1.1 Abiotic Substrate Points

The current distribution of artificial substrate points (e.g., shipwrecks, oil/gas platforms, military towers, wind turbines, and unspecified obstructions) is represented by 14 data sources intersecting the Study Area. Artificial reefs are represented by the designated area for reef material (refer to Section 4.3, Management Areas, for summary information). The mostly nearshore location of shipwrecks are mainly based on U.S. data sources within the U.S. EEZ and most concentrated within the coastal zone. The density of shipwrecks in the Study Area outside of the U.S. EEZ is likely very low due to the distant offshore location of the Study Area in these other regions.

The shipwreck data could include some of the same wrecks with slightly different positions as well as notably wrecks that are "address restricted" due to status on the National Registry of Historic Places (e.g., Gen. C.B. Comstock located in Texas state waters). Shipwrecks also include wrecks created from naval sinking exercises, especially in the vicinity of Puerto Rico/Vieques (at least 26 Navy vessels were deliberately sunk in this area).

4.2.1.2 Abiotic Substrate Lines

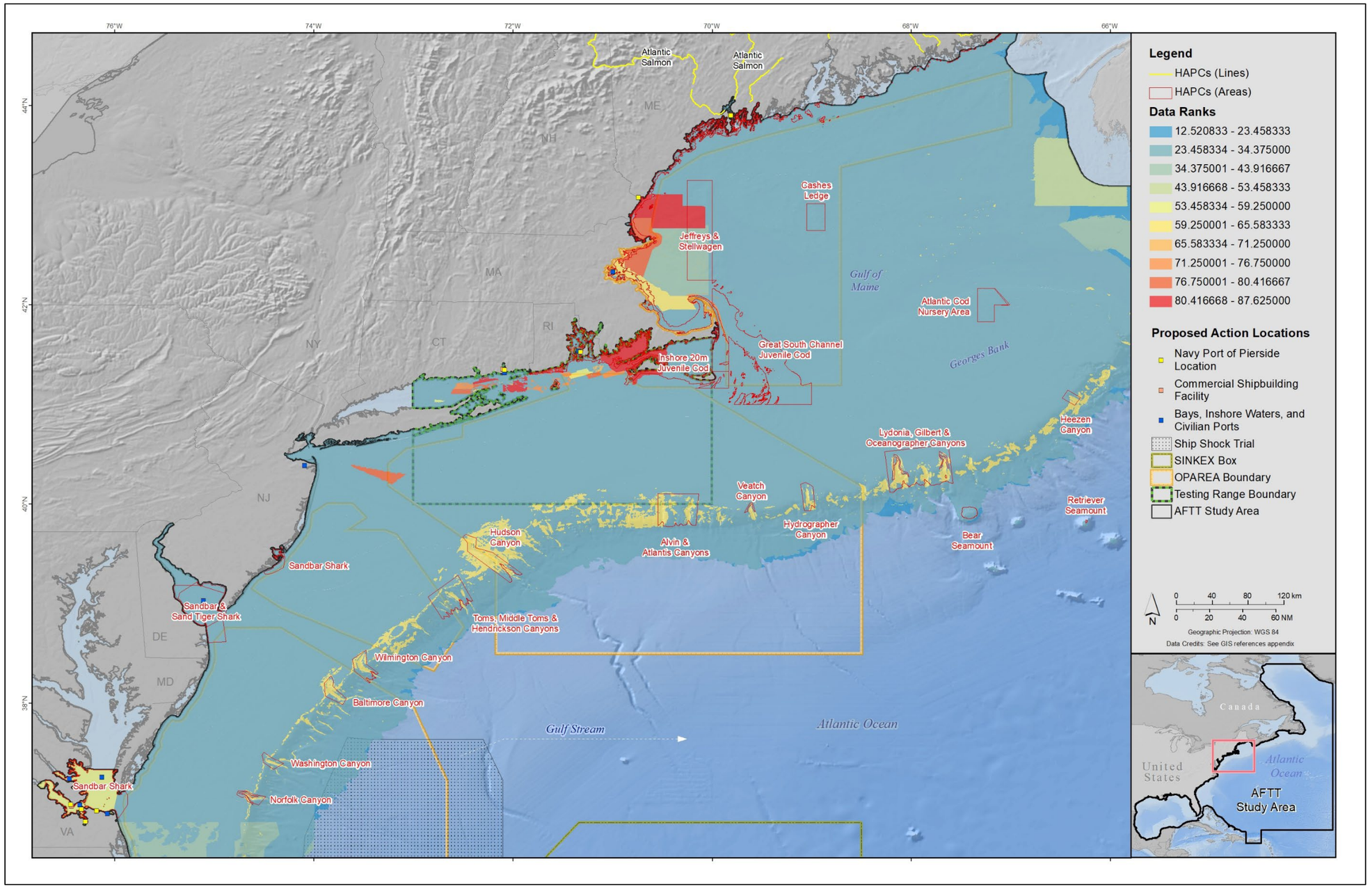
Abiotic substrate lines include only shoreline types and seafloor pipelines (1 data source) around inshore training areas; linear data sources for bottom areas were converted into polygons based on the swath width of the data collection method (e.g., transect width). Shoreline types were delineated from the same sources used for the wetland shorelines (Section 4.1.1, Vegetated Habitats). The shoreline types from these data sources included a high, middle, and low tide designator. Accordingly, the substrate types along a shoreline depended on the tide stage. For simplicity, the multiple types based on tide stage are presented in the EFHA figures as single designators using the following hierarchy: (1) artificial structures, (2) hard substrate, (3) intermediate substrate, and (4) soft substrate. Refer to the polygon section below for why this hierarchy was chosen.

4.2.1.3 Abiotic Substrate Polygons

The current distribution of abiotic substrate areas is represented by 87 primary-data sources intersecting with the Study Area. For the overlapping low-quality data (ranks less than 40), hard substrate classifications were added to the mosaic first, followed by intermediate substrate classifications (where hard substrate was not also mapped), and finally the soft substrate classifications (where hard or intermediate substrate were not also mapped). The resulting mosaic of hard, intermediate and soft substrate therefore overestimates hard and intermediate substrate areas for low quality datasets that were difficult to place in a hierarchy of data quality. The overestimation is intentional based on the importance of hard/intermediate substrate for intertidal macroalgae and stationary invertebrates (e.g., oyster beds/reefs).

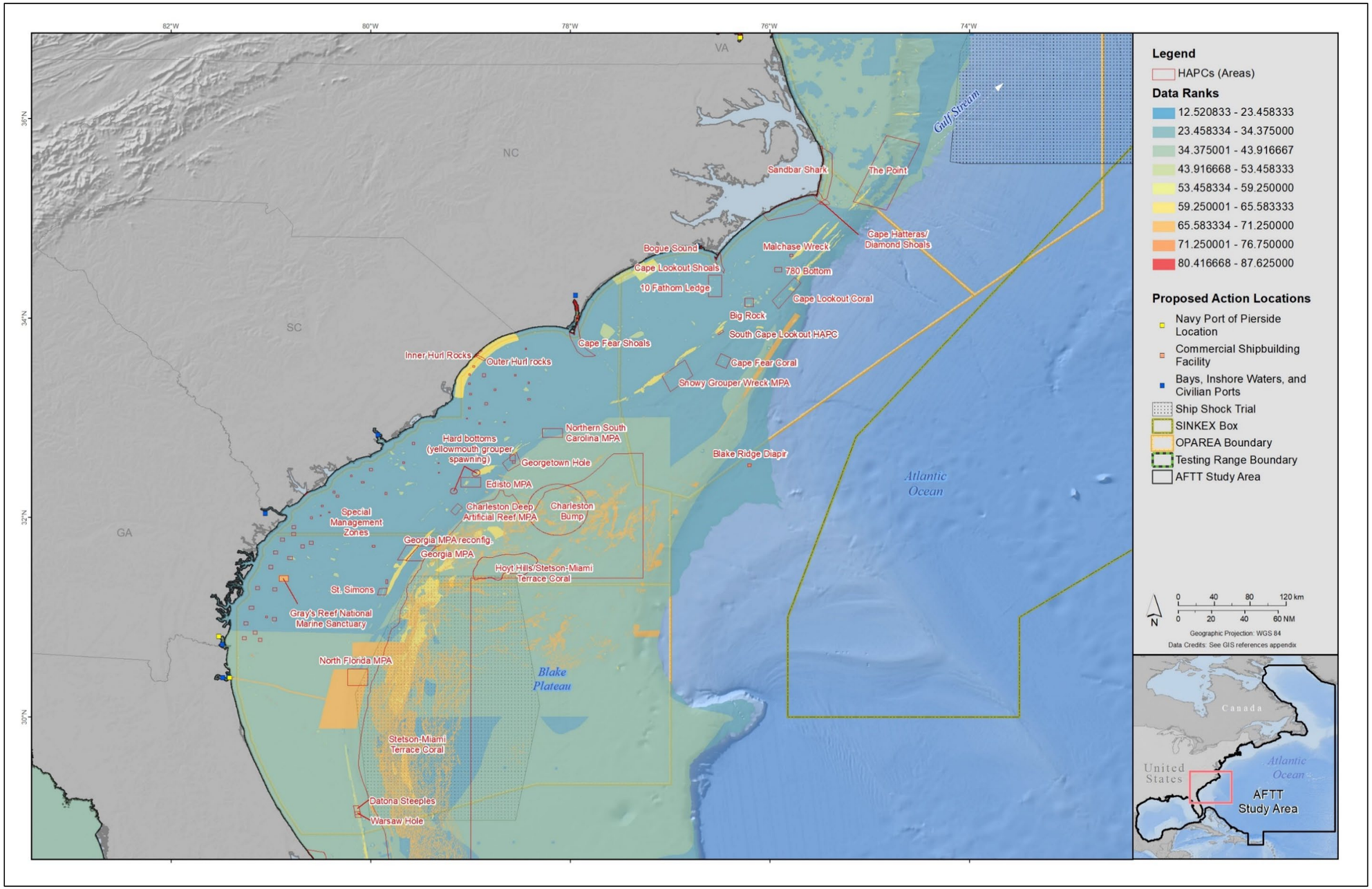
Developing a data quality ranking scheme also allowed for identifying over- or under-estimation of habitat types by comparing areas of higher and lower quality data for the same location. For example, the multiple data sources for Pulley Ridge demonstrate how using the highest quality data actually reduces the amount of hard substrate actually present on the ridge. In this case, merging the hard substrate data from higher and lower quality datasets would eliminate the high quality mapping of other substrate types (e.g., soft substrate).

Figure 4-2 to Figure 4-6 show the distribution of data source ranks for the abiotic substrate data by various regions of the Study Area. The determining factors for the rankings are provided in Section 5 (Source Data Tables).



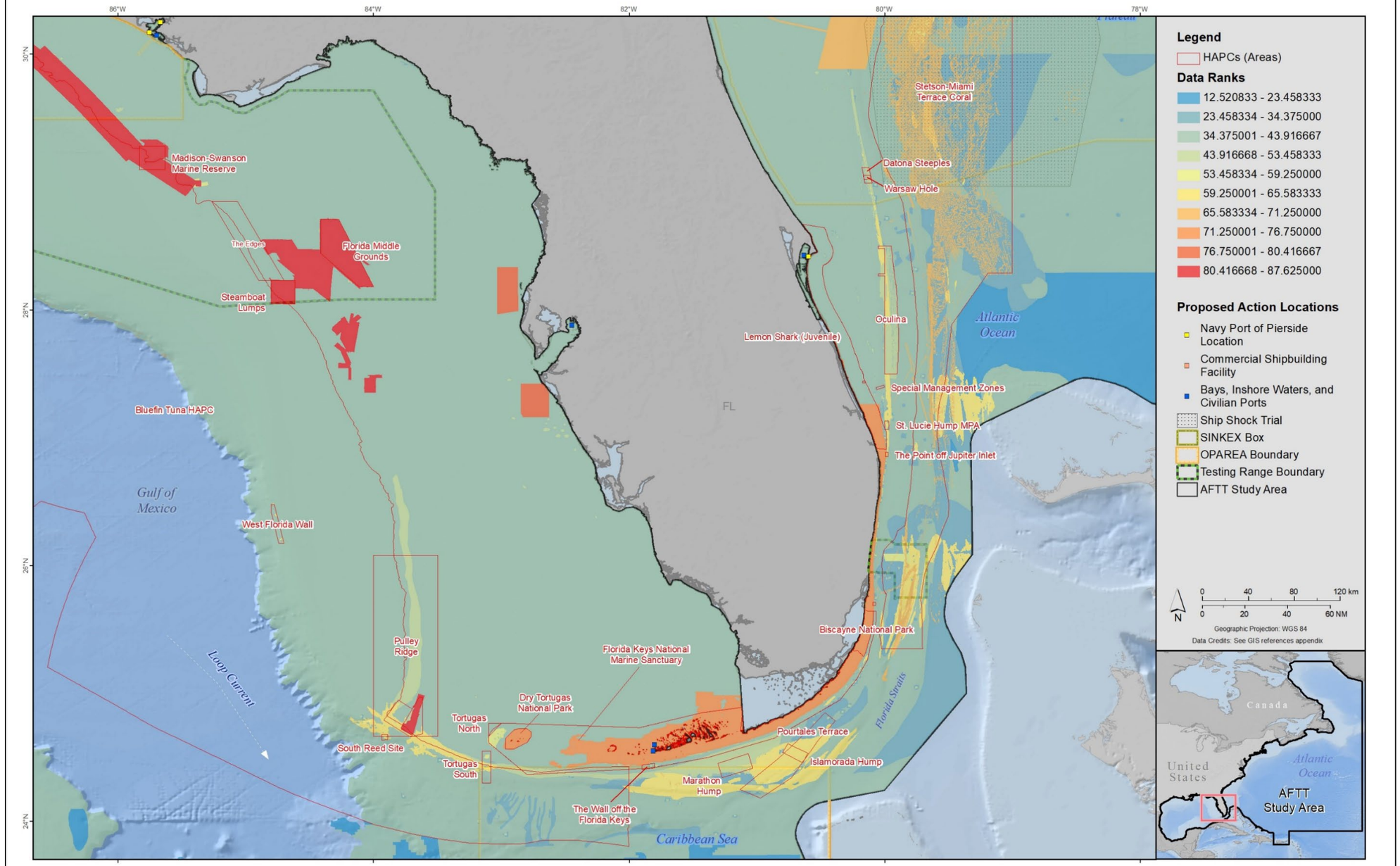
AFTT = Atlantic Fleet Training and Testing; HAPC = Habitat Area of Particular Concern; OPAREA = Operating Area; SINKEX = Sinking Exercise

Figure 4-2. Data Source Ranking for Abiotic Substrate in the U.S. Northeast Atlantic Region of the AFTT Study Area (Refer to Section 5 for Source Information).



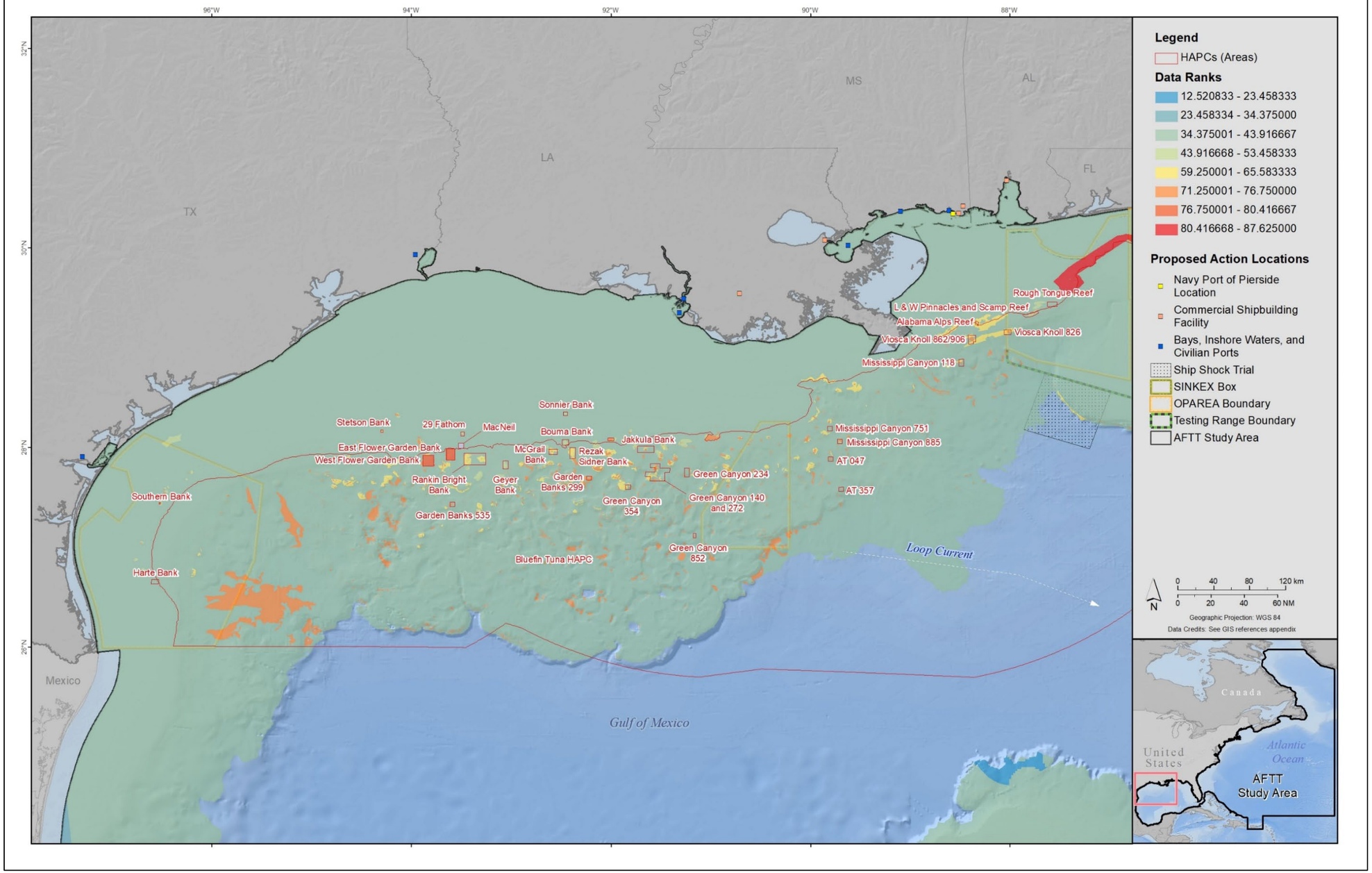
AFTT = Atlantic Fleet Training and Testing; HAPC = Habitat Area of Particular Concern; OPAREA = Operating Area; SINKEX = Sinking Exercise

Figure 4-3. Data Source Ranking for Abiotic Substrate in the U.S. Southeast Atlantic Region of the AFTT Study Area (Refer to Section 5 for Source Information).



AFTT = Atlantic Fleet Training and Testing; HAPC = Habitat Area of Particular Concern; OPAREA = Operating Area; SINKEX = Sinking Exercise

Figure 4-4. Data Source Ranking for Abiotic Substrate in the South Florida Region of the AFTT Study Area (Refer to Section 5 for Source Information).



AFTT = Atlantic Fleet Training and Testing; HAPC = Habitat Area of Particular Concern; OPAREA = Operating Area; SINKEX = Sinking Exercise

Figure 4-5. Data Source Ranking for Abiotic Substrate in the Gulf of Mexico Region of the AFTT Study Area (Refer to Section 5 for Source Information).

4.2.2 BATHYMETRY/TOPOGRAPHY

Bathymetry and topography data used in the Phase IV AFTT Supplemental EIS/OEIS includes only global and estuary-specific-depth mapping of various resolutions.

4.2.2.1 Bathymetry

Bathymetry data used in the Phase IV AFTT Supplemental EIS/OEIS is limited to the ETOPO1 1 Arc-Minute global relief model produced by NOAA's Geophysical Data Center (Amante & Eakins, 2009). The 30 x 30 m relief model was developed from diverse global and regional digital data sets that mapped bathymetry, topography, and shorelines, which were shifted to common horizontal and vertical datums, and then evaluated and edited as needed. Combining overlapping bathymetric data for the AFTT study area was therefore deemed unnecessary because of the previous work completed. However, high relief features smaller than 30 x 30 meters (e.g., small outcrops, pinnacles, deep-sea vents) may have been overlooked by the ETOPO1 synthesis of data. The global effort to assemble ocean bathymetry data, that includes the ETOPO1 relief model, is described in Wölfl et al. (2019).

Inshore bathymetry is represented by raster data from the National Geospatial Data Center (National Oceanic and Atmospheric Administration-National Geospatial Data Center, 2017).

4.2.2.2 Topography

Mapping of topography feature types (i.e., termed "geoforms" in some classification systems) are currently not included in the marine habitat database, but could improve the mapping of diverse and persistent live hard bottom communities on moderate- to high-relief topographic features (Paxton et al., 2017; Parker Jr. et al., 1994; Kendall et al. , 2005; Ilich et al., 2021). This sort of information was seldom included in the data sources and including what is available would suggest high relief areas occur with only high-quality mapping. However, topography information was used by a number of sources of abiotic substrate mapping to predict areas of live hard bottom. The level of analysis in the AFTT and environmental compliance documents also do not distinguish between low and high relief hard bottom; both types of hard bottom are simply labeled as hard bottom in AFTT and other environmental compliance documents.

4.2.3 WATER FLOW/QUALITY

Water column data used in the Phase IV AFTT Supplemental EIS/OEIS includes major ocean currents, average sea surface temperatures, sediment and water quality surveys, and monitoring of dead zones.

4.2.3.1 Major Ocean Currents

The general mapping of major ocean currents was drawn by the Navy in 2015. However, the drawing has become inaccurate based on more recent mapping of ocean currents using satellite-based measurements of sea surface height (i.e., altimeter measurements), surface vector wind and sea surface temperatures (ESR, 2009). The mapping of ocean currents was updated using yearly ESR data representing zonal current speed and direction in each AFTT OPAREA from 2022. The dataset covers global oceans at a resolution of 1/3 of a degree of latitude and longitude resampled to 1/10 of a degree for smoother appearance across the Study Area. The addition of average current speed and directions should improve the analysis of impacts on seafloor resources from military expended materials that drift.

4.2.3.2 Sea Surface Temperatures

The mapping of sea surface temperatures was from NOAA's Optimum Interpolation Sea Surface Temperature (SST) v2 dated 2016 (NCEP/NWS/NOAA, 2016). Whereas there are seasonal and long-term trends in sea surface temperature, the averaged data presented in the EIS is sufficient for the level of analysis and distribution of marine organisms. The need to update or combine overlapping datasets is therefore unnecessary.

4.2.3.3 Sediment and Water Quality Surveys

The presence of temperature zones in the water and sediment do not necessarily indicate sufficient water and sediment quality for biological resources. The mapping of water and sediment quality is from EPA's National Coastal Condition Assessment (U.S. Environmental Protection Agency, 2010) reports on point sampling as a quality indicator for biotic life (e.g., benthic macroinvertebrates, fish tissues, water chemistry, sediment toxicity). There are other sources of water quality data for the coastal and open ocean environment, but the level of information presented in the EIS is sufficient for the level of analysis. The need to combine overlapping datasets was therefore unnecessary.

4.2.3.4 Dead Zones

The mapping of dead zones (i.e., zones of low or no dissolved oxygen) in the AFTT supplemental EIS/OEIS is based on ancillary data collected by the Southeast Area Monitoring and Assessment Program (SEAMAP) Summer Shrimp/Groundfish Survey from 2001-2011 (May et al., 2012).

4.3 MANAGEMENT AREAS

The current distribution of artificial reef areas is represented by 17 state-level data sources intersecting with the Study Area. With the exception of Florida, the location of artificial reefs was represented by the designated artificial reef areas instead of a single point. Around Florida, artificial reef areas were represented either by points or "obstruction areas" on NOAA's electronic nautical charts. For the point data, the maximum permit area for artificial reef material (0.25 x 0.25 nm) was used to estimate the polygon area. The representation of artificial reefs as areas of variable size is an improvement over the Phase II and III method of applying a standard buffer around artificial reef centroids.

5 SOURCE DATA TABLES

Refer to Table 5-1 for the source data for habitat dimensions mapped in the AFTT Study Area and how the original mapping classification was translated into standard habitat categories. Refer to Table 5-2 for the source qualities supporting rank determinations (abiotic substrate polygons only).

Table 5-1. Source Data for Habitat Dimensions Mapped in the AFTT Study Area.

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
4.1.1-Biotic Features/ Vegetated Habitats	Coastal Wetlands	Line	Office of Response and Restoration-National Oceanic and Atmospheric Administration, 1996	356	Selected wetland shorelines
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2007	369	Selected wetland shorelines
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2010	370	Selected wetland shorelines
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2012	353	Selected wetland shorelines
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2013	400	Selected wetland shorelines
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2014a	371	Selected wetland shorelines
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2015	352	Selected wetland shorelines
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2015b	354	Selected wetland shorelines
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2016	422	Selected wetland shorelines
			Office of Response and Restoration-National Oceanic and	355	Selected wetland shorelines

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			Atmospheric Administration, 2016a		
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2016h	351	Selected wetland shorelines
		Polygon	Mcowen et al., 2017	277	Selected wetland shorelines
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2014a	357	Selected wetland shorelines; Mcowen et al. (2017) did not include all the wetland areas for this part of the Study Area.
			Spalding et al., 2010	278	Selected wetland shorelines
	Floating *Sargassum*	Polygon	Gower & King, 2008	305	Digitized from figure in Gower & King (2008)
	Seagrass Beds	Polygon	Albemarle Pamlico National Estuarine Program, 2015	310	None
			Barker, 2019	319	None
			Connecticut Department of Energy and Environmental Protection, 2017	317	None
			Florida Fish and Wildlife Conservation Commission & Fish and Wildlife Research Institute, 2021b	308	Created study area for mapping and combined with seagrass mapping

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			Handley, 2011	35	Included only study area for Mississippi and Alabama, where more recent data was unavailable
			Lathrop et al., 2010	28	Verified this is most up-to-date for area (November 2021)
			Maine Department of Marine Resources, 2010c	320	None
			Maine Department of Marine Resources, 2018	321	None
			Massachusetts Department of Environment Protection, 2017	318	None
			Narragansett Bay Estuarine Program, 2017	316	None
			National Park Service, 2011	313	GMFMC (2004) has greater coverage of Mississippi, but older
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2016h	347	Selected widgeon grass and seagrass beds not included in mapping of eelgrass beds covered by other sources
			Texas Parks and Wildlife Department, 2012a	245	Verified this is still current as of November 2021
			UNEP-WCMC & Short, 2021	279	Overlaps with other seagrass data sources except New York, Puerto Rico, and foriegn coastal waters
			Virginia Institute of Marine Science, 2019	314	Selected seagrass densities >0

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
4.1.2-Biotic Features/ Invertebrate Beds and Reefs	Oyster Beds/Reefs	Polygon	Anson et al., 2011	337	Included everything except the Florida dataset (already acquired with FFWC 2015).
			Chesapeake Bay Program-National Oceanic and Atmospheric Administration, 2017	388	Oyster Bed/Reef as SubClass = 'Anthropogenic_Shell_Reef' OR SubClass = 'Anthropogenic_Shell_Rubble' OR SubClass = 'Biogenic_Shell_Hash' OR SubClass = 'Biogenic_Shell_Reef' OR SubClass = 'Biogenic_Shell_Rubble'
			Florida Fish and Wildlife Conservation Commission, 2015	336	None
			Georgia Department of Natural Resources, 2015b	258	None
			Naval Facilities Engineering Command Atlantic, 2022	389	Mounds of oyster habitat digitized from satellite imagery are assumed to be hard substrate (i.e., reefs)
			North Carolina Division of Marine Fisheries, 2013	341	Selected all strata classified as, "with shell"
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2014a	312	None
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2014b	342	Used invertebrates polygon data and selected "eastern oyster"
			South Carolina Department of Natural Resources, 2016	167	None

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			University of Florida, 2016	168	None
	Shallow-water Coral Reefs	Polygon	Clark et al., 2014	406	Digitized low- and high-relief coral reefs from georeferenced figure 2.9 (updated)
			Florida Fish and Wildlife Conservation Commission and Fish and Wildlife Research Institute, 2016	191	"ClassLv4" = 'Acropora cervicornis' OR "ClassLv4" = 'Aggregate Reef' OR "ClassLv4" = 'Aggregate Reef (Inner)' OR "ClassLv4" = 'Aggregate Reef (Middle)' OR "ClassLv4" = 'Aggregate Reef (Outer)' OR "ClassLv4" = 'Aggregate Reef, Live Coral (Discontinuous)' OR "ClassLv4" = 'Aggregate Reef, Live Coral (Patchy)' OR "ClassLv4" = 'Aggregate Reef, Live Coral (Sparse)' OR "ClassLv4" = 'Aggregated Patch Reef' OR "ClassLv4" = 'Aggregated Patch Reef (Deep)' OR "ClassLv4" = 'Aggregated Patch Reef (Shallow)' OR "ClassLv4" = 'Colonized Pavement' OR "ClassLv4" = 'Colonized Pavement (Deep)' OR "ClassLv4" = 'Colonized Pavement (Shallow)' OR "ClassLv4" = 'Colonized Pavement, Live Coral' OR "ClassLv4" = 'Colonized Pavement, Live Coral (Discontinuous)' OR "ClassLv4" = 'Colonized Pavement, Live Coral (Patchy)' OR "ClassLv4" = 'Colonized Pavement, Live Coral (Sparse)' OR "ClassLv4" = 'Colonized Reef Rubble, Live Coral (Sparse)' OR "ClassLv4" = 'Deep Ridge Complex'
			Franklin et al., 2003	419	Georeferenced and digitized habitats including the term "reef" or hard substrate on Figure 6.

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			National Ocean Service, 2001	151	Select polygons with "reef" in the descriptor field
			Naval Facilities Engineering Command Atlantic, 2022b	392	Included hard substrate depicted ranked at 49 or greater and occurring within low-high suitability areas predicted in GMFMC (2021). Additional criteria included being below 30 degrees latitude and less than 52 m depth in the northwest Gulf of Mexico (Clark et al., 2014) or less than 105 m on Pulley Ridge (Reed et al., 2019) to around south Florida using bathymetry contours from GEBCO (2021) or higher resolution bathymetry from NOAA Centers for Environmental Information (2022). Northern limit of shallow water coral reefs in southeast Florida based on depiction in Walker & Gilliam (2013). Also added hard bottom on Riley's Hump based on observations documented in Weaver et al. (2006).
			UNEP-WCMC et al., 2021	280	None
	Worm Reefs	Polygon	Florida Fish and Wildlife Conservation Commission & the Nature Conservancy, 2004	262	None
4.1-Biotic Features/ Biogeographic Zones	Large Marine Ecosystems	Polygon	NOAA Fisheries, 2014	254	None
4.2.1-Physical/Abiotic Substrate	Bottom Substrate	Polygon	Anderson et al., 2010	53	Soft bottom sources added after all the hard bottom sources; Feat_name: Soft as mud or sand; Intermediate as gravel; based on usSEABED data

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			Anderson et al., 2017	303	Confidence = Mapped; Hard as Substrate = Platform Reef, Patch Reef, Oculina Banks, Hardbottom Slope, Hardbottom Pavement, Patchy Hardbottom, or Hardbottom Upper Shelf
			Anderson et al., 2017	360	Confidence = High; Hard as Substrate = Platform Reef, Patch Reef, Oculina Banks, Hardbottom Slope, Hardbottom Pavement, Patchy Hardbottom, or Hardbottom Upper Shelf
			Anderson et al., 2017	361	Confidence = Probable; Hard as Substrate = Platform Reef, Patch Reef, Oculina Banks, Hardbottom Slope, Hardbottom Pavement, Patchy Hardbottom, or Hardbottom Upper Shelf
			Anderson et al., 2017	363	Soft-intermediate bottom sources added after all the hard bottom sources; Given same rank as Anderson et al. 2010 that employed the same data source.
			Baldwin et al., 2016	204	feat_name "hard" as "sed_type" = 'Rg' OR "sed_type" = 'Rs'; feat_name "Intermediate" as "sed_type" = 'G' OR "sed_type" = 'Gr' OR "sed_type" = 'Gs'; feat_name "Soft" as (everything else)
			Barnhardt et al., 1996	71	Included only hard substrate in working mosaic to combine with very similar quality datasets (soft-intermediate bottom sources added after all the hard bottom sources); feat_name: Intermediate as "POLYTYPE" LIKE 'G%'; Soft as "POLYTYPE" LIKE 'S%' OR "POLYTYPE" LIKE 'M%'; Hard as "POLYTYPE" LIKE 'R%'
			Briere et al., 2000	227	May be superseded by C-SCAMP interpretation of overlapping data; feat_name "Hard" = Hbtmgeo.shp OR Outcrgeo.shp; "Soft" = Hsiltgeo.shp OR Lsiltgeo.shp OR "Pitsgeo.shp"; Artificial = "Mnmadgeo.shp"

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			Bureau of Ocean Energy Management, 2016a	195	Hard substrate as Legend Label = "SSS_Potential_Outcrops"; Converted line data to polygon data using 1m buffer
			Bureau of Ocean Energy Management, 2017	186	Hard and Soft substrate overlapping = intermediate; Hard substrate as hab_descr = 'anomaly_Cretaceous' OR hab_descr = 'anomaly_Cretaceous_talus' OR hab_descr = 'anomaly_salt' OR hab_descr = 'seep_anomaly_confirmed_carbonate' OR hab_descr = 'seep_anomaly_confirmed_corals' OR hab_descr = 'seep_anomaly_confirmed_hydrates' OR hab_descr = 'seep_anomaly_confirmed_organisms' OR hab_descr = 'seep_anomaly_positives' OR hab_descr = 'seep_anomaly_positives_confirmed_gas' OR hab_descr = 'seep_anomaly_positives_confirmed_oil' OR hab_descr = 'seep_anomaly_positives_possible_oil'; Soft substrate as everything else
			Bureau of Ocean Energy Management, 2019	275	Soft as "Rippled Sand" or "Rippled Sand and Pebbles" or "Megaripple Sand"
			Butman et al., 2007	232	Only mb_backpc10m.tif is georeferenced (of 4 raster files); Resampled to 100x100 pixels (cubic interpolation) and converted to polygons, then equal interval categories for soft, intermediate, and hard (matches up well with surrounding datasets); gridcodes 174-253 = hard, 95-174 = Intermediate, 0-95 = Soft; Ranked same as Valentine et al. (2005) backscatter classification.

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			Chesapeake Bay Program-National Oceanic and Atmospheric Administration, 2017	387	Soft substrate as "SubClass" = 'Fine_Unconsolidated'; Intermediate Substrate as "SubClass" = 'Biogenic_Shell_Rubble' OR "SubClass" = 'Anthropogenic_Shell_Rubble'; ,Hard Substrate as "SubClass" = 'Anthropogenic_Shell_Reef' OR "SubClass" = 'Biogenic_Shell_Reef'; Unknown substrate as "SubClass" = 'Unclassified'; Artificial Substrate as "SubClass" = 'Construction_Reef'
			Florida Fish and Wildlife Conservation Commission & Fish and Wildlife Research Institute, 2013	23	feat_name: all categories (hard coral habitat only) = Hard Substrate; FFWC-WRC (2016) replaces this data for only Florida Key area
			Florida Fish and Wildlife Conservation Commission and Fish and Wildlife Research Institute, 2016	190	feat_name "Artificial" = "Inlet Jetty" OR "Artificial"; "Hard" = Coral Reef and Hardbottom"; "Soft" = Mangrove OR Seagrass OR Unconsolidated Sediment OR Dredged/Excavated (Sand Borrow Area, Inlet Channel); "Unknown" = Unknown
			Foster et al., 2016	207	feat_name "Hard" as "sed_type" = 'R' OR "sed_type" = 'Rg' OR "sed_type" = 'Rm' OR "sed_type" = 'Rs'; feat_name "Intermediate" as "sed_type" = 'G' OR "sed_type" = 'Gr' OR "sed_type" = 'Gs'
			Franklin et al., 2003	420	Georeferenced and digitized Tortugas Bank, Little Bank, and Riley's Hump hard substrate depicted on Figure 6 of reference document; geospatial data could not be located
			Fugro Survey Limited and CSA International, 2011	11	feat_name: Soft as "Fine Sediment" Or "Coarse Sediment"; Hard as "Subcropping Rock" Or "Rock Outcrop"; Digitized substrate map showing line feature for bottom type; Converted line to polygon geometry using 10 meter buffer.

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			Gulf of Mexico Fishery Management Council, 2004	13	Included only hard substrate in working mosaic to combine with very similar quality datasets (soft-intermediate bottom sources added after all the hard bottom sources); Feat_name: Soft as [TYPE] = 'Sand' OR [TYPE] = 'Seagrass' OR [TYPE] = 'Silt' OR [TYPE] = 'Clay'; Hard as [TYPE] = 'Coral' OR [TYPE] = 'Hard Bottom' (Note: intertidal "shore" habitats not included); Overlaps with higher quality data in Florida Keys and elsewhere in the GOM
			Gulf States Marine Fisheries Commission, 2008	27	Included only hard substrate in working mosaic to combine with very similar quality datasets (soft-intermediate bottom sources added after all the hard bottom sources); Feat_name: Soft as "sediment" LIKE 'Mud%' or "sediment" LIKE 'Sand%'; Intermediate as "sediment" LIKE 'Gravel%'; Hard as "sediment" LIKE 'Rock%'
			Harris & Stokesbury, 2010	241	Included only hard substrate in working mosaic to combine with very similar quality datasets (soft-intermediate bottom sources added after all the hard bottom sources); SedDominant Raster converted to polygon; Soft substrate as Value =1-2; Intermediate substrate as Value = 3; Hard substrate as Value = 4-5
			Ilich et al., 2021	404	Supersedes interpretation of Gardner et al., 2002 (b-c) and 2003, and USGS 2005 (Pulley Ridge).
			Kendall et al., 2005	125	feat_name: Hard as "Densely colonized live bottom" or "Sparsely colonized live bottom"; Soft as "Flat Sand" or "Rippled Sand"
			Kinlan et al., 2013a	128	Used ALCY and SCLER threshold shapefile and selected FPR:FNR > 10:1
			Kinlan et al., 2013b	129	Used ALLFRAME threshold shapefile and selected FPR:FNR > 10:1; Included BOEM (2017) seismic anomalies in the modeling

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			Kinlan et al., 2013c	130	Used SCLERFRAME, ANTI, ALCY and OCULSPP threshold shapefile and selected FPR:FNR > 10:1
			McMullen et al., 2008a	224	OVERLAPPING! feat_name "Soft" as "LABEL" = 'Sandwaves' but not "LABEL" = 'Rocky'; feat_name "Intermediate" as "LABEL" = 'Modbkstr' but not "LABEL" = 'Sandwaves' OR "LABEL" = 'Benches'; feat_name "Hard" as "LABEL" = 'Highbkstr' (but not 'Sandwave') OR "LABEL" = 'Rocky'
			McMullen et al., 2008b	226	Add to working; feat_name "Soft" as "LABEL" = 'Mottled' OR "LABEL" = 'Sandwaves' OR "LABEL" = 'TrawlMark'; feat_name "Hard" as "LABEL" = 'Rocky' OR "LABEL" = 'Scarp'; feat_name "Intermediate" as "LABEL" = 'Tabular'
			McMullen et al., 2009	225	feat_name "Soft" as 'Sandwave' (but not 'Rocks') OR 'Lowbkstr'; feat_name "Intermediate" as 'Modbkstr' (but not 'Sandwave' or 'Rocks'); feat_name "Hard" as 'Rocks' or 'Highbkstr' (but not 'Sandwave')
			McMullen et al., 2010	223	feat_name "Hard" as 'Boulders'; feat_name "Soft" as 'Sandwaves'
			McMullen et al., 2011b	221	feat_name "Hard" as 'Boulders'; feat_name "Soft" as 'Sandwave'
			McMullen et al., 2012a	214	feat_name "Hard" as 'Boulders'; feat_name "Soft" as 'Sand waves'; feat_name "Artificial" as 'Wreck'
			McMullen et al., 2012b	216	feat_name "Soft" as 'Megaripples' or 'Scour depressions'; feat_name "Hard" as 'Boulders'
			McMullen et al., 2013	211	feat_name "Soft" as 'Sand ripples' or 'Scour depressions'; feat_name "Hard" as 'Boulders'

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			McMullen et al., 2014a	208	feat_name "Soft" as 'Sand waves'; feat_name "Intermediate" as 'Glaciolacustrine'; feat_name "Hard" as 'Boulders'
			McMullen et al., 2014b	209	feat_name "Soft" as 'Sand waves' or 'Scour outliers' or 'Trawl marks'; feat_name "Hard" as 'Boulders'
			McMullen et al., 2015a	205	feat_name "Soft" as 'sand waves' or 'scour depression'; feat_name "Hard" as 'rocky'; feat_name "Artificial" as 'shipwreck'
			McMullen et al., 2015b	206	feat_name "Hard" as 'Boulders' or 'Bedrock' or 'Drumlins'; feat_name "Intermediate" as 'Glaciolacustrine' or 'Cobbles'; feat_name "Soft" as 'Sand waves/megaripples' or 'Trawl marks'
			McMullen, 2007	32	feat_name: Artificial substrate as "INTERP" = 'BRIDGE' OR "INTERP" = 'PIER' OR "INTERP" = 'PIPELINE' OR "INTERP" = 'SHIPWRECK'; Hard substrate as "INTERP" = 'ROCKY' or 'HIGHBKSTR'; Intermediate as "INTERP" = 'MOTTLED' but NOT 'LOWBKSTR' or 'HIGHBKSTR'; Soft as "INTERP" = 'LOWBKSTR' and 'Depressions' but NOT 'Rocky'; Unknown substrate as "INTERP" = 'Depressions' and no other category
			Messing et al., 2011	121	feat_name: Soft as Major_Comp = "unconsolidated"; Hard as "Major_Comp" = 'Hardbottom' AND "Slope" = 'High'; Intermediate as "Major_Comp" = 'Hardbottom' AND "Slope" = 'Low'
			Moser & Taylor, 1995	33	feat_name: All polygon data was representing hard bottom
			National Ocean Service, 2001	5	feat_name: assumed reef macroalgae habitat was hard substrate and seagrass habitat was soft substrate; excluded classifications for land and intertidal; other types were classifed as unknown.

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			Naval Facilities Engineering Atlantic Command, 2022	390	Mounds of oyster habitat digitized from satellite imagery are assumed to be hard substrate (i.e., reefs)
			NOAA National Database for Deep-Sea Corals and Sponges, 2022	398	Drew polygon around buffered points within coral HAPCs of the Gulf of Mexico, based on location accuracy. Accuracies noted as ">1,000m" or "NA" were not included. Selected only polygons where other data sources indicated soft or intermediate substrate.
			North Carolina Division of Marine Fisheries, 2013	340	Intermediate Substrate as anything with shell; Soft as everything else.
			North Carolina Natural Heritage Program, 2010	329	All polygons represent hard substrate
			Nova Southeastern University, 2017	379	Hard as "GeoFormDet" = 'Pavement'; Soft as "GeoFormDet" = 'Sand'
			Pendleton et al., 2013	212	Soft substrate as "sed_type" = 'M' OR "sed_type" = 'Mg' OR "sed_type" = 'Ms' OR "sed_type" = 'S' OR "sed_type" = 'Sg' OR "sed_type" = 'Sm' OR "sed_type" = 'Sr'; Intermediate Substrate as "sed_type" = 'G' OR "sed_type" = 'Gr' OR "sed_type" = 'Gs'; Hard Substrate "sed_type" = 'Rg' OR "sed_type" = 'Rs'
			Pendleton et al., 2015	298	Hard as sed_type LIKE 'R%'; Intermediate as sed_type LIKE 'G%'; Soft as sed_type LIKE 'S%' or 'M%'
			Pendleton et al., 2019	297	Hard as Barnhardt LIKE 'R%'; Intermediate as Barnhardt LIKE 'G%'; Soft as Barnhardt LIKE 'S%' or 'M%'
			Poppe et al., 2006a	233	feat_name "Artificial" as "INTERPRET" = 'shipwreck' or 'Pipeline or Cable'; "Soft" as "INTERPRET" = 'Furrow' or 'Anchor Scar' or 'Depression'

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			Poppe et al., 2006b	234	feat_name "Soft" as "SEDCLASS" = 'CLAYEY SILT' OR "SEDCLASS" = 'SAND' OR "SEDCLASS" = 'SILTY CLAY' OR "SEDCLASS" = 'SILTY SAND'; "Intermediate' as "SEDCLASS" = 'GRAVEL' OR "SEDCLASS" = 'GRAVELLY SEDIMENT'
			Poppe et al., 2007a	229	feat_name "Soft" as Features = megaripples/sand waves; "Hard" as Features = bedrock or boulders; "Artificial" as Features = wreck or obstruction or Features = wreck; "Intermediate" as Features = 'glaciolacustrine'
			Poppe et al., 2007b	230	feat_name "Soft" as "INTERPRETA" = 'dredge spoils' OR "INTERPRETA" = 'transverse sand waves' OR "INTERPRETA" = 'barchanoid sand waves'; feat_name "Artificial" as "INTERPRETA" = 'ship wreck'
			Poppe et al., 2011a	218	feat_name "Intermediate" as "SEDENV" = 'erosion or nondeposition' or 'coarse bedload transport'; feat_name "Soft" as "SEDENV" = 'sorting and reworking'
			Poppe et al., 2011b	220	feat_name "Hard" as "SEAFLOOR" = 'Rocky'; feat_name "Soft" as "SEAFLOOR" = 'Dredge Spoils' OR "SEAFLOOR" = 'Ripples and Megaripples' OR "SEAFLOOR" = 'Sand waves'; feat_name "Artificial" as
			Poppe et al., 2012	215	feat_name "Soft" as 'Sand Waves and Megaripples'; feat_name "Intermediate" as 'Shell bed'; feat_name "Artificial" as 'Shipwreck'
			Poppe et al., 2013a	242	feat_name "Soft" as "FEATURES" = 'Dredge spoils' OR "FEATURES" = 'Megaripples' OR "FEATURES" = 'Sand waves'; feat_name "Intermediate" as "FEATURES" = 'Gravelly pavement'; feat_name "Hard" as "FEATURES" = 'Rocky'

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			Poppe et al., 2013b	213	feat_name "Hard" as 'Rocky'; feat_name "Soft" as 'Megaripples' or 'Sand waves'
			Poppe et al., 2014	217	feat_name "Soft" as 'Sand waves and megaripples' or 'Storm-Induced Scour'; feat_name "Hard" as 'Boulders'; feat_name "Artificial" as 'Shipwreck'
			Poppe, 2010	40	feat_name: Soft as "FEATURES" = 'Bedforms'; Hard as "FEATURES" = 'Boulders'; Artificial as "FEATURES" = 'Shipwreck'
			Reed et al., 2013	399	Digitized georeferenced figure in text reference; all deep-sea coral habitat was classified as "hard substrate"; based on overlap with higher quality data, delineation appears to be a combination of hard and intermediate substrate.
			Scanlon et al., 1999	56	feat_name: Intermediate as "Low relief - low backscatter"; Hard as "High relief - high backscatter" or "Low relief - high backscatter"
			Scanlon et al., 2003	43	feat_name: Hard as 0-1 (low to high-relief hard bottom); Intermediate as 2 (biogenic coarse); Soft as 3 (terrigenous fines) Note: Used data collected by Dartnell and Gardner, 1999
			Skidaway Institute of Oceanography, 2004	7	Hard as “exposed hard pavement” OR “exposed hard pavement w/ limestone base or thinly covered hard substrate – high relief” OR “exposed hard pavement w/ siltstone base” OR “algal cemented reef >3 meters high”; Intermediate as "Rock/coral rubble" OR “thinly covered hard substrate – med to low relief”; Soft as “unconsolidated sand”

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			Sowers, 2020	394	Hard substrate as "Ridge" or "Peak" or "Slope"; ROV validation found these geoforms were mostly (90-99%) live hard bottom habitat (approx. 2-7% live coral).
			Todd & Kostylev, 2011	97	feat_name: Hard as "Habitat" = 'Bedrock deep' OR "Habitat" = 'Bedrock shallow'; Intermediate as "Habitat" = 'Till deep' OR "Habitat" = 'Till shallow'; Soft as "Habitat" = 'Mud deep' OR "Habitat" = 'Mud shallow' OR "Habitat" = 'Sand deep' OR "Habitat" = 'Sand shallow'
			Todd, 2006	98	feat_name: Hard as "SURFICIAL_UNITS_BROWNS_BANK.CODE" = 'B'; Intermediate as "SURFICIAL_UNITS_BROWNS_BANK.CODE" = 'Icl' OR "SURFICIAL_UNITS_BROWNS_BANK.CODE" = 'Ict'; Soft as "SURFICIAL_UNITS_BROWNS_BANK.CODE" = 'PGssp' OR "SURFICIAL_UNITS_BROWNS_BANK.CODE" = 'Pgstk' OR "SURFICIAL_UNITS_BROWNS_BANK.CODE" = 'PGstk' OR "SURFICIAL_UNITS_BROWNS_BANK.CODE" = 'PGstn'
			U.S. Army Corp of Engineers, 2009	183	Delineations that were ground-truthed from CPE sidescans off New Topsail Inlet
			U.S. Army Corp of Engineers, 2009	200	feat_name Artificial: "Descript" = 'Pier Debris'; Hard: "Descript" = 'Possible Habitat' OR "Descript" = 'Possible Hardbottom' OR "Descript" = 'Probable Hardbottom' OR "Descript" = 'Possible Rubble' OR "Descript" = 'Probable Rubble'; 2004-2006 Data collection described in Andrews and Willson (2006).

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			U.S. Army Corp of Engineers, 2009	251	Created polygon data from original line data using 5 meter buffer; Hard as Final_HB = "FINAL HARDBOTTOM"; Associated text citation and document do not show this data! Data collection shown in AEC and CPE (2008) and Willson (2009)
			U.S. Army Corp of Engineers, 2009	377	Sidescan collected and interpreted by Mid-Atlantic Technologies and Environment Research (MATER) for cultural resources; More detailed maps from MATER shown in AEC and CPE (2008) but not provided by USACE request for data.
			U.S. Department of the Navy, 2010	8	feat_name: Soft as "SedType" = 'coarse sand' OR "SedType" = 'medium sand' OR "SedType" = 'medium sand with sandwaves' OR "SedType" = 'silt/clay/fine sand'; Intermediate as "SedType" = 'coral rubble' OR "SedType" = 'rubble' OR "SedType" = 'silt/clay/fine sand with rubble'; Hard as "SedType" = 'pavement' OR "SedType" = 'rock outcrop'
			U.S. Department of the Navy, 2011a	9	feat_name: Soft as "Interp" = 'coarse sand' OR "Interp" = 'medium sand' OR "Interp" = 'silt/clay/fine sand'; Intermediate as "Interp" = 'coral rubble' OR "Interp" = 'rubble' OR "Interp" = 'sand with rubble'; Hard as "Interp" = 'pavement' OR "Interp" = 'rock outcrop'
			U.S. Department of the Navy, 2011b	10	feat_name: Soft as "Silt/clay/fine sand" OR "Coarse sand" OR "Medium sand"; Hard as "Pavement" OR "Rock outcrop"

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			U.S. Department of the Navy, 2016zo	185	(Confidence = 5) Soft as "LABEL" = 'C Sandy Clay (Sandy Marl)' OR "LABEL" = 'C Sandy Mud' OR "LABEL" = 'C Sandy Muddy Tidal Flat' OR "LABEL" = 'C Sandy Tidal Flats' OR "LABEL" = 'C Silt' OR "LABEL" = 'C Silty Sand' OR "LABEL" = 'C Stuff Mud' OR "LABEL" = 'C Very Coarse Sand' OR "LABEL" = 'HC Clay (Marl)' OR "LABEL" = 'HC Clayey Sand' OR "LABEL" = 'HC Clayey Silt' OR "LABEL" = 'HC Coarse Sand' OR "LABEL" = 'HC Coarse Silt' OR "LABEL" = 'HC Fine Sand' OR "LABEL" = 'HC Fine Sand - Shell' OR "LABEL" = 'HC Fine Silt' OR "LABEL" = 'HC Gravelly Muddy Sand' OR "LABEL" = 'HC Gravelly Sand' OR "LABEL" = 'HC Medium Sand' OR "LABEL" = 'HC Medium Sand - Shell' OR "LABEL" = 'HC Medium Silt' OR "LABEL" = 'HC Mud' OR "LABEL" = 'HC Muddy Sand' OR "LABEL" = 'HC Sand - Mud' OR "LABEL" = 'HC Sand - Silt - Clay' OR "LABEL" = 'HC Sand - Silt - Clay - Shell' OR "LABEL" = 'HC Sandy Clay (Sandy Marl)' OR "LABEL" = 'HC Sandy Mud' OR "LABEL" = 'HC Silt' OR "LABEL" = 'HC Silt - Shell' OR "LABEL" = 'HC Silty Sand' OR "LABEL" = 'HC Very Coarse Sand' OR "LABEL" = 'HC Very Fine Sand' OR "LABEL" = 'HC Very Fine Silt' OR "LABEL" = 'HT Clay' OR "LABEL" = 'HT Clayey Silt' OR "LABEL" = 'HT Coarse Sand' OR "LABEL" = 'HT Fine Sand' OR "LABEL" = 'HT Fine Sand - Shell' OR "LABEL" = 'HT Medium Sand' OR "LABEL" = 'HT Medium Sand - Shell' OR "LABEL" = 'HT Mud' OR "LABEL" = 'HT Muddy Sand' OR "LABEL" = 'HT Sand - Mud' OR "LABEL" = 'HT Sand - Silt - Clay' OR "LABEL" = 'HT Sandy Mud' OR "LABEL" = 'HT Silty Clay' OR "LABEL" = 'HT Silty Sand' OR "LABEL" = 'HT Silt Sand - Shell' OR "LABEL" = 'HT Very Fine Sand' OR "LABEL" = 'P Clay' OR "LABEL" = 'PC Clay' OR "LABEL" = 'PC Marl' OR "LABEL" =

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
					'PC Ooze' OR "LABEL" = 'T Clay' OR "LABEL" = 'T Clay - Shell' OR "LABEL"= 'T Fine Silt' OR "LABEL" = 'T Gravelly Sandy Silt' OR "LABEL" = 'Gravelly Silt' OR "LABEL" = 'T Gravelly Silt - Shell' OR "LABEL" = 'T Medium Silt' OR "LABEL" = 'T Muddy Tidal Flats' OR "LABEL" = 'T Sand - Clay - Shell' OR "LABEL" = 'T Sand - Silt - Clay' OR "LABEL" = 'T Sandy Clay' OR "LABEL" = 'T Sandy Mud' OR "LABEL" = 'T Sandy Muddy Tidal Flats' OR "LABEL" = 'T Sandy Silt' OR "LABEL" = 'T Sandy Silt - Shell' OR "LABEL" = 'T Sandy Tidal Flats' OR "LABEL" = 'T Silt' OR "LABEL" = 'T Silty Clay' OR "LABEL" = 'T Silty Sand - Shell' OR "LABEL" = 'T Soft Mud' OR "LABEL" = 'T Very Coarse Sand' OR "LABEL" = 'T Very Fine Silt' OR "LABEL" = 'C Stiff Mud' OR "LABEL' = 'C Very Fine Sand' OR "LABEL" = 'HT Silty Sand - Shell' OR "LABEL" = 'PC Sand' OR "LABEL" = 'T Gravelly Silt'; Intermediate "LABEL" = 'C Sandy Gravel - Shell' OR "LABEL" = 'T Cobbles (Stones) - Shell' OR "LABEL" = 'T Gravel' OR "LABEL" = 'T Gravel - Sand' OR "LABEL" = 'T Gravel - Sand - Mud' OR "LABEL" = 'T Gravel - Sand - Shell' OR "LABEL" = 'T Gravel - Shell' OR "LABEL" = 'T Mud - Shell' OR "LABEL" = 'T Muddy Sandy Gravel' OR "LABEL" = 'T Pebbles - Shell' OR "LABEL" = 'T Pebbles - Shells' OR "LABEL" = 'T Sandy Gravel' OR "LABEL" = 'T Sandy Gravel - Shell' OR "LABEL" = 'T Shell' OR "LABEL" = 'T Gravelly Sand - Shell' OR "LABEL" = 'C Coral Debris' OR "LABEL" = 'C Coral Debris - Mud' OR "LABEL" = 'C Coral Debris - Mud - Shell' OR "LABEL" = 'C Coral Debris - Sand' OR "LABEL" = 'C Coral Debris - Sand - Mud' OR "LABEL" = 'C Coral Debris - Sand - Mud - Shell' OR "LABEL" = 'C Coral Debris - Sand - Shell' OR "LABEL" = 'C Coral

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
					Debris - Shell' OR "LABEL" = 'C Granules' OR "LABEL" = 'C Gravel - Sand' OR "LABEL" = 'C Gravel - Sand - Shell' OR "LABEL" = 'C Gravel - Shell' OR "LABEL" = 'C Gravel - Silty Sand' OR "Label" = 'C Gravel (Shell Detritus)' OR "LABEL" = 'C Hard Mud' OR "LABEL" = 'C Pebbles - Shell' OR "LABEL" = 'C Sandy Gravel' OR "LABEL" = 'C Shell' OR "LABEL" = 'C Silty Gravel' OR "LABEL" = 'HC Coral Debris - Sand' OR "LABEL" = 'HC Coral Debris - Sand - Mud' OR "LABEL" = 'HC Coral Debris - Sand - Mud' OR "LABEL" = 'HC Coral Debris - Sand - Shell' OR "LABEL" = 'HC Gravel - Sand' OR "LABEL" = 'HC Gravel (Shell Detritus)' OR "LABEL" = 'HC Sandy Gravel' OR "LABEL" = 'HC Shell' OR "LABEL" = 'HT Gravel - Sand' OR "LABEL" = 'HT Gravel - Sand - Mud' OR "LABEL" = 'HT Shell' OR "LABEL" = 'T Clayey Gravel' OR "LABEL" = 'T Granules' OR "LABEL" = 'T Gravel - Mud' OR "LABEL" = 'T Gravel - Silty Sand' OR "LABEL" = 'T Hard Mud' OR "LABEL" = 'T Silty Gravel' OR "LABEL" = 'T Silty Gravel - Shell'; Hard "LABEL"= 'C Rock' OR "LABEL" = 'C Rock-Gravel-Sand' OR "LABEL" = 'Rock-Sand' OR "LABEL" = 'N Hard Bottom' OR "LABEL" = 'T Rock' OR "LABEL" = 'T Rock-Gravel' OR "LABEL" = 'T Rock-Gravel-Mud' OR "LABEL" = 'T Rock-Gravel-Sand-Mud' OR "LABEL" = 'T Rock-Gravel-Sand-Shell' OR "LABEL" = 'T Rock-Sand' OR "LABEL" = 'T Rock-Sand-Mud' OR "LABEL" = 'C Rock - Gravel - Sand' OR "LABEL" = 'C Coral' OR "LABEL" = 'C Rock - Coral' OR "LABEL" = 'C Rock - Gravel - Sand - Mud' OR "LABEL" = 'C Rock - Gravel - Sand - Shell' OR "LABEL" = 'C Rock - Mud' OR "LABEL" = 'C Rock - Sand' OR "LABEL" = 'C Rock - Sand' OR "LABEL" = 'C Rock - Sand - Mud' OR "LABEL" = 'HC

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
					Coral' OR "LABEL" = 'HC Rock - Coral' OR "LABEL" = 'HT Rock' OR "LABEL" = 'HT Rock - Coral' OR "LABEL" = 'HT Rock - Gravel - Sand - Mud' OR "LABEL" = 'T Boulders' OR "LABEL" = 'T Rock - Coral' OR "LABEL" = 'T Rock - Gravel' OR "LABEL" = 'T Rock - Gravel - Sand' OR "LABEL" = 'T Rock - Gravel - Sand - Mud' OR "LABEL" = 'T Rock - Gravel - Sand - Shell' OR "LABEL" = 'T Rock - Mud' OR "LABEL" = 'T Rock - Sand' OR "LABEL" = 'T Rock - Sand - Mud'; Artificial "LABEL" = 'A Man-Made Features' OR "LABEL" = 'A Rubble
			U.S. Department of the Navy, 2016zo	187	(Confidence = 3) Soft as "LABEL" = 'C Sandy Clay (Sandy Marl)' OR "LABEL" = 'C Sandy Mud' OR "LABEL" = 'C Sandy Muddy Tidal Flat' OR "LABEL" = 'C Sandy Tidal Flats' OR "LABEL" = 'C Silt' OR "LABEL" = 'C Silty Sand' OR "LABEL" = 'C Stuff Mud' OR "LABEL" = 'C Very Coarse Sand' OR "LABEL" = 'HC Clay (Marl)' OR "LABEL" = 'HC Clayey Sand' OR "LABEL" = 'HC Clayey Silt' OR "LABEL" = 'HC Coarse Sand' OR "LABEL" = 'HC Coarse Silt' OR "LABEL" = 'HC Fine Sand' OR "LABEL" = 'HC Fine Sand - Shell' OR "LABEL" = 'HC Fine Silt' OR "LABEL" = 'HC Gravelly Muddy Sand' OR "LABEL" = 'HC Gravelly Sand' OR "LABEL" = 'HC Medium Sand' OR "LABEL" = 'HC Medium Sand - Shell' OR "LABEL" = 'HC Medium Silt' OR "LABEL" = 'HC Mud' OR "LABEL" = 'HC Muddy Sand' OR "LABEL" = 'HC Sand - Mud' OR "LABEL" = 'HC Sand - Silt - Clay' OR "LABEL" = 'HC Sand - Silt - Clay - Shell' OR "LABEL" = 'HC Sandy Clay (Sandy Marl)' OR "LABEL" = 'HC Sandy Mud' OR "LABEL" = 'HC Silt' OR "LABEL" = 'HC Silt - Shell' OR "LABEL" = 'HC Silty Sand' OR "LABEL" = 'HC Very Coarse Sand' OR "LABEL" = 'HC Very Fine

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
					Sand' OR "LABEL" = 'HC Very Fine Silt' OR "LABEL" = 'HT Clay' OR "LABEL" = 'HT Clayey Silt' OR "LABEL" = 'HT Coarse Sand' OR "LABEL" = 'HT Fine Sand' OR "LABEL" = 'HT Fine Sand - Shell' OR "LABEL" = 'HT Medium Sand' OR "LABEL" = 'HT Medium Sand - Shell' OR "LABEL" = 'HT Mud' OR "LABEL" = 'HT Muddy Sand' OR "LABEL" = 'HT Sand - Mud' OR "LABEL" = 'HT Sand - Silt - Clay' OR "LABEL" = 'HT Sandy Mud' OR "LABEL" = 'HT Silty Clay' OR "LABEL" = 'HT Silty Sand' OR "LABEL" = 'HT Silt Sand - Shell' OR "LABEL" = 'HT Very Fine Sand' OR "LABEL" = 'P Clay' OR "LABEL" = 'PC Clay' OR "LABEL" = 'PC Marl' OR "LABEL" = 'PC Ooze' OR "LABEL" = 'T Clay' OR "LABEL" = 'T Clay - Shell' OR "LABEL"= 'T Fine Silt' OR "LABEL" = 'T Gravelly Sandy Silt' OR "LABEL" = 'Gravelly Silt' OR "LABEL" = 'T Gravelly Silt - Shell' OR "LABEL" = 'T Medium Silt' OR "LABEL" = 'T Muddy Tidal Flats' OR "LABEL" = 'T Sand - Clay - Shell' OR "LABEL" = 'T Sand - Silt - Clay' OR "LABEL" = 'T Sandy Clay' OR "LABEL" = 'T Sandy Mud' OR "LABEL" = 'T Sandy Muddy Tidal Flats' OR "LABEL" = 'T Sandy Silt' OR "LABEL" = 'T Sandy Silt - Shell' OR "LABEL" = 'T Sandy Tidal Flats' OR "LABEL" = 'T Silt' OR "LABEL" = 'T Silty Clay' OR "LABEL" = 'T Silty Sand - Shell' OR "LABEL" = 'T Soft Mud' OR "LABEL" = 'T Very Coarse Sand' OR "LABEL" = 'T Very Fine Silt' OR "LABEL" = 'C Stiff Mud' OR "LABEL' = 'C Very Fine Sand' OR "LABEL" = 'HT Silty Sand - Shell' OR "LABEL" = 'PC Sand' OR "LABEL" = 'T Gravelly Silt'; Intermediate "LABEL" = 'C Sandy Gravel - Shell' OR "LABEL" = 'T Cobbles (Stones) - Shell' OR "LABEL" = 'T Gravel' OR "LABEL" = 'T Gravel - Sand' OR "LABEL" = 'T Gravel - Sand - Mud' OR

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
					"LABEL" = 'T Gravel - Sand - Shell' OR "LABEL" = 'T Gravel - Shell' OR "LABEL" = 'T Mud - Shell' OR "LABEL" = 'T Muddy Sandy Gravel' OR "LABEL" = 'T Pebbles - Shell' OR "LABEL" = 'T Pebbles - Shells' OR "LABEL" = 'T Sandy Gravel' OR "LABEL" = 'T Sandy Gravel - Shell' OR "LABEL" = 'T Shell' OR "LABEL" = 'T Gravelly Sand - Shell' OR "LABEL" = 'C Coral Debris' OR "LABEL" = 'C Coral Debris - Mud' OR "LABEL" = 'C Coral Debris - Mud - Shell' OR "LABEL" = 'C Coral Debris - Sand' OR "LABEL" = 'C Coral Debris - Sand - Mud' OR "LABEL" = 'C Coral Debris - Sand - Mud - Shell' OR "LABEL" = 'C Coral Debris - Sand - Shell' OR "LABEL" = 'C Coral Debris - Shell' OR "LABEL" = 'C Granules' OR "LABEL" = 'C Gravel - Sand' OR "LABEL" = 'C Gravel - Sand - Shell' OR "LABEL" = 'C Gravel - Shell' OR "LABEL" = 'C Gravel - Silty Sand' OR "Label" = 'C Gravel (Shell Detritus)' OR "LABEL" = 'C Hard Mud' OR "LABEL" = 'C Pebbles - Shell' OR "LABEL" = 'C Sandy Gravel' OR "LABEL" = 'C Shell' OR "LABEL" = 'C Silty Gravel' OR "LABEL" = 'HC Coral Debris - Sand' OR "LABEL" = 'HC Coral Debris - Sand - Mud' OR "LABEL" = 'HC Coral Debris - Sand - Mud' OR "LABEL" = 'HC Coral Debris - Sand - Shell' OR "LABEL" = 'HC Gravel - Sand' OR "LABEL" = 'HC Gravel (Shell Detritus)' OR "LABEL" = 'HC Sandy Gravel' OR "LABEL" = 'HC Shell' OR "LABEL" = 'HT Gravel - Sand' OR "LABEL" = 'HT Gravel - Sand - Mud' OR "LABEL" = 'HT Shell' OR "LABEL" = 'T Clayey Gravel' OR "LABEL" = 'T Granules' OR "LABEL" = 'T Gravel - Mud' OR "LABEL" = 'T Gravel - Silty Sand' OR "LABEL" = 'T Hard Mud' OR "LABEL" = 'T Silty Gravel' OR "LABEL" = 'T Silty Gravel - Shell';

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
					Hard "LABEL"= 'C Rock' OR "LABEL" = 'C Rock-Gravel-Sand' OR "LABEL" = 'Rock-Sand' OR "LABEL" = 'N Hard Bottom' OR "LABEL" = 'T Rock' OR "LABEL" = 'T Rock-Gravel' OR "LABEL" = 'T Rock-Gravel-Mud' OR "LABEL" = 'T Rock-Gravel-Sand-Mud' OR "LABEL" = 'T Rock-Gravel-Sand-Shell' OR "LABEL" = 'T Rock-Sand' OR "LABEL" = 'T Rock-Sand-Mud' OR "LABEL" = 'C Rock - Gravel - Sand' OR "LABEL" = 'C Coral' OR "LABEL" = 'C Rock - Coral' OR "LABEL" = 'C Rock - Gravel - Sand - Mud' OR "LABEL" = 'C Rock - Gravel - Sand - Shell' OR "LABEL" = 'C Rock - Mud' OR "LABEL" = 'C Rock - Sand' OR "LABEL" = 'C Rock - Sand' OR "LABEL" = 'C Rock - Sand - Mud' OR "LABEL" = 'HC Coral' OR "LABEL" = 'HC Rock - Coral' OR "LABEL" = 'HT Rock' OR "LABEL" = 'HT Rock - Coral' OR "LABEL" = 'HT Rock - Gravel - Sand - Mud' OR "LABEL" = 'T Boulders' OR "LABEL" = 'T Rock - Coral' OR "LABEL" = 'T Rock - Gravel' OR "LABEL" = 'T Rock - Gravel - Sand' OR "LABEL" = 'T Rock - Gravel - Sand - Mud' OR "LABEL" = 'T Rock - Gravel - Sand - Shell' OR "LABEL" = 'T Rock - Mud' OR "LABEL" = 'T Rock - Sand' OR "LABEL" = 'T Rock - Sand - Mud'; Artificial "LABEL" = 'A Man-Made Features' OR "LABEL" = 'A Rubble
			U.S. Department of the Navy, 2016zo	188	(Confidence = 4) Soft as "LABEL" = 'C Sandy Clay (Sandy Marl)' OR "LABEL" = 'C Sandy Mud' OR "LABEL" = 'C Sandy Muddy Tidal Flat' OR "LABEL" = 'C Sandy Tidal Flats' OR "LABEL" = 'C Silt' OR "LABEL" = 'C Silty Sand' OR "LABEL" = 'C Stuff Mud' OR "LABEL" = 'C Very Coarse Sand' OR "LABEL" = 'HC Clay (Marl)' OR "LABEL" = 'HC Clayey Sand' OR "LABEL" = 'HC Clayey Silt' OR "LABEL" = 'HC Coarse Sand' OR "LABEL" = 'HC

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
					Coarse Silt' OR "LABEL" = 'HC Fine Sand' OR "LABEL" = 'HC Fine Sand - Shell' OR "LABEL" = 'HC Fine Silt' OR "LABEL" = 'HC Gravelly Muddy Sand' OR "LABEL" = 'HC Gravelly Sand' OR "LABEL" = 'HC Medium Sand' OR "LABEL" = 'HC Medium Sand - Shell' OR "LABEL" = 'HC Medium Silt' OR "LABEL" = 'HC Mud' OR "LABEL" = 'HC Muddy Sand' OR "LABEL" = 'HC Sand - Mud' OR "LABEL" = 'HC Sand - Silt - Clay' OR "LABEL" = 'HC Sand - Silt - Clay - Shell' OR "LABEL" = 'HC Sandy Clay (Sandy Marl)' OR "LABEL" = 'HC Sandy Mud' OR "LABEL" = 'HC Silt' OR "LABEL" = 'HC Silt - Shell' OR "LABEL" = 'HC Silty Sand' OR "LABEL" = 'HC Very Coarse Sand' OR "LABEL" = 'HC Very Fine Sand' OR "LABEL" = 'HC Very Fine Silt' OR "LABEL" = 'HT Clay' OR "LABEL" = 'HT Clayey Silt' OR "LABEL" = 'HT Coarse Sand' OR "LABEL" = 'HT Fine Sand' OR "LABEL" = 'HT Fine Sand - Shell' OR "LABEL" = 'HT Medium Sand' OR "LABEL" = 'HT Medium Sand - Shell' OR "LABEL" = 'HT Mud' OR "LABEL" = 'HT Muddy Sand' OR "LABEL" = 'HT Sand - Mud' OR "LABEL" = 'HT Sand - Silt - Clay' OR "LABEL" = 'HT Sandy Mud' OR "LABEL" = 'HT Silty Clay' OR "LABEL" = 'HT Silty Sand' OR "LABEL" = 'HT Silt Sand - Shell' OR "LABEL" = 'HT Very Fine Sand' OR "LABEL" = 'P Clay' OR "LABEL" = 'PC Clay' OR "LABEL" = 'PC Marl' OR "LABEL" = 'PC Ooze' OR "LABEL" = 'T Clay' OR "LABEL" = 'T Clay - Shell' OR "LABEL"= 'T Fine Silt' OR "LABEL" = 'T Gravelly Sandy Silt' OR "LABEL" = 'Gravelly Silt' OR "LABEL" = 'T Gravelly Silt - Shell' OR "LABEL" = 'T Medium Silt' OR "LABEL" = 'T Muddy Tidal Flats' OR "LABEL" = 'T Sand - Clay - Shell' OR "LABEL" = 'T Sand - Silt - Clay' OR "LABEL" = 'T Sandy Clay' OR "LABEL" = 'T Sandy Mud' OR "LABEL" = 'T Sandy Muddy Tidal Flats' OR "LABEL"

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
					= 'T Sandy Silt' OR "LABEL" = 'T Sandy Silt - Shell' OR "LABEL" = 'T Sandy Tidal Flats' OR "LABEL" = 'T Silt' OR "LABEL" = 'T Silty Clay' OR "LABEL" = 'T Silty Sand - Shell' OR "LABEL" = 'T Soft Mud' OR "LABEL" = 'T Very Coarse Sand' OR "LABEL" = 'T Very Fine Silt' OR "LABEL" = 'C Stiff Mud' OR "LABEL' = 'C Very Fine Sand' OR "LABEL" = 'HT Silty Sand - Shell' OR "LABEL" = 'PC Sand' OR "LABEL" = 'T Gravelly Silt'; Intermediate "LABEL" = 'C Sandy Gravel - Shell' OR "LABEL" = 'T Cobbles (Stones) - Shell' OR "LABEL" = 'T Gravel' OR "LABEL" = 'T Gravel - Sand' OR "LABEL" = 'T Gravel - Sand - Mud' OR "LABEL" = 'T Gravel - Sand - Shell' OR "LABEL" = 'T Gravel - Shell' OR "LABEL" = 'T Mud - Shell' OR "LABEL" = 'T Muddy Sandy Gravel' OR "LABEL" = 'T Pebbles - Shell' OR "LABEL" = 'T Pebbles - Shells' OR "LABEL" = 'T Sandy Gravel' OR "LABEL" = 'T Sandy Gravel - Shell' OR "LABEL" = 'T Shell' OR "LABEL" = 'T Gravelly Sand - Shell' OR "LABEL" = 'C Coral Debris' OR "LABEL" = 'C Coral Debris - Mud' OR "LABEL" = 'C Coral Debris - Mud - Shell' OR "LABEL" = 'C Coral Debris - Sand' OR "LABEL" = 'C Coral Debris - Sand - Mud' OR "LABEL" = 'C Coral Debris - Sand - Mud - Shell' OR "LABEL" = 'C Coral Debris - Sand - Shell' OR "LABEL" = 'C Coral Debris - Shell' OR "LABEL" = 'C Granules' OR "LABEL" = 'C Gravel - Sand' OR "LABEL" = 'C Gravel - Sand - Shell' OR "LABEL" = 'C Gravel - Shell' OR "LABEL" = 'C Gravel - Silty Sand' OR "Label" = 'C Gravel (Shell Detritus)' OR "LABEL" = 'C Hard Mud' OR "LABEL" = 'C Pebbles - Shell' OR "LABEL" = 'C Sandy Gravel' OR "LABEL" = 'C Shell' OR "LABEL" = 'C Silty Gravel' OR "LABEL" = 'HC Coral Debris - Sand' OR "LABEL" = 'HC Coral

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
					Debris - Sand - Mud' OR "LABEL" = 'HC Coral Debris - Sand - Mud' OR "LABEL" = 'HC Coral Debris - Sand - Shell' OR "LABEL" = 'HC Gravel - Sand' OR "LABEL" = 'HC Gravel (Shell Detritus)' OR "LABEL" = 'HC Sandy Gravel' OR "LABEL" = 'HC Shell' OR "LABEL" = 'HT Gravel - Sand' OR "LABEL" = 'HT Gravel - Sand - Mud' OR "LABEL" = 'HT Shell' OR "LABEL" = 'T Clayey Gravel' OR "LABEL" = 'T Granules' OR "LABEL" = 'T Gravel - Mud' OR "LABEL" = 'T Gravel - Silty Sand' OR "LABEL" = 'T Hard Mud' OR "LABEL" = 'T Silty Gravel' OR "LABEL" = 'T Silty Gravel - Shell'; Hard "LABEL"= 'C Rock' OR "LABEL" = 'C Rock-Gravel-Sand' OR "LABEL" = 'Rock-Sand' OR "LABEL" = 'N Hard Bottom' OR "LABEL" = 'T Rock' OR "LABEL" = 'T Rock-Gravel' OR "LABEL" = 'T Rock-Gravel-Mud' OR "LABEL" = 'T Rock-Gravel-Sand-Mud' OR "LABEL" = 'T Rock-Gravel-Sand-Shell' OR "LABEL" = 'T Rock-Sand' OR "LABEL" = 'T Rock-Sand-Mud' OR "LABEL" = 'C Rock - Gravel - Sand' OR "LABEL" = 'C Coral' OR "LABEL" = 'C Rock - Coral' OR "LABEL" = 'C Rock - Gravel - Sand - Mud' OR "LABEL" = 'C Rock - Gravel - Sand - Shell' OR "LABEL" = 'C Rock - Mud' OR "LABEL" = 'C Rock - Sand' OR "LABEL" = 'C Rock - Sand' OR "LABEL" = 'C Rock - Sand - Mud' OR "LABEL" = 'HC Coral' OR "LABEL" = 'HC Rock - Coral' OR "LABEL" = 'HT Rock' OR "LABEL" = 'HT Rock - Coral' OR "LABEL" = 'HT Rock - Gravel - Sand - Mud' OR "LABEL" = 'T Boulders' OR "LABEL" = 'T Rock - Coral' OR "LABEL" = 'T Rock - Gravel' OR "LABEL" = 'T Rock - Gravel - Sand' OR "LABEL" = 'T Rock - Gravel - Sand - Mud' OR "LABEL" = 'T Rock - Gravel - Sand - Shell' OR "LABEL" = 'T Rock - Mud'

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
					OR "LABEL" = 'T Rock - Sand' OR "LABEL" = 'T Rock - Sand - Mud'; Artificial "LABEL" = 'A Man-Made Features' OR "LABEL" = 'A Rubble'
			U.S. Department of the Navy, 2016zo	194	(Confidence = 2) Soft as "LABEL" = 'C Sandy Clay (Sandy Marl)' OR "LABEL" = 'C Sandy Mud' OR "LABEL" = 'C Sandy Muddy Tidal Flat' OR "LABEL" = 'C Sandy Tidal Flats' OR "LABEL" = 'C Silt' OR "LABEL" = 'C Silty Sand' OR "LABEL" = 'C Stuff Mud' OR "LABEL" = 'C Very Coarse Sand' OR "LABEL" = 'HC Clay (Marl)' OR "LABEL" = 'HC Clayey Sand' OR "LABEL" = 'HC Clayey Silt' OR "LABEL" = 'HC Coarse Sand' OR "LABEL" = 'HC Coarse Silt' OR "LABEL" = 'HC Fine Sand' OR "LABEL" = 'HC Fine Sand - Shell' OR "LABEL" = 'HC Fine Silt' OR "LABEL" = 'HC Gravelly Muddy Sand' OR "LABEL" = 'HC Gravelly Sand' OR "LABEL" = 'HC Medium Sand' OR "LABEL" = 'HC Medium Sand - Shell' OR "LABEL" = 'HC Medium Silt' OR "LABEL" = 'HC Mud' OR "LABEL" = 'HC Muddy Sand' OR "LABEL" = 'HC Sand - Mud' OR "LABEL" = 'HC Sand - Silt - Clay' OR "LABEL" = 'HC Sand - Silt - Clay - Shell' OR "LABEL" = 'HC Sandy Clay (Sandy Marl)' OR "LABEL" = 'HC Sandy Mud' OR "LABEL" = 'HC Silt' OR "LABEL" = 'HC Silt - Shell' OR "LABEL" = 'HC Silty Sand' OR "LABEL" = 'HC Very Coarse Sand' OR "LABEL" = 'HC Very Fine Sand' OR "LABEL" = 'HC Very Fine Silt' OR "LABEL" = 'HT Clay' OR "LABEL" = 'HT Clayey Silt' OR "LABEL" = 'HT Coarse Sand' OR "LABEL" = 'HT Fine Sand' OR "LABEL" = 'HT Fine Sand - Shell' OR "LABEL" = 'HT Medium Sand' OR "LABEL" = 'HT Medium Sand - Shell' OR "LABEL" = 'HT Mud' OR "LABEL" = 'HT Muddy Sand' OR "LABEL" = 'HT

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
					Sand - Mud' OR "LABEL" = 'HT Sand - Silt - Clay' OR "LABEL" = 'HT Sandy Mud' OR "LABEL" = 'HT Silty Clay' OR "LABEL" = 'HT Silty Sand' OR "LABEL" = 'HT Silt Sand - Shell' OR "LABEL" = 'HT Very Fine Sand' OR "LABEL" = 'P Clay' OR "LABEL" = 'PC Clay' OR "LABEL" = 'PC Marl' OR "LABEL" = 'PC Ooze' OR "LABEL" = 'T Clay' OR "LABEL" = 'T Clay - Shell' OR "LABEL"= 'T Fine Silt' OR "LABEL" = 'T Gravelly Sandy Silt' OR "LABEL" = 'Gravelly Silt' OR "LABEL" = 'T Gravelly Silt - Shell' OR "LABEL" = 'T Medium Silt' OR "LABEL" = 'T Muddy Tidal Flats' OR "LABEL" = 'T Sand - Clay - Shell' OR "LABEL" = 'T Sand - Silt - Clay' OR "LABEL" = 'T Sandy Clay' OR "LABEL" = 'T Sandy Mud' OR "LABEL" = 'T Sandy Muddy Tidal Flats' OR "LABEL" = 'T Sandy Silt' OR "LABEL" = 'T Sandy Silt - Shell' OR "LABEL" = 'T Sandy Tidal Flats' OR "LABEL" = 'T Silt' OR "LABEL" = 'T Silty Clay' OR "LABEL" = 'T Silty Sand - Shell' OR "LABEL" = 'T Soft Mud' OR "LABEL" = 'T Very Coarse Sand' OR "LABEL" = 'T Very Fine Silt' OR "LABEL" = 'C Stiff Mud' OR "LABEL' = 'C Very Fine Sand' OR "LABEL" = 'HT Silty Sand - Shell' OR "LABEL" = 'PC Sand' OR "LABEL" = 'T Gravelly Silt'; Intermediate "LABEL" = 'C Sandy Gravel - Shell' OR "LABEL" = 'T Cobbles (Stones) - Shell' OR "LABEL" = 'T Gravel' OR "LABEL" = 'T Gravel - Sand' OR "LABEL" = 'T Gravel - Sand - Mud' OR "LABEL" = 'T Gravel - Sand - Shell' OR "LABEL" = 'T Gravel - Shell' OR "LABEL" = 'T Mud - Shell' OR "LABEL" = 'T Muddy Sandy Gravel' OR "LABEL" = 'T Pebbles - Shell' OR "LABEL" = 'T Pebbles - Shells' OR "LABEL" = 'T Sandy Gravel' OR "LABEL" = 'T Sandy Gravel - Shell' OR "LABEL" = 'T Shell' OR "LABEL" = 'T Gravelly Sand - Shell' OR "LABEL"

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
					= 'C Coral Debris' OR "LABEL" = 'C Coral Debris - Mud' OR "LABEL" = 'C Coral Debris - Mud - Shell' OR "LABEL" = 'C Coral Debris - Sand' OR "LABEL" = 'C Coral Debris - Sand - Mud' OR "LABEL" = 'C Coral Debris - Sand - Mud - Shell' OR "LABEL" = 'C Coral Debris - Sand - Shell' OR "LABEL" = 'C Coral Debris - Shell' OR "LABEL" = 'C Granules' OR "LABEL" = 'C Gravel - Sand' OR "LABEL" = 'C Gravel - Sand - Shell' OR "LABEL" = 'C Gravel - Shell' OR "LABEL" = 'C Gravel - Silty Sand' OR "Label" = 'C Gravel (Shell Detritus)' OR "LABEL" = 'C Hard Mud' OR "LABEL" = 'C Pebbles - Shell' OR "LABEL" = 'C Sandy Gravel' OR "LABEL" = 'C Shell' OR "LABEL" = 'C Silty Gravel' OR "LABEL" = 'HC Coral Debris - Sand' OR "LABEL" = 'HC Coral Debris - Sand - Mud' OR "LABEL" = 'HC Coral Debris - Sand - Mud' OR "LABEL" = 'HC Coral Debris - Sand - Shell' OR "LABEL" = 'HC Gravel - Sand' OR "LABEL" = 'HC Gravel (Shell Detritus)' OR "LABEL" = 'HC Sandy Gravel' OR "LABEL" = 'HC Shell' OR "LABEL" = 'HT Gravel - Sand' OR "LABEL" = 'HT Gravel - Sand - Mud' OR "LABEL" = 'HT Shell' OR "LABEL" = 'T Clayey Gravel' OR "LABEL" = 'T Granules' OR "LABEL" = 'T Gravel - Mud' OR "LABEL" = 'T Gravel - Silty Sand' OR "LABEL" = 'T Hard Mud' OR "LABEL" = 'T Silty Gravel' OR "LABEL" = 'T Silty Gravel - Shell'; Hard "LABEL"= 'C Rock' OR "LABEL" = 'C Rock-Gravel-Sand' OR "LABEL" = 'Rock-Sand' OR "LABEL" = 'N Hard Bottom' OR "LABEL" = 'T Rock' OR "LABEL" = 'T Rock-Gravel' OR "LABEL" = 'T Rock-Gravel-Mud' OR "LABEL" = 'T Rock-Gravel-Sand-Mud' OR "LABEL" = 'T Rock-Gravel-Sand-Shell' OR "LABEL" = 'T Rock-Sand' OR "LABEL" = 'T Rock-Sand-Mud' OR "LABEL" = 'C Rock - Gravel -

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
					Sand' OR "LABEL" = 'C Coral' OR "LABEL" = 'C Rock - Coral' OR "LABEL" = 'C Rock - Gravel - Sand - Mud' OR "LABEL" = 'C Rock - Gravel - Sand - Shell' OR "LABEL" = 'C Rock - Mud' OR "LABEL" = 'C Rock - Sand' OR "LABEL" = 'C Rock - Sand' OR "LABEL" = 'C Rock - Sand - Mud' OR "LABEL" = 'HC Coral' OR "LABEL" = 'HC Rock - Coral' OR "LABEL" = 'HT Rock' OR "LABEL" = 'HT Rock - Coral' OR "LABEL" = 'HT Rock - Gravel - Sand - Mud' OR "LABEL" = 'T Boulders' OR "LABEL" = 'T Rock - Coral' OR "LABEL" = 'T Rock - Gravel' OR "LABEL" = 'T Rock - Gravel - Sand' OR "LABEL" = 'T Rock - Gravel - Sand - Mud' OR "LABEL" = 'T Rock - Gravel - Sand - Shell' OR "LABEL" = 'T Rock - Mud' OR "LABEL" = 'T Rock - Sand' OR "LABEL" = 'T Rock - Sand - Mud'; Artificial "LABEL" = 'A Man-Made Features' OR "LABEL" = 'A Rubble'
			U.S. Department of the Navy, 2022	382	(Confidence Level = 5; Fair quality; Charts and maps); Included only hard substrate in working mosaic to combine with very similar quality datasets (soft-intermediate bottom sources added after all the hard bottom sources); Hard Substrate = Rock, Rough Rock, Cobble; Intermediate = Gravel, Muddy Gravel, Muddy Sandy Gravel, Pebble, Sandy Gravel; Soft = Clayey Sand, Clayey Silt, Coarse Sand, Coarse Silt, Fine Sand, Fine Silt, Gravelly Mud, Gravelly Muddy Sand, Gravelly Sand, Medium Sand, Medium Silt, Medium Sand, Sand, Sand-Silt-Clay, Sandy Clay, Sandy Mud, Sandy Silt, Silt, Silty Clay, Silty Sand, Very Coarse Sand, Very Fine Sand, Very Fine Silt; Unknown Substrate = NO DATA

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			U.S. Department of the Navy, 2022	383	(Confidence Level = 4; Moderate quality; Minimal bottom samples, literature, charts); Included only hard substrate in working mosaic to combine with very similar quality datasets (soft-intermediate bottom sources added after all the hard bottom sources); Hard Substrate = Rock, Rough Rock, Cobble; Intermediate = Gravel, Muddy Gravel, Muddy Sandy Gravel, Pebble, Sandy Gravel; Soft = Clayey Sand, Clayey Silt, Coarse Sand, Coarse Silt, Fine Sand, Fine Silt, Gravelly Mud, Gravelly Muddy Sand, Gravelly Sand, Medium Sand, Medium Silt, Medium Sand, Sand, Sand-Silt-Clay, Sandy Clay, Sandy Mud, Sandy Silt, Silt, Silty Clay, Silty Sand, Very Coarse Sand, Very Fine Sand, Very Fine Silt; Unknown Substrate = NO DATA
			U.S. Department of the Navy, 2022	384	(Confidence Level = 3; Good quality; Abundant bottom samples, literature, charts); Included only hard substrate in working mosaic to combine with very similar quality datasets (soft-intermediate bottom sources added after all the hard bottom sources); Hard Substrate = Rock, Rough Rock, Cobble; Intermediate = Gravel, Muddy Gravel, Muddy Sandy Gravel, Pebble, Sandy Gravel; Soft = Clayey Sand, Clayey Silt, Coarse Sand, Coarse Silt, Fine Sand, Fine Silt, Gravelly Mud, Gravelly Muddy Sand, Gravelly Sand, Medium Sand, Medium Silt, Medium Sand, Sand, Sand-Silt-Clay, Sandy Clay, Sandy Mud, Sandy Silt, Silt, Silty Clay, Silty Sand, Very Coarse Sand, Very Fine Sand, Very Fine Silt; Unknown Substrate = NO DATA

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			U.S. Geological Survey & S.C. Sea Grant Consortium, 2007	70	feat_name: Soft as "Name" = 'Inlet-Associated Shoal' OR "Name" = 'Shore-Detached Shoal' OR "Name" = 'Mixed'; Intermediate as "Name" = 'Hardground'
			U.S. Geological Survey, 2005	199	feat_name: Soft as "INTERP" = 'low-backscatter' OR "INTERP" = 'mottled-low' OR "INTERP" = 'depression-large'; Intermediate as "INTERP" = 'mod-backscatter' OR "INTERP" = 'mottled-mod'; Hard as "INTERP" = 'high-backscatter' OR "INTERP" = 'terraces' OR "INTERP" = 'broad lines"
			UNEP-WCMC et al., 2021	378	All shallow-water coral reef = hard substrate
			Valentine, 2005	202	This data set contains the locations of boulder ridges greater than or equal to 1 meter in height in the Stellwagen Bank National Marine Sanctuary Region off Boston, Massachusetts, an area of approximately 1100 nautical square miles.
			Walker et al., 2006	122	feat_name: Intermediate as "Spoil area"
			Ward et al., 2021	391	Hard substrate as "SC_GROUP" = 'BR' OR "SC_GROUP" = 'Cobble Boulder Megaclast Plain'; Intermediate substrate as "SC_GROUP" = 'Gravel' OR "SC_GROUP" = 'Gravel Mixes' OR "SC_GROUP" = 'Gravel Mixes to Gravel' OR "SC_GROUP" = 'Gravel Mixes to Gravel_Unverified' OR "SC_GROUP" = 'Gravel Mixes_Unverified' OR "SC_GROUP" = 'Gravel_Unverified' OR "SC_GROUP" = 'Gravelly' OR "SC_GROUP" = 'Gravelly_Unverified'; Soft substrate as "SC_GROUP" = 'Mud' OR "SC_GROUP" = 'Mud_Unverified' OR "SC_GROUP" = 'muddy Sand' OR "SC_GROUP" = 'muddy Sand_Unverified' OR "SC_GROUP" = 'Sand' OR "SC_GROUP" = 'Sand_Unverified' OR

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
					"SC_GROUP" = 'sandy Mud' OR "SC_GROUP" = 'sandy Mud_Unverified' OR "SC_GROUP" = 'Slightly Gravelly' OR "SC_GROUP" = 'Slightly Gravelly_Unverified'
			Willson, 2009	376	Digitized from 3-point georeferenced Figure 12 in reference document; Hard substrate as "Limestone Outcrop"; Intermediate as "Silt/Siltstone" or "Shelly Sand" or "Gravel"; Soft as "Sand" or "Muddy Sand"
	Oil and Gas Platforms	Point	Bureau of Ocean Energy Management, 2021a	338	Included only platforms that have NOT been removed
	Seafloor Pipeline	Line	Bureau of Ocean Energy Management, 2021b	339	None
	Shipwrecks	Point	Berg & Berg, 1989	113	Mapped points representing shipwreck centroids
			Cerame Vivas, 1988	114	Mapped points representing shipwreck centroids
			Handler, 2001	115	Mapped points representing artificial reef or shipwreck centroids
			National Oceanic and Atmospheric Administration, 2018	261	None
			NOAA Fisheries Greater Atlantic Regional Fisheries Office, 2020	343	None
			NRHP, 2017	260	Location of NRHP shipwrecks, some address restricted.
			Simonsen, 2000	116	Mapped points representing artificial reef or shipwreck centroids
			U.S. Department of the Navy, 2002	132	Mapped points representing SINKEX vessel remains around Puerto Rico
			Veridian Corporation, 2001	117	Mapped points representing shipwreck centroids; does not represent a global database
			War Grave, no date	189	NRHP datasets

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			Waterproof Charts Inc., 1998	118	Mapped points representing shipwreck centroids
	Shoreline	Line	Office of Response and Restoration-National Oceanic and Atmospheric Administration, 1996	169	Artificial structures = solid, manmade structures; Artificial substrate = riprap; Soft Substrate = sand, sand/gravel mix, tidal flats, or vegetated; Intermediate Substrate = gravel or hard clay; Hard Substrate = cobble/boulder, rocky or bedrock
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2007	368	Artificial as solid, manmade structures or riprap; Hard as cobble/boulder or rocky or bedrock; Intermediate as gravel or hard clay; Soft as sand, sand/gravel mix, tidal flats, or vegetated.
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2010	367	Artificial as solid, manmade structures or riprap; Hard as cobble/boulder or rocky or bedrock; Intermediate as gravel or hard clay; Soft as sand, sand/gravel mix, tidal flats, or vegetated.
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2012	283	Artificial structures = solid, manmade structures; Artificial substrate = riprap; Soft Substrate = sand, sand/gravel mix, tidal flats, or vegetated; Intermediate Substrate = gravel or hard clay; Hard Substrate = cobble/boulder, rocky or bedrock
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2013	401	Artificial as solid, manmade structures or riprap; Hard as cobble/boulder or rocky or bedrock; Intermediate as gravel or hard clay; Soft as sand, sand/gravel mix, tidal flats, or vegetated.
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2014a	366	Artificial as solid, manmade structures or riprap; Hard as cobble/boulder or rocky or bedrock; Intermediate as gravel or hard clay; Soft as sand, sand/gravel mix, tidal flats, or vegetated.

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2015	165	Artificial structures = solid, manmade structures; Artificial substrate = riprap; Soft Substrate = sand, sand/gravel mix, tidal flats, or vegetated; Intermediate Substrate = gravel or hard clay; Hard Substrate = cobble/boulder, rocky or bedrock
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2015b	284	Artificial structures = solid, manmade structures; Artificial substrate = riprap; Soft Substrate = sand, sand/gravel mix, tidal flats, or vegetated; Intermediate Substrate = gravel or hard clay; Hard Substrate = cobble/boulder, rocky or bedrock
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2016	421	Artificial structures = solid, manmade structures; Artificial substrate = riprap; Soft Substrate = sand, sand/gravel mix, tidal flats, or vegetated; Intermediate Substrate = gravel or hard clay; Hard Substrate = cobble/boulder, rocky or bedrock
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2016a	348	Artificial structures = solid, manmade structures; Artificial substrate = riprap; Soft Substrate = sand, sand/gravel mix, tidal flats, or vegetated; Intermediate Substrate = gravel or hard clay; Hard Substrate = cobble/boulder, rocky or bedrock
			Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2016h	344	Artificial structures = solid, manmade structures; Artificial substrate = riprap; Soft Substrate = sand, sand/gravel mix, tidal flats, or vegetated; Intermediate Substrate = gravel or hard clay; Hard Substrate = cobble/boulder, rocky or bedrock
	Towers (Air Force and Navy)	Point	Naval Facilities Engineering Command Atlantic, 2015	91	Mapped centroid of offshore military towers
	Wind Turbines	Point	Longley-Wood, 2015	134	Mapped centroid of experimental wind turbines

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
4.2.3-Physical/ Bathymetry and Topography	Bathymetry	Raster	GEBCO, 2021	295	None
			National Oceanic and Atmospheric Administration-National Geospatial Data Center, 2017	359	Need to merge separate rasters
4.2.3-Physical/Water Flow and Quality	Average Sea Surface Temperature	Raster	NCEP/NWS/NOAA, 2016	257	None
	Currents	Polygon	Naval Facilities Engineering Command Atlantic, 2016	365	Moved from Phase 3 feature class location
	Dead Zones	Polygon	May et al., 2012	417	None
4.3-Management Areas	Artificial Reefs	Polygon	Florida Fish and Wildlife Conservation Commission & Fish and Wildlife Research Institute, 2021	268	Footprint assumes maximum general permit dimensions of 0.25 nm on a side, which is larger than the longest dimensions of any material or vessel listed in the data table, unless area overlaps with a large obstruction area on NOAA electronic nautical charts
			Georgia Department of Natural Resources, 2021	269	None
			Longley-Wood, 2015	331	Added 0.25 nm buffer around points to indicate artificial reef management areas, as described in Atlantic States Marine Fisheries Commission (2021).
			Louisiana Department of Wildlife and Fisheries, 2021	327	None
			Maryland Department of Natural Resources, 2017	271	None
			Massachusetts Division of Marine Fisheries, 2015	333	None

Section/Habitat Dimension	Figure Legend Item	Geometry	Text Citation	Map_id	Processing Notes
			Mississippi Department of Marine Resources, 2015	92	feat_name: Permitted areas indicate concentration of artificial substrate
			National Oceanic and Atmospheric Administration, 2021b	332	None
			New Jersey Division of Fish and Wildlife, 2019	330	None
			New York Department of Environmental Conservation, 2015	93	feat_name: Permitted areas indicate concentration of artificial substrate
			North Carolina Division of Marine Fisheries, 2021	272	None
			Outdoor Alabama - Alabama Department of Conservation and Natural Resources, 2015	95	feat_name: Permitted areas digitized from NOAA nautical charts; indicate concentration of artificial substrate
			Rhode Island Artificial Reef Program, 2015	88	Phase III: Mapped points representing artificial reef centroids [Polygon concentration areas >80 acres mapped from same reference in abiotic substrate mosaic (NAVFAC Atlantic 2015 reference)]; Phase IV: retained the polygons representing artificial reef boundaries.
			South Carolina Department of Natural Resources, 2021	273	None
			State of Delaware, 2020	270	None
			Texas Parks and Wildlife Department, 2021	288	None
			Virginia Marine Resources Commission, 2021	289	None

Table 5-2. Source Qualities Supporting Rank Determinations (Abiotic Substrate Polygons Only).

Text Citation	Map_id	Resolution %	Method %	Classi-fication %	Modifier	Reason for Modification	Data Rank
Anderson et al., 2010	53	31%	50%	67%	-16.00	Modified for data age	27.96
Anderson et al., 2017	303	81%	100%	67%	-8.00	Modified for minimum data age	75.96
Anderson et al., 2017	360	56%	63%	67%	-10.00	Modified for minimum data age	50.21
Anderson et al., 2017	361	8%	63%	67%	-10.00	Modified for minimum data age	25.99
Anderson et al., 2017	363	31%	50%	67%	-16.00	Modified for data age	27.96
Baldwin et al., 2016	204	88%	100%	100%	-10.00	Modified for minimum data age	83.75
Barnhardt et al., 1996	71	44%	75%	100%	-30.00	Modified for minimum data age	34.38
Briere et al., 2000	227	88%	75%	83%	-24.00	Modified for data age	58.92
Bureau of Ocean Energy Management, 2016a	195	100%	75%	100%	-8.00	Modified for data age	84.50
Bureau of Ocean Energy Management, 2017	186	81%	100%	50%	-5.00	Modified for minimum data age	75.63
Bureau of Ocean Energy Management, 2019	275	80%	100%	67%	-3.00	Modified for minimum data age	80.33
Butman et al., 2007	232	50%	75%	83%	-23.00	Modified for minimum data age	41.17
Chesapeake Bay Program-National Oceanic and Atmospheric Administration, 2017	387	50%	75%	67%	-5.00	Modified for minimum data age	55.83
Florida Fish and Wildlife Conservation Commission & Fish and Wildlife Research Institute, 2013	23	50%	50%	100%	-11.00	Modified for minimum data age	49.00
Florida Fish and Wildlife Conservation Commission and Fish and Wildlife Research Institute, 2016	190	50%	50%	100%	16.00	Modified for minimum data age (-4) and best available for area (+20)	76.00
Franklin et al., 2003	420	13	2	3	-21.00	Modified for data age	54.63
Foster et al., 2016	207	88%	100%	100%	-10.00	Modified for minimum data age	83.75
Fugro Survey Limited and CSA International, 2011	11	72%	100%	100%	-10.00	Modified for data age	75.94
Gulf of Mexico Fishery Management Council, 2004	13	50%	50%	83%	-17.00	Modified for minimum data age	39.67
Gulf States Marine Fisheries Commission, 2008	27	13%	75%	100%	-13.00	Modified for minimum data age	35.75
Harris & Stokesbury, 2010	241	25%	50%	83%	-12.00	Modified for minimum data age	32.17
Ilich et al., 2021	404	81%	100%	100%	-3.00	Modified for minimum data age	87.63
Kendall et al., 2005	125	81%	100%	100%	-20.00	Modified for data age	70.63

Text Citation	Map_id	Resolution %	Method %	Classi-fication %	Modifier	Reason for Modification	Data Rank
Kinlan et al., 2013a	128	38%	75%	67%	10.00	Modified for depicting habitat suitability for deep-sea hard corals	64.58
Kinlan et al., 2013b	129	38%	75%	67%	10.00	Modified for depicting habitat suitability for deep-sea hard corals	64.58
Kinlan et al., 2013c	130	38%	75%	67%	10.00	Modified for depicting habitat suitability for deep-sea hard corals	64.58
McMullen et al., 2008a	224	88%	75%	50%	-17.00	Modified for minimum data age	59.25
McMullen et al., 2008b	226	88%	88%	83%	-17.00	Modified for data age	69.67
McMullen et al., 2009	225	88%	88%	50%	-17.00	Modified for data age	63.00
McMullen et al., 2010	223	88%	100%	67%	-12.00	Modified for minimum data age	75.08
McMullen et al., 2011b	221	88%	100%	83%	-11.00	Modified for minimum data age	79.42
McMullen et al., 2012a	214	88%	100%	83%	-11.00	Modified for minimum data age	79.42
McMullen et al., 2012b	216	88%	100%	83%	-10.00	Modified for minimum data age	80.42
McMullen et al., 2013	211	88%	100%	83%	-9.00	Modified for data age	81.42
McMullen et al., 2014a	208	88%	100%	83%	-8.00	Modified for data age	82.42
McMullen et al., 2014b	209	88%	100%	83%	-9.00	Modified for data age	81.42
McMullen et al., 2015a	205	88%	100%	83%	-7.00	Modified for data age	83.42
McMullen et al., 2015b	206	88%	100%	83%	-8.00	Modified for data age	82.42
McMullen, 2007	32	100%	100%	67%	-15.00	Modified for data age	78.33
Messing et al., 2011	121	81%	50%	50%	-10.00	Modified for data age	55.63
Moser & Taylor, 1995	33	31%	25%	100%	-26.00	Modified for minimum data age	17.13
National Ocean Service, 2001	5	63%	100%	67%	-20.00	Modified for data age	54.58
Naval Facilities Engineering Atlantic Command, 2022	390	100%	75%	100%	-8.00	Modified for data age	84.50
NOAA National Database for Deep-Sea Corals and Sponges, 2022	398	25%	75%	83%	10.00	Modified for representing hard coral locations	61.67

Text Citation	Map_id	Resolution %	Method %	Classi-fication %	Modifier	Reason for Modification	Data Rank
North Carolina Division of Marine Fisheries, 2013	340	63%	50%	67%	-8.00	Modified for minimum data age	51.58
North Carolina Natural Heritage Program, 2010	329	30%	25%	67%	5.00	Modified for being designated an NC Natural Heritage Area	40.68
Nova Southeastern University, 2017	379	69%	100%	100%	-5.00	Modified for minimum data age	79.38
Pendleton et al., 2013	212	63%	100%	83%	-13.00	Modified for minimum data age	64.92
Pendleton et al., 2015	298	88%	100%	83%	-13.00	Modified for minimum data age	77.42
Pendleton et al., 2019	297	88%	100%	83%	-8.00	Modified for minimum data age	82.42
Poppe et al., 2006a	233	88%	88%	17%	-17.00	Modified for data age	56.33
Poppe et al., 2006b	234	88%	100%	100%	-17.00	Modified for minimum data age	76.75
Poppe et al., 2007a	229	88%	100%	83%	-17.00	Modified for data age	73.42
Poppe et al., 2007b	230	88%	88%	83%	-18.00	Modified for data age	68.67
Poppe et al., 2011a	218	88%	100%	50%	-11.00	Modified for minimum data age	72.75
Poppe et al., 2011b	220	88%	100%	83%	-11.00	Modified for minimum data age	79.42
Poppe et al., 2012	215	88%	100%	100%	-10.00	Modified for minimum data age	83.75
Poppe et al., 2013a	242	88%	100%	100%	-11.00	Modified for minimum data age	82.75
Poppe et al., 2013b	213	88%	100%	100%	-11.00	Modified for minimum data age	82.75
Poppe et al., 2014	217	88%	100%	67%	-12.00	Modified for data age	75.08
Poppe, 2010	40	63%	100%	67%	-12.00	Modified for minimum data age	62.58
Reed et al., 2013	399	8%	50%	100%	-8.00	Modified for minimum date age	31.06
Scanlon et al., 1999	56	31%	100%	100%	-16.00	Modified for data age	49.63
Scanlon et al., 2003	43	54%	100%	100%	0.00	Modified for minimum data age (-20) and best available mapping for area (+20)	77.19
Skidaway Institute of Oceanography, 2004	7	25%	100%	83%	-17.00	Modified for data age	42.17
Sowers, 2020	394	69%	75%	67%	-1.00	Modified for minimum data age	69.21
Todd & Kostylev, 2011	97	56%	100%	67%	-18.00	Modified for minimum data age	53.46
Todd, 2006	98	63%	100%	33%	-24.00	Modified for minimum data age	43.92
U.S. Army Corp of Engineers, 2009	183	88%	88%	100%	-14.00	Modified for minimum data age	76.00
U.S. Army Corp of Engineers, 2009	200	88%	75%	67%	-14.00	Modified for minimum data age	65.58
U.S. Army Corp of Engineers, 2009	251	88%	75%	100%	-15.00	Modified for minimum data age	71.25
U.S. Army Corp of Engineers, 2009	377	72%	75%	67%	-16.00	Modified for minimum data age	55.77

Text Citation	Map_id	Resolution %	Method %	Classi-fication %	Modifier	Reason for Modification	Data Rank
U.S. Department of the Navy, 2010	8	63%	100%	83%	-11.00	Modified for data age	66.92
U.S. Department of the Navy, 2011a	9	63%	100%	83%	-10.00	Modified for data age	67.92
U.S. Department of the Navy, 2011b	10	63%	100%	100%	-10.00	Modified for data age	71.25
U.S. Department of the Navy, 2016zo	185	9%	25%	67%	-13.00	Modified for average penalty because data lacking source attribution	12.52
U.S. Department of the Navy, 2016zo	187	31%	25%	67%	-13.00	Modified for average penalty because data lacking source attribution	23.46
U.S. Department of the Navy, 2016zo	188	16%	25%	67%	-13.00	Modified for average penalty because data lacking source attribution	15.65
U.S. Department of the Navy, 2016zo	194	69%	88%	50%	-13.00	Modified for average penalty because data lacking source attribution	57.63
U.S. Department of the Navy, 2022	382	9%	25%	100%	-13.00	Modified for average penalty because data lacking source attribution	19.19
U.S. Department of the Navy, 2022	383	16%	50%	100%	-13.00	Modified for average penalty because data lacking source attribution	29.81
U.S. Department of the Navy, 2022	384	31%	50%	100%	-13.00	Modified for average penalty because data lacking source attribution	37.63
U.S. Geological Survey & S.C. Sea Grant Consortium, 2007	70	81%	100%	50%	-18.00	Modified for minimum data age	62.63
U.S. Geological Survey, 2005	199	69%	75%	50%	-17.00	Modified for data age	49.88
UNEP-WCMC et al., 2021	378	50%	50%	100%	-12.00	Modified for minimum data age	48.00
Valentine, 2005	202	84%	75%	100%	-18.00	Modified for minimum data age	66.69
Walker et al., 2006	122	69%	75%	67%	-15.00	Modified for data age	55.21
Ward et al., 2021	391	88%	88%	100%	-4.00	Modified for minimum data age	86.00
Willson, 2009	376	53%	88%	100%	-20.00	Modified for minimum data age	52.81

6 LITERATURE AND DATA CITED[1]

Text Citation	Full Citation
Albemarle Pamlico National Estuarine Program, 2015	Albemarle Pamlico National Estuarine Program. (2015). Submerged Aquatic Vegetation Maps (1981-2015) [GIS data]. Available from http://portal.ncdenr.org/web/apnep/resources/maps Assessed in November 2021.
Amante & Eakins, 2009	Amante, C. and B.W. Eakins. (2009). ETOPO1 1 Arc-Minute Global Relief Model (Ice Surface): Procedures, Data Sources and Analysis [GIS data]. NOAA Technical Memorandum NESDIS NGDC-24. National Geophysical Data Center, NOAA. doi:10.7289/V5C8276M [2017] https://www.ngdc.noaa.gov/docucomp/page?xml=NOAA/NESDIS/NGDC/MGG/DEM/iso/xml/316.xml&view=getDataView&header=none
Anderson et al., 2010	Anderson, M., J. Greene, D. Morse, C. Shumway, & M. Clark. (2010). Chapter 3: Benthic Habitats. In J. K. Greene, Anderson, M.G., Odell, J., Steinberg, N., (Ed.), The Northwest Atlantic Marine Ecoregional Assessment: Species, Habitats and Ecosystems [GIS data]. Phase One (pp. 3-1 to 3-61). Boston, MA: The Nature Conservancy, Eastern U.S. Division.
Anderson et al., 2017	Anderson, M.G., J. Prince, A. Barnett, K.J. Weaver, M.F. Conley, and K.L. Goodin. (2017). Seafloor Habitats of the South Atlantic Bight Marine Region in Conley, M.F., M.G. Anderson, N. Steinberg, and A. Barnett, eds. 2017. The South Atlantic Bight Marine Assessment: Species, Habitats and Ecosystems. The Nature Conservancy, Eastern Conservation Science. http://nature.ly/marineSAtlanticBightERA
Anson et al., 2011	Anson K, Arnold W, Banks P, Berrigan M, Pollack J, Randall B, Reed D. (2011). Eastern Oyster In Gulf of Mexico Data Atlas [Internet]. Stennis Space Center (MS): National Centers for Environmental Information; 2011. [6 screens]. Available from: https://gulfatlas.noaa.gov/.
Baldwin et al., 2016	Baldwin, W.E., D.S. Foster, E.A. Pendleton, W.A. Barnhardt, W.C. Schwab, B.D. Andrews, and S.D. Ackerman. (2016). Shallow geology, sea-floor texture, and physiographic zones of Vineyard and western Nantucket Sounds, Massachusetts [GIS data]. U.S. Geological Survey Open-File Report 2016-1119.
Ball, 2012	Ball, Anne O'Donnell.(2012). NOAA Office for Coastal Management Benthic Habitat Data, Long Island Sound, Jamaica Bay, and Lower Bay of NY/NJ Harbor, NY, 1994-2002 (NCEI Accession 0089467). NOAA National Centers for Environmental Information. Dataset. https://www.ncei.noaa.gov/archive/accession/0089467. Accessed 24 March 2022.
Barker, 2019	Barker, S. (2019). Great Bay Estuary Eelgrass, 2019 [GIS data]. Available from https://granit.unh.edu/data/ Accessed in November 2021.
Barnhardt et al., 1996	Barnhardt, W.A., D.F. Belknap, A.R. Kelley, J.T. Kelley, & S.M. Dickson. (1996). Surficial Geology of the Maine Inner Continental Shelf [GIS data]. Department of Conservation, Maine Geology Survey.
Barnhardt et al., 2010	Barnhardt, W.A., S.D. Ackerman, B.D. Andrews, and W.E. Baldwin. (2010). Geophysical and sampling data from the inner continental shelf; Duxbury to Hull, Massachusetts [GIS data]. U.S. Geological Survey Open-File Report 2009-1072, 1 DVD-ROM.
Berg & Berg, 1989	Berg, D. & D. Berg. (1989). Tropical shipwrecks [GIS data]. East Rockaway, New York: Aqua Explorers Inc.
Briere et al., 2000	Briere, P.R., K.M. Scanlon, C.T. Gledhill, C.C. Koenig, and G. Fitzhugh. (2000). West Florida Shelf: Sidescan-Sonar and Sediment Data from Shelf-edge Habitats in the Northeastern Gulf of Mexico [GIS data]. U.S. Geological Survey Open-File Report 99-589. Shapefile descriptions are here: https://pubs.usgs.gov/of/1999/of99-589/htm/aview.htm.

[1] For sources identified with "[GIS metadata]", no supporting literature or documentation other than basic GIS metadata is available.

Text Citation	Full Citation
Bureau of Ocean Energy Management, 2016a	Bureau of Ocean Energy Management. (2016). Benthic Mapping and Assessment in the Wilmington-East Wind Energy Call Area [GIS data]. OCS Study BOEM 2016-003 and NOAA Technical Memorandum 196. 172 pages.
Bureau of Ocean Energy Management, 2017	Bureau of Ocean Energy Management. (2017). Seismic Water Bottom Anomalies [GIS data]. Data available from BOEM's Office of Resource Evaluation. Available from: https://www.boem.gov/Seismic-Water-Bottom-Anomalies-Map-Gallery/, access in April 2018.
Bureau of Ocean Energy Management, 2019	Bureau of Ocean Energy Management. (2019). Comprehensive seafloor substrate mapping and model validation in the New York Bight [GIS data]. OCS Study BOEM 2019-069. 184 pages. Available from https://www.nodc.noaa.gov/archive/arc0147/0204737/1.1/data/0-data/ Accessed December 2021.
Bureau of Ocean Energy Management, 2021a	Bureau of Ocean Energy Management. (2021). Platform Locations - Gulf of Mexico [GIS data]. Available from http://www.boem.gov/Oil-and-Gas-Energy-Program/Mapping-and-Data/Index.aspx. Accessed in December 2021.
Bureau of Ocean Energy Management, 2021b	Bureau of Ocean Energy Management. (2021). Pipeline Locations - Gulf of Mexico [GIS data]. Available from http://www.boem.gov/Oil-and-Gas-Energy-Program/Mapping-and-Data/Index.aspx. Accessed in December 2021.
Butman et al., 2007	Butman, B., P.C. Valentine, T.J. Middleton, W.W. Danworth. (2007). A GIS Library of Multibeam Data for Massachusetts Bay and the Stellwagen Bank National Marine Sanctuary, Offshore of Boston, Massachusetts. U.S. Geological Survey Data Series 99, 1 DVD-ROM.
Cerame Vivas, 1988	Cerame Vivas, M.J. (1988). Coastal atlas of Puerto Rico. Boquerón, Puerto Rico: M.J. Cerame Vivas, Inc.
Chesapeake Bay Program-National Oceanic and Atmospheric Administration, 2017	Chesapeake Bay Office-National Oceanic and Atmospheric Administration. (2017). Chesapeake_Bay_CMECS_V4_Substrate_Component_01062017 [GIS data]. Available from https://www.habitat.noaa.gov/chesapeakebay/gis/, Accessed in January 2022.
Clark et al., 2014	Clark, R., J.C. Taylor, C.A. Buckel, and L.M. Kracker (eds). 2014. Fish and Benthic Communities of the Flower Garden Banks National Marine Sanctuary: Science to Support Sanctuary Management. NOAA Technical Memorandum NOS NCCOS 179. Silver Spring, MD. 317 pp.
Connecticut Department of Energy and Environmental Protection, 2017	Connecticut Department of Energy and Environmental Protection. (2017). Eelgrass Beds 2017 Polygon [GIS data]. Available from https://ct-deep-gis-open-data-website-ctdeep.hub.arcgis.com/datasets/ Accessed in November 2021.
ESR, 2009	ESR. (2009). OSCAR third deg (Altimeter-based Ocean Current Velocity 1992-2022). Ver. 1. PO.DAAC, CA, USA. Dataset accessed [2022-10-11] at https://doi.org/10.5067/OSCAR-03D1Y
Florida Fish and Wildlife Conservation Commission & Fish	Florida Fish and Wildlife Conservation Commission and Fish and Wildlife Research Institute. (2021). Artificial Reefs Florida Points [GIS data]. Tallahassee, FL.

Text Citation	Full Citation
and Wildlife Research Institute, 2021	
Florida Fish and Wildlife Conservation Commission & Fish and Wildlife Research Institute, 2021b	Florida Fish and Wildlife Conservation Commission Fish and Wildlife Research Institute. (2021). Seagrass Florida 1987-2020 [GIS data]. Available from https://geodata.myfwc.com/datasets/myfwc::seagrass-habitat-in-florida/about. Access on 22 November, 2021.
Florida Fish and Wildlife Conservation Commission & the Nature Conservancy, 2004	Florida Fish and Wildlife Conservation Commission & the Nature Conservancy. (2004). Worm Reef Habitats Florida East Coast [GIS data]. Available from https://geodata.myfwc.com/datasets/dff9b71b85c04e47b8e54d0eed167205_2/about Accessed on 26 August, 2021.
Florida Fish and Wildlife Conservation Commission and Fish and Wildlife Research Institute, 2016	Florida Fish and Wildlife Conservation Commission and Fish and Wildlife Research Institute. (2016). Unified Florida Coral Reef Tract Map v2 [GIS data]. Assemblage includes some additional datasets and other benthic habitats compared to FFWC-FWRI (2013).
Florida Fish and Wildlife Conservation Commission, 2015	Florida Fish and Wildlife Conservation Commission. (2015). Oyster Habitats Florida (Volume 2015) [GIS data]. Available from http://research.myfwc.com/ as accessed on December 2021.
Foster et al., 2016	Foster, D.S., W.E. Baldwin, W.A. Barnhardt, W.C. Schwab, S.D. Ackerman, B.D. Andrews, E.A. Pendleton. (2016). Shallow geology, sea-floor texture, and physiographic zones of Buzzards Bay, Massachusetts (ver. 1.1, June 2016) [GIS data]: U.S. Geological Survey Open-File Report 2014–1220.
Fugro Survey Limited and CSA International, 2011	Fugro Survey Limited and CSA International, I. (2011). Benthic habitat classification survey report for AM1 submarine cable system, Segment 1.1, Jacksonville, FL (BMH JKV to BU-1 Continental Shelf) [GIS data]. 87 pages.
GEBCO, 2021	GEBCO. (2021). Global Bathymetry and Elevation Raster (WMS layer service based on 2021 bathymetry grid). Available from https://www.gebco.net/data_and_products/gebco_web_services/web_map_service/mapserv?
Georgia Department of Natural Resources, 2015b	Georgia Department of Natural Resources. (2015). Distribution of Georgia Oyster Reefs [GIS data]. Available from https://coast.noaa.gov/dataviewer.
Georgia Department of Natural Resources, 2021	Georgia Department of Natural Resources. (2021). Artificial Reef Boundaries [GIS data]. Received 2021.
Gower & King, 2008	Gower, J. & King, S. (2008). Satellite images show the movement of floating *Sargassum* in the Gulf of Mexico and Atlantic Ocean. [Manuscript]. Nature Precedings.

Text Citation	Full Citation
Gulf of Mexico Fishery Management Council, 2004	Gulf of Mexico Fishery Management Council. (2004). Final Environmental Impact Statement for the Generic Essential Fish Habitat Amendment to the following Fishery Management Plans of the Gulf of Mexico [GIS data]. Tampa, Florida: Gulf of Mexico Fishery Management Council.
Gulf of Mexico Fishery Management Council, 2021	Gulf of Mexico Fishery Management Council. (2021). Predicted Spatial Distribution of Corals in the Gulf of Mexico and the Caribbean. White Paper. 49 pages.
Gulf States Marine Fisheries Commission, 2008	Gulf States Marine Fisheries Commission. (2008). Marine Benthic Substrates Geodatabase, Northern Gulf of Mexico (2005-2008 GIS data).
Handler, 2001	Handler, M. (2001). Diving and snorkeling: British Virgin Islands (2nd ed.) [GIS data]. Melbourne, Australia: Lonely Planet Publications.
Handley, 2011	Handley L. (2011). Submerged Aquatic Vegetation In Gulf of Mexico Data Atlas [GIS data]. Stennis Space Center (MS): National Coastal Data Development Center [1 screen]. Available from: http://gulfatlas.noaa.gov/
Harris & Stokesbury, 2010	Harris, B. P., and K. D. E. Stokesbury. (2010). The spatial structure of local surficial sediment characteristics on Georges Bank, USA [GIS data]. Cont. Shelf Res. 30 (17): 1840-1853.
Ilich et al., 2021	Ilich, A.R., Brizzolara, J.L. , Graham, A.G.C., Grasty, S.E., Gray, J.W. , Hommeyer, M., Kilborn, J.P., Lecours, V., Lembke, C., Locker, S.D., Silverman, A., Switzer, T.S., Vivlamore, A., & Murawski, S.A. (2021). Mapping Offshore Hardbottom Areas on the West Florida Shelf Using Multiple Spatial Scales of Analysis, GeoHab 2021, Americas Node.
Kendall et al., 2005	Kendall, M.S., O.P. Jensen, C. Alexander, D. Field, G. McFall, R. Bohne, & M.E. Monaco. (2005). Benthic mapping using sonar, video transects, and innovative approach to accuracy assessment: a characterization of bottom features in the Georgia Bight [GIS data]. Journal of Coastal Research. 21(6): 1154-1165.
Kinlan et al., 2013a	Kinlan, B.P., M. Poti, A. Drohan, D.B. Packer, M. Nizinski, D. Dorfman, and C. Caldow. (2013). Digital data: Predictive models of deep-sea coral habitat suitability in the U.S. Northeast Atlantic and Mid-Atlantic regions [GIS data]. Downloadable digital data package. Released August 2013.
Kinlan et al., 2013b	Kinlan, B.P., M. Poti, R.P. Etnoye, L. Siceloff, C. Jenkins, D. Dorfman, and C. Caldow. (2013). Digital data: Predictive models of deep-sea coral habitat suitability in the U.S. Gulf of Mexico [GIS data]. Downloadable digital data package. Released August 2013.
Kinlan et al., 2013c	Kinlan, B. P., Poti, M., Hourigan, T., Dorfman, D., & Caldow, C. (2013). Digital data: Predictive models of deep-sea coral habitat suitability in the U.S. Southeast region [GIS data]. Downloadable digital data package. Released August 2013.
Lathrop et al., 2010	Lathrop, R. G. & S. Haag. (2010). Submerged aquatic vegetation (SAV) CRSSA image classification of the Barnegat Bay - Little Egg Harbor estuary, New Jersey: 2009 [GIS data]. Available from http://www.crssa.rutgers.edu/projects/coastal/sav/downloads/bbleh_sav09.htm
Longley-Wood, 2015	Longley-Wood, K. (2015). Block Island wind farm turbine locations - GIS data prepared for the Northeast Ocean Data Portal (www.northeastoceandata.org). 3 pages.
Louisiana Department of Wildlife and Fisheries, 2021	Louisiana Department of Wildlife and Fisheries. (2021). Artificial Reef Boundary Areas [GIS data]. Received from mmcdonough@wlf.la.gov on 4 August 2021.

Text Citation	Full Citation
Maine Department of Marine Resources, 2010c	Maine Department of Marine Resources. (2010). Eelgrass 2010 [GIS data]. Available from https://www.maine.gov/geolib/catalog.html#biota Accessed in November 2021.
Maine Department of Marine Resources, 2018	Maine Department of Marine Resources. (2018). Eelgrass 2018 - Casco Bay Only [GIS data]. Available from https://www.maine.gov/geolib/catalog.html#biota Accessed in November 2021.
Maryland Department of Natural Resources, 2017	Maryland Department of Natural Resources. (2017). Artificial Reef Boundaries [GIS data]. Received in 2021.
Massachusetts Department of Environment Protection, 2017	Massachusetts Department of Environmental Protection. (2017). 2015-2017 DEP Eelgrass [GIS data]. Accessed in November 2021.
McMullen et al., 2008a	McMullen, K.Y., L.J. Poppe, J.F. Denny, T.A. Haupt, and J.M. Crocker. (2008). Sidescan-sonar imagery and surficial geologic interpretations of the sea floor in Central Rhode Island Sound [GIS data]. USGS Open File Report 2007-1366.
McMullen et al., 2008b	McMullen, K., L. Poppe, E. Twomey, W.W. Danforth, T. Haupt, and J. Crocker. (2008). Sidescan-sonar imagery, multibeam bathymetry, and surficial geologic interpretations of the sea floor in Rhode Island Sound, off Sakonnet Point, Rhode Island [GIS data]. USGS Open File Report 2007-1150.
McMullen et al., 2009	McMullen, K., L.J. Poppe, T.A. Haupt, and J.M. Crocker. (2009). Sidescan-sonar imagery and surficial geologic interpretations of the sea floor in Western Rhode Island Sound [GIS data]. USGS Open File Report 2008-1181.
McMullen et al., 2010	McMullen, K.Y., L.J. Poppe, W.W. Danforth, D.S. Blackwood, J.D. Schaer, A.J. Ostapenko, K.A. Glomb, and E.F. Doran. (2010). Surficial geology of the sea floor in Long Island Sound offshore of Plum Island, New York [GIS data]. U.S. Geological Survey Open-File Report 2010–1005, CD-ROM. (Also available at https://pubs.usgs.gov/of/2010/1005/.)
McMullen et al., 2011b	McMullen, K.Y., L.J. Poppe, W.W. Danforth, D.S. Blackwood, J.D. Schaer, M.R. Guberski, D.A. Wood, and E.F. Doran. (2011). Surficial geology of the sea floor in Long Island Sound offshore of Orient Point, New York [GIS data]. U.S. Geological Survey Open-File Report 2010–1100, CD-ROM. (Also available at https://pubs.usgs.gov/of/2010/1100.)
McMullen et al., 2012a	McMullen, K.Y., L.J. Poppe, W.W. Danforth, D.S. Blackwood, J.D. Schaer, K.A. Glomb, and E.F. Doran. (2012). Sea-floor geology of Long Island Sound north of Duck Pond Point, New York [GIS data]. U.S. Geological Survey Open-File Report 2011–1149, DVD-ROM. (Also available at https://pubs.usgs.gov/of/2011/1149/.)
McMullen et al., 2012b	McMullen, K.Y., L.J. Poppe, S.D. Ackerman, C.R. Worley, M.A. Nadeau, and M.V. Van Hoy. (2012). Sea-floor geology in central Rhode Island Sound south of Sakonnet Point, Rhode Island [GIS data]. U.S. Geological Survey Open-File Report 2012–1004, DVD-ROM. (Also available at http://pubs.usgs.gov/of/2012/1004/.)
McMullen et al., 2013	McMullen, K.Y., L.J. Poppe, S.D. Ackerman, D.S. Blackwood, P.G. Lewit, and C.E. Parker. (2013). Sea-floor geology in northeastern Block Island Sound, Rhode Island [GIS data]. U.S. Geological Survey Open-File Report 2013–1003, 1 DVD-ROM, http://pubs.usgs.gov/of/2013/1003/.
McMullen et al., 2014a	McMullen, K.Y., L.J. Poppe, W.W. Danforth, D.S. Blackwood, A.R. Clos, and C.E. Parker. (2014). Sea-floor morphology and sedimentary environments of western Block Island Sound, northeast of Gardiners Island, New York [GIS data]. U.S. Geological Survey Open-File Report 2014–1160, 1 DVD-ROM, https://dx.doi.org/10.3133/ofr20141160.

Text Citation	Full Citation
McMullen et al., 2014b	McMullen, K.Y., L.J. Poppe, S.D. Ackerman, D.S. Blackwood, K.A. Glomb, and D.A. Wood. (2014). Sea-floor geology in northwestern Block Island Sound, Rhode Island [GIS data]. U.S. Geological Survey Open-File Report 2014–1018, 1 DVD-ROM, 13 p., https://dx.doi.org/10.3133/ofr20141018.
McMullen et al., 2015a	McMullen, K.Y., L.J. Poppe, D.S. Blackwood, M.J. Nardi, and Andring, M.A., (2015). Sea-floor morphology and sedimentary environments in southern Narragansett Bay, Rhode Island [GIS data]. U.S. Geological Survey Open-File Report 2015-1149.
McMullen et al., 2015b	McMullen, K.Y., L.J. Poppe, W.W. Danforth, D.S. Blackwood, W.G. Winner, and C.E. Parker. (2015). Sea-Floor Morphology and Sedimentary Environments in Western Block Island Sound, Offshore of Fishers Island, New York [GIS data]. U.S. Geological Survey Open-File Report 2014-1224.
McMullen, 2007	McMullen, K.Y. (2007). H11310INT: Interpretation of NOAA H11310 Sidescan Sonar and Bathymetric Data from Central Narragansett Bay [GIS data]. Open-File Report 2006-1199. U.S. Geological Survey, Coastal and Marine Geology Program: Woods Hole Science Center, Woods Hole, MA. Available from http://pubs.usgs.gov/of/2006/1199/data/interpretation/mosaicinterp/mosaicinterp.zip as accessed in December 2014.
Mcowen et al., 2017	Mcowen C., L.V. Weatherdon, J. Bochove, E. Sullivan, S. Blyth, C. Zockler, D. Stanwell-Smith, N. Kingston, C.S. Martin, M. Spalding, and S. Fletcher. (2017). A global map of saltmarshes (v6.1) [GIS data]. Biodiversity Data Journal 5: e11764. Paper DOI: https://doi.org/10.3897/BDJ.5.e11764. Data DOI: https://doi.org/10.34892/07vk-ws51
Messing et al., 2011	Messing, C., J. Reed, and B. Walker. (2011). Navy Cable Project: Deepwater Habitats [GIS data]. Nova Southeastern University (unpublished data).
Mississippi Department of Marine Resources, 2015	Mississippi Department of Marine Resources. (2015). Artificial Reefs [GIS data]. Available from http://www.dmr.state.ms.us/index.php/marine-fisheries/artificial-reef. Accessed in July 2015.
Moser & Taylor, 1995	Moser, M. L., Taylor, B.L. (1995). Hard bottom habitat in North Carolina state waters: a survey of available data.
Narragansett Bay Estuarine Program, 2017	Narragansett Bay Estuarine Program. (2017). 2012 Seagrass Bed Mapping Seagrass 2012 - NBEP2017 [GIS data]. Accessed in November 2021.
National Centers for Environmental Information, 2017	National Centers for Environmental Information. (2017). NOAA NOS Estuarine Bathymetry - Chesapeake Bay (M130). National Centers for Environmental Information, NOAA. doi:10.7289/V5ZK5F0X [Accessed: April 11, 2019].
National Ocean Service, 2001	National Ocean Service. (2001). Benthic habitats of Puerto Rico and the U.S. Virgin Islands (Vol. CDROM) [GIS data]. Silver Spring, Maryland: National Oceanic and Atmospheric Administration.
National Oceanic and Atmospheric Administration, 2013g	National Oceanic and Atmospheric Administration. (2013). Risk Assessment for Potentially Polluting Wrecks in U.S. Waters. National Oceanic and Atmospheric Administation, Silver Spring, MD. 127 pp + appendices
National Oceanic and Atmospheric Administration, 2018	National Oceanic and Atmospheric Administration. (2018). Automated Wreck and Obstruction Avoidance System database [GIS data]. Available from http://www.nauticalcharts.noaa.gov/hsd/wrecks_and_obstructions.html. Accessed in July 2021.
National Oceanic and Atmospheric	National Oceanic and Atmospheric Administration. (2021). Raster Nautical Charts (RNCs) for Rhode Island and Massachusetts [Digitized Artificial Reef Boundaries]. Available from

Text Citation	Full Citation
Administration, 2021b	https://www.charts.noaa.gov/InteractiveCatalog/nrnc.shtml?rnc=13224. Accessed in December 2021.
National Oceanic and Atmospheric Administration-National Geospatial Data Center, 2017	National Oceanic and Atmospheric Administration-National Geospatial Data Center. (2017). Estuarine Bathymetry - Phase IV AFTT Inshore Training Areas. [GIS data]. Available from https://www.ngdc.noaa.gov/mgg/bathymetry/estuarine/. Accessed December 2021.
National Park Service, 2011	National Park Service. (2011). Seagrass - Gulf Islands National Seashore - 2011/10/04 [GIS data]. Available from https://data.amerigeoss.org/it/dataset/seagrass-gulf-islands-national-seashore-2011-10-04/. Accessed in November 2021.
Naval Facilities Engineering Command Atlantic, 2015	Naval Facilities Engineering Command Atlantic. (2015). Department of Defense Tower Locations [GIS data]. Digitized from NOAA Nautical Charts. July 2015.
Naval Facilities Engineering Command Atlantic, 2016	Naval Facilities Engineering Command Atlantic. (2016). Essential Fish Habitat - Water Column Features (e.g., Charleston Gyre) [GIS data].
Naval Facilities Engineering Command Atlantic, 2016b	Naval Facilities Engineering Command Atlantic. (2016). Seamounts in the U.S. Atlantic EEZ (peak areas digitized using bathymetry) [GIS data].
Naval Facilities Engineering Command Atlantic, 2022	Naval Facilities Engineering Atlantic Command. (2022a). Oyster Restoration Sites in Little Creek Harbor [GIS data]. Digitized from satellite imagery dated April 2013.
Naval Facilities Engineering Command Atlantic, 2022b	Naval Facilities Engineering Command Atlantic. (2022). Distribution of warm-water coral reef in the Gulf of Mexico based on hard bottom mapping and suitability zones for warm-water coral reef species modeled by the Gulf of Mexico Fishery Management Council in 2021 [GIS data].
NCEP/NWS/NOAA, 2016	NCEP/NWS/NOAA. (2016). Optimum Interpolation (OI) Sea Surface Temperature (SST) V2 [GIS data]. Climate Modeling Branch W/NP24 http://www.esrl.noaa.gov/psd/data/gridded/data.noaa.oisst.v2.html#references.
New Jersey Division of Fish and Wildlife, 2019	New Jersey Division of Fish and Wildlife. (2019). Artificial Reef Sites of New Jersey, Edition 20191003 [GIS data]. Available from https://gisdata-njdep.opendata.arcgis.com/datasets/njdep::artificial-reef-sites-of-new-jersey. Accessed in December 2021.
New York Department of Environmental Conservation, 2015	New York Department of Environmental Conservation. (2015). Artificial Reefs Managed by the New York Department of Environmental Conservation [GIS data]. Available from http://www.dec.ny.gov/outdoor/71702.html. Accessed in July 2015.
NOAA Fisheries Greater Atlantic Regional Fisheries Office, 2020	NOAA Fisheries Greater Atlantic Regional Fisheries Office. (2020). Stellwagen Shipwreck Sites [GIS data]. Available from https://www.fisheries.noaa.gov/resource/map/stellwagen-bank-national-marine-sanctuary-shipwreck-sites. Accessed in December 2021.
NOAA Fisheries, 2014	NOAA Fisheries. (2014). Large Marine Ecosystem Program [GIS data]. NOAA Fisheries, Narragansett Laboratory, Narragansett, RI. Updated 06/26/2014. SDSFIE Version 2.6. www.lme.noaa.gov Contact: Kenneth.Sherman@NOAA.gov.

Text Citation	Full Citation
NOAA Fisheries, 2017	NOAA Fisheries. (2017). Large Marine Ecosystem Program [GIS data]. NOAA Fisheries, Narragansett Laboratory, Narragansett, RI. Available from http://lme.edc.uri.edu/images/Content/Downloads/DigitalData/LME66.zip
NOAA National Database for Deep-Sea Corals and Sponges, 2022	NOAA National Database for Deep-Sea Corals and Sponges (version 20220204-1). Structure-forming Species Query for Deep-water Coral Observations in the Gulf of Mexico (2001-2022). https://deepseacoraldata.noaa.gov/; NOAA Deep Sea Coral Research & Technology Program.
North Carolina Division of Marine Fisheries, 2013	North Carolina Division of Marine Fisheries. (2013). Estuarine Benthic Habitat Mapping (Iteration 1) [GIS data]. Available from http://portal.ncdenr.org/web/mf. Accessed December 2021
North Carolina Division of Marine Fisheries, 2021	North Carolina Division of Marine Fisheries. (2021). Artificial Reef Boundary Areas [GIS data]. Received in 2021.
North Carolina Natural Heritage Program, 2010	North Carolina Natural Heritage Program. (2010). Significant Natural Heritage Areas: Outcrops (vector digital data). Raleigh, NC.
Nova Southeastern University, 2017	Nova Southeastern University. (2017). Hardbottom mapping and community characterization of the West-Central Florida Gulf Coast [GIS data]. Available from https://geodata.myfwc.com/datasets/myfwc::west-florida-shelf-benthic-habitats/about Accessed in January 2022
NRHP, 2017	NRHP. (2017). NRHP National Register of Historic Places; NRHP Eligible National Register of Historic Places-Eligible; NRHP Listed National Register of Historic Places-Listed; NRHP Listed- FORT National Register of Historic Places-Fort; NRHP Listed, ad.res. National Register of Historic Places-Listed address restricted
Office of Response and Restoration-National Oceanic and Atmospheric Administration, 1996	Office of Response and Restoration-National Oceanic and Atmospheric Administration. (1996). Environmental Sensitivity (ESI) Maps—Florida Peninsula [GIS data]. Available from http://response.restoration.noaa.gov/maps-and-spatial-data/download-esi-maps-and-gis-data.html.
Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2007	Office of Response and Restoration-National Oceanic and Atmospheric Administration. (2007). Environmental Sensitivity (ESI) Maps—Alabama. Retrieved from http://response.restoration.noaa.gov/maps-and-spatial-data/download-esi-maps-and-gis-data.html.
Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2010	Office of Response and Restoration - National Oceanic and Atmospheric Administration. (2010). Environmental Sensitivity Maps—Mississippi. Data retrieved from http://response.restoration.noaa.gov/maps-and-spatial-data/download-esi-maps-and-gis-data.html
Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2012	Office of Response and Restoration-National Oceanic and Atmospheric Administration. (2012). Environmental Sensitivity (ESI) Maps—Florida Panhandle [GIS data]. Available from http://response.restoration.noaa.gov/maps-and-spatial-data/download-esi-maps-and-gis-data.html.

Text Citation	Full Citation
Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2013	Office of Response and Restoration-National Oceanic and Atmospheric Administration. (2013). Environmental Sensitivity (ESI) Maps—South Florida Northwest Peninsular. Retrieved from http://response.restoration.noaa.gov/maps-and-spatial-data/download-esi-maps-and-gis-data.html.
Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2014a	Office of Response and Restoration - National Oceanic and Atmospheric Administration. (2014). Environmental Sensitivity Maps—Louisiana. Data retrieved from http://response.restoration.noaa.gov/maps-and-spatial-data/download-esi-maps-and-gis-data.html
Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2014b	National Oceanic and Atmospheric Administration Office of Response and Restoration. (2014). Environmental Sensitivity Maps—Delaware, New Jersey, and Pennsylvania. Data retrieved from http://response.restoration.noaa.gov/maps-and-spatial-data/download-esi-maps-and-gis-data.html
Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2015	Office of Response and Restoration-National Oceanic and Atmospheric Administration. (2015). Environmental Sensitivity (ESI) Maps—Georgia [GIS data]. Available from http://response.restoration.noaa.gov/maps-and-spatial-data/download-esi-maps-and-gis-data.html. Accessed in January, 2017.
Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2015b	Office of Response and Restoration-National Oceanic and Atmospheric Administration. (2015). Environmental Sensitivity (ESI) Maps—South Carolina [GIS data]. Available from http://response.restoration.noaa.gov/maps-and-spatial-data/download-esi-maps-and-gis-data.html.
Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2016a	National Oceanic and Atmospheric Administration Office of Response and Restoration. (2016). Environmental Sensitivity Maps—Chesapeake Bay [GIS data]. Available from http://response.restoration.noaa.gov/maps-and-spatial-data/download-esi-maps-and-gis-data.html
Office of Response and Restoration-National Oceanic and Atmospheric Administration, 2016h	Office of Response and Restoration - National Oceanic and Atmospheric Administration. (2016b). Environmental Sensitivity Maps—Massachusetts and Rhode Island. Data retrieved from http://response.restoration.noaa.gov/maps-and-spatial-data/download-esi-maps-and-gis-data.html
Outdoor Alabama - Alabama Department of Conservation and Natural Resources, 2015	Outdoor Alabama - Alabama Department of Conservation and Natural Resources. (2015). Artificial Reefs [GIS data]. Available from http://www.outdooralabama.com/artificial-reefs. Accessed in July 2015.

Text Citation	Full Citation
Pendleton et al., 2013	Pendleton, E.A., Baldwin, W.E., Barnhardt, W.A., Ackerman, S.D., Foster, D.S., Andrews, B.D., and Schwab, W.C. (2013). Shallow geology, seafloor texture, and physiographic zones of the Inner Continental Shelf from Nahant to northern Cape Cod Bay, Massachusetts: U.S. Geological Survey Open-File Report 2012–1157, 53 p., http://pubs.usgs.gov/of/2012/1157/.
Pendleton et al., 2015	Pendleton, E.A., W.A. Barnhardt, W.E. Baldwin, D.S. Foster, W.C. Schwab, B.D. Andrews, and S.D. Ackerman. (2015). Sea-floor texture and physiographic zones of the inner continental shelf from Salisbury to Nahant, Massachusetts, including the Merrimack Embayment and Western Massachusetts Bay: U.S. Geological Survey Open-File Report 2015–1153, 36 p., 1 appendix, http://dx.doi.org/10.3133/ofr20151153.
Pendleton et al., 2019	Pendleton, E.A., W.E. Baldwin, S.D. Ackerman, D.S. Foster, B.D. Andrews, W.C. Schwab, and L.L. Brothers. (2019). Shallow geology, sea-floor texture, and physiographic zones of the inner continental shelf from Aquinnah to Wasque Point, Martha's Vineyard, and Eel Point to Great Point, Nantucket, Massachusetts: U.S. Geological Survey Open-File Report 2018–1181, 37 p., https://doi.org/10.3133/ofr20181181.
Poppe et al., 2006a	Poppe, L.J., S.D. Ackerman, E.F. Doran, M.S. Moser, H.F. Stewart, N.A. Forfinski, U.L. Gardner, and J.A. Keene. (2006). Geologic Interpretation and Multibeam Bathymetry of the Sea Floor in Southeastern Long Island Sound [GIS data]. U.S. Geological Survey Open-File Report 2006-1059, 1 DVD-ROM.
Poppe et al., 2006b	Poppe, L.J., V.F. Paskevich, B. Butman, S.D. Ackerman, W.W. Danforth, D.S. Foster, and D.S. Blackwood. (2006). Geological Interpretation of Bathymetric and Backscatter Imagery of the Sea Floor Off Eastern Cape Cod, Massachusetts [GIS data]. U.S. Geological Survey Open-File Report 2005-1048, 1 DVD-ROM.
Poppe et al., 2007a	Poppe, L.J., J.F. Denny, S.J. Williams, M.S. Moser, N.A. Forfinski, H.F. Steward, and E.F. Doran. (2007). The Geology of Six Mile Reef, Eastern Long Island Sound [GIS data]. U.S. Geological Survey Open-File Report 2007-1191, 1 DVD-ROM.
Poppe et al., 2007b	Poppe, L.J., M.L. DiGiacomo-Cohen, E.F. Doran, S.M. Smith, H.F. Stewart, and N.A. Forfinski. (2007). Geologic Interpretation and Multibeam Bathymetry of the Sea Floor in the Vicinity of the Race, Eastern Long Island Sound [GIS data]. U.S. Geological Survey Open-File Report 2007-1012, 1 DVD-ROM.
Poppe et al., 2011a	Poppe, L.J., McMullen, K.Y., Ackerman, S.D., Blackwood, D.S., Irwin, B.J., Schaer, J.D., and Forrest, M.R. (2011). Sea-Floor geology and character of eastern Rhode Island Sound west of Gay Head, Massachusetts. U.S. Geological Survey Open-File Report 2011–1004, DVD-ROM. (Also available online at https://pubs.usgs.gov/of/2011/1004)
Poppe et al., 2011b	Poppe, L.J., K.Y. McMullen, S.D. Ackerman, D.S. Blackwood, J.D. Schaer, M.R. Forrest, A.J. Ostapenko, and E.F. Doran. (2011). Sea-floor geology and topography offshore in Eastern Long Island Sound [GIS data]. U.S. Geological Survey Open-File Report 2010–1150, DVD-ROM. (Also available at https://pubs.usgs.gov/of/2010/1150)
Poppe et al., 2012	Poppe, L.J., K.Y. McMullen, S.D. Ackerman, J.D. Schaer, and D.B. Wright. (2012). Sea-floor geology and sedimentary processes in the vicinity of Cross Rip Channel, Nantucket Sound, offshore southeastern Massachusetts [GIS data]. U.S. Geological Survey Open-File Report 2011–1222, DVD-ROM. (Also available at https://pubs.usgs.gov/of/2011/1222/)
Poppe et al., 2013a	Poppe, L.J., K.Y. McMullen, S.D. Ackerman, and K.A. Glomb. (2013). Sea-floor geology and topography offshore in northeastern Long Island Sound [GIS data]. U.S. Geological Survey Open-File Report 2013–1060, DVD-ROM, http://dx.doi.org/10.3133/ofr20131060
Poppe et al., 2013b	Poppe, L.J., McMullen, K.Y., Ackerman, S.D., Guberski, M.R., and Wood, D.A. (2013). Sea-floor character and geology off the entrance to the Connecticut River, northeastern Long

Text Citation	Full Citation
	Island Sound: U.S. Geological Survey Open-File Report 2012–1103 DVD-ROM. (Also available at http://pubs.usgs.gov/of/2012/1103/)
Poppe et al., 2014	Poppe, L.J., W.W. Danforth, K.Y. McMullen, M.A. Blakenship, K.A. Glomb, D.B. Wright, and S.M. Smith. (2014). Sea-floor character and sedimentary processes of Block Island Sound, offshore Rhode Island (ver.1.1, August 2014) [GIS data]: U.S. Geological Survey Open-File Report 2012–1005, http://pubs.usgs.gov/of/2012/1005/.
Poppe, 2010	Poppe, L. (2010). H11251_INTERP.SHP: Interpretation of Bottom Features from National Oceanic and Atmospheric Administration (NOAA) Survey H11251 Offshore of Rocky Point, New York (Geographic, WGS84) [GIS data]. Open-File Report. U.S. Geological Survey, Coastal and Marine Geology Program: Woods Hole Coastal and Marine Science Center. Available from http://pubs.usgs.gov/of/2010/1007/data/interpret/h11251_interp.zip accessed in December 2014.
Reed et al., 2013	Reed, J.K., C. Messing, B.K. Walker, et al. (2013). Habitat characterization, distribution, and areal extent of deep-sea coral ecosystems off Florida, Southeastern U.S.A. Caribbean Journal of Science. 47 (1): 13-30.
Rhode Island Artificial Reef Program, 2015	Rhode Island Artificial Reef Program. (2015). Artificial reef off Newport and Block Island [GIS data]. Available from http://www.risaa.org/reefs.html. Accessed in July 2015.
Scanlon et al., 1999	Scanlon, K. M., P. R. Briere, and C. C. Koenig. (1999). Oculina Bank: Sidescan sonar and sediment data from a deep-water coral reef habitat off east-central Florida. USGS Open-File Report 99-10, Available from http://pubs.usgs.gov/of/1999/of99-010/htm/einterp.htm accessed in June 2015.
Scanlon et al., 2003	Scanlon, K.M., S.D. Ackerman, and J.E. Rozycki. (2003). Texture, Carbonate Content, and Preliminary Maps of Surficial Sediments of the Flower Garden Banks Area, Northwestern Gulf of Mexico Outer Shelf. [GIS data]. U.S. Geological Survey Open File Report OFR 03-002. Woods Hole, MA. Accessed from http://pubs.usgs.gov/of/2003/of03-002/ in December 2014.
Simonsen, 2000	Simonsen, S. (2000). Diving & snorkeling: Puerto Rico [GIS data]. Melbourne, Australia: Lonely Planet Publications.
Skidaway Institute of Oceanography, 2004	Skidaway Institute of Oceanography. (2004). Base geology: Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute. GIS data available upon request from GISLibrarian@MyFWC.com.
South Carolina Department of Natural Resources, 2016	South Carolina Department of Natural Resources. (2016). SCDNRoyster2015Live, 2015 Live Edition [GIS data].
South Carolina Department of Natural Resources, 2021	South Carolina Department of Natural Resources. (2021). South Carolina Artificial Reef Areas [GIS data].
Sowers, 2020	Sowers, D. (2020). 35 Meter Resolution Multibeam Sonar Bathymetric Synthesis, Backscatter Intensity Mosaics, and Geomorphic Landforms of the Blake Plateau. NOAA Office of Ocean Exploration and Research. Durham, NH.
Spalding et al., 2010	Spalding M., M. Kainuma, and L. Collins. (2010). World Atlas of Mangroves (version 3.1) [GIS data]. A collaborative project of ITTO, ISME, FAO, UNEP-WCMC, UNESCO-MAB, UNU-INWEH and TNC. London (UK): Earthscan, London. 319 pp. URL:

Text Citation	Full Citation
	http://www.routledge.com/books/details/9781844076574, Data DOI: https://doi.org/10.34892/w2ew-m8
State of Delaware, 2020	State of Delaware. (2020). Artificial Reef Boundaries [GIS data]. Received 2021.
Texas Parks and Wildlife Department, 2012a	Texas Parks and Wildlife Department. (2012). Seagrass Viewer [GIS data]. Available from https://tpwd.texas.gov/landwater/water/habitats/seagrass/ Accessed in summer 2012.
Texas Parks and Wildlife Department, 2021	Texas Parks and Wildlife Department. (2021). Texas Artificial Reef Site Boundaries. Received from Dr. Brooke Shipley on 30 August, 2021.
Todd & Courtney, 2014	Todd, B.J., and R.C. Courtney. (2014). Backscatter strength and shaded seafloor relief, Georges Bank, Fundian Channel and Northeast Channel; Gulf of Maine; Geological Survey of Canada, Open File 7243, scale 1:50,000. Doi: 10.4095/293641
Todd & Kostylev, 2011	Todd, B.J., and V.E. Kostylev. (2011). Surficial geology and benthic habitat of the German Bank seabed, Scotian Shelf, Canada [GIS data]. Continental Shelf Research (Vol. 31, pp. S54-S68).
Todd, 2006	Todd, B.J. (2006). Surficial geology polygons, Browns Bank 2006, Gulf of Maine, Scotian Shelf, offshore Nova Scotia, Canada [GIS data]. Unpublished material.
U.S. Army Corp of Engineers, 2009	U.S. Army Corp of Engineers. (2009). Final Integrated General Evaluation Report and Environmental Impact Statement on Shore Protection for West Onslow Beach and New River Inlet (Topsail Beach), North Carolina [GIS data].
U.S. Army Corp of Engineers, 2021	U.S. Army Corp of Engineers. (2021). USACE Borrow Areas [GIS data]. Available from https://geospatial-usace.opendata.arcgis.com/datasets/. Accessed in January 2022.
U.S. Department of the Navy, 2002	U.S. Department of the Navy. (2002). SINKEX shipwrecks around Puerto Rico. GIS data reported in the 2002 Marine Resource Assessment for Puerto Rico/St. Croix operating area.
U.S. Department of the Navy, 2010	U.S. Department of the Navy. (2010). JAX OPAREA USWTR Bottom Mapping and Habitat Characterization, Florida. Final Cruise Report [GIS data]. Norfolk, Virginia: Naval Facilities Engineering Command Atlantic.
U.S. Department of the Navy, 2011a	U.S. Department of the Navy. (2011). CC Range Bottom Mapping and Habitat Characterization: Final Cruise Report [GIS data]. Norfolk, VA: Naval Facilities Engineering Command Atlantic. 112 pages.
U.S. Department of the Navy, 2011b	U.S. Department of the Navy. (2011). Jacksonville USWTR Nearshore Bottom Mapping, Final Descriptive Report: Nearshore Trunk Cable Corridor [GIS data]. Norfolk, Virginia: Naval Facilities Engineering Command Atlantic. 149 pages.
U.S. Department of the Navy, 2015	U.S. Department of the Navy. (2015) Major Ocean Current [GIS data]. Navy POC: David Urbik (David.urbik.ctr@navy.mil).
U.S. Department of the Navy, 2016zo	U.S. Department of the Navy. (2016). Sediment Enhanced Global, Subset for AFTT study area. GIS data available from Naval Oceanographic Office, and created on September 22, 2016.
U.S. Department of the Navy, 2022	U.S. Department of the Navy. (2022). Sediment Enhanced Global, Subset for AFTT study area [GIS data]. Available from Naval Oceanographic Office, accessed in January 2022.
U.S. Environmental Protection Agency, 2010h	U.S. Environmental Protection Agency. (2010). Mapping of water and sediment quality from EPA's National Coastal Condition Assessment [GIS data]. Available from https://www.epa.gov/national-aquatic-resource-surveys/data-national-aquatic-resource-surveys

Text Citation	Full Citation
U.S. Geological Survey & S.C. Sea Grant Consortium, 2007	U.S. Geological Survey, & S.C. Sea Grant Consortium. (2007). SEAFLOORENV - Distribution of Seafloor Environments within the inner shelf of Long Bay, South Carolina [GIS data]. Online linkage to larger work: http://pubs.usgs.gov/of/2005/1346/.
U.S. Geological Survey, 2005	U.S. Geological Survey. (2005). Interpretation of the surficial geology of the Pulley Ridge study area [GIS data]. Available from http://pubs.usgs.gov/of/2005/1089/data/interpretation/pulley_interp.zip Accessed in June 2018.
UNEP-WCMC & Short, 2021	UNEP-WCMC and F.T. Short. (2021). Global distribution of seagrasses (version 7.1) [GIS data]. Seventh update to the data layer used in Green and Short (2003). Cambridge (UK): UN Environment Programme World Conservation Monitoring Centre. Data DOI: https://doi.org/10.34892/x6r3-d211
UNEP-WCMC et al., 2021	UNEP-WCMC, WorldFish Centre, WRI, TNC (2021). Global distribution of coral reefs, compiled from multiple sources including the Millennium Coral Reef Mapping Project [GIS data]. Version 4.1, updated by UNEP-WCMC. Includes contributions from IMaRS-USF and IRD (2005), IMaRS-USF (2005) and Spalding et al. (2001). Cambridge (UK): UN Environment Programme World Conservation Monitoring Centre. Data DOI: https://doi.org/10.34892/t2wk-5t34
University of Florida, 2016	University of Florida. (2016). Spatial distribution of intertidal oyster reef in the St. Johns River [GIS metadata]. Available from http://data.floridaswater.opendata.arcgis.com/datasets/7779f2353b644d6cb513fe2649e4d74b_0. Access in December 2016.
University of South Florida, 2017	University of South Florida. (2017). Benthic habitat mapping, characterization, and Assessment of the West Florida Shelf from Pensacola to north of the Dry Tortugas, Florida. Status report available at http://www.nfwf.org/gulf/Documents/fl-benthic-mapping-
Valentine, 2005	Valentine, P.C. (2005). Sea floor image maps showing topography, sun-illuminated topography, backscatter intensity, ruggedness, slope, and the distribution of boulder ridges and bedrock outcrops in the Stellwagen Bank National Marine Sanctuary region off Boston, Massachusetts [GIS data]. U.S. Geological Survey Scientific Investigations Map 2840. Available online at http://pubs.usgs.gov/sim/2005/2840/.
Veridian Corporation, 2001	Veridian Corporation. (2001). The global maritime wreck database [GIS data]. Falls Church, Virginia: General Dynamics Corporation.
Virginia Institute of Marine Science, 2019	Virginia Institute of Marine Science. (2019). Chesapeake Bay SAV Annual Monitoring GIS Dataset (2019 data) [GIS data]. Available from https://mobjack.vims.edu/sav/gisdata/sav2019.zip
Virginia Marine Resources Commission, 2021	Virginia Marine Resources Commission. (2021). Virginia Artificial Reef Boundaries [GIS polygon data]. Received from Alicia Nelson on 24 September, 2021.
Walker et al., 2006	Walker, B. K., Dodge, R. E., & Gilliam, D. S. (2006). Coral Reef Burial in Southeast Florida [GIS data]. Global Challenges Facing Oceanography and Limnology, American Society of Limnology and Oceanography, Victoria, British Colombia, Canada. June 4-9
War Grave, no date	War Grave. (no date). NRHP shipwreck datasets from the AFTT contractor for Phase III EIS/OEIS [GIS data].
Ward et al., 2021	Ward, L.G., McAvoy, Z.S., Vallee-Anziani, M., and Morrison, R.C., 2021, Surficial Geology of the Continental Shelf off New Hampshire: Morphologic Features and Surficial Sediment: BOEM/New Hampshire Cooperative Agreement (Contract M14ACOOO10) Technical Report, Department of Interior, Bureau of Ocean Energy Management, Marine Minerals Division, 45600 Woodland Road, Sterling, VA,

Text Citation	Full Citation
	20166, 184pp. https://dx.doi.org/10.34051/p/2021.31
Waterproof Charts Inc., 1998	Waterproof Charts Inc. (1998). Waterproof Chart #53F: Eastern Puerto Rico to St. Thomas–fishing [GIS data]. Punta Gorda, Florida: Waterproof Charts, Inc.
Willson, 2009	Willson, K. (2009). Shoreface mapping and sand resource inventory: North Topsail Beach and Surf City, North Carolina. Masters Thesis submitted to the University of North Carolina Wilmington, Department of Geography and Geology. 115 pages.