# Draft

# Supplemental Environmental Impact Statement/
# Overseas Environmental Impact Statement
# Atlantic Fleet Training and Testing

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# 3.8 Reptiles

**REPTILES SYNOPSIS**

The Action Proponents considered the stressors to reptiles that could result from the Proposed Action in the Study Area. The following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Acoustic: Reptiles may be exposed to multiple acoustic stressors, including sonars and other transducers (hereafter called sonars), air guns, pile driving, vessel, aircraft, and weapons noise. Reptiles may be affected by a limited portion of acoustic stressors due to limited hearing abilities. Exposures to sound-producing activities may cause auditory masking, physiological stress, or minor behavioral responses, while non-auditory injury and mortality are unlikely to occur under realistic conditions. Exposures to some sonars, air guns, and pile driving may also affect hearing (temporary threshold shift [TTS] or auditory injury [AINJ]) and cause significant behavioral reactions. The number of auditory and significant behavioral reactions are estimated for each sea turtle species. Sea turtles would be exposed to acoustic stressors in the inshore and offshore portions of the Study Area, while crocodilians and terrapins would be exposed at inshore locations. Most activities involving acoustic stressors would be temporary and localized. Effects such as hearing loss or behavioral responses are expected to have a minor to moderate impact on individuals. Overall, long-term consequences for reptile populations are not expected.
- Explosive: Explosions in the water or near the water surface may cause auditory effects (TTS or AINJ), auditory masking, physiological stress, and behavioral reactions. Reptiles located in close proximity to explosions in the water or near the water surface can be injured or killed due to the shock waves produced by explosives. The number of auditory (TTS and AINJ), non-auditory injury (injury and mortality), and significant behavioral impacts are estimated for each sea turtle species. Sea turtles would be exposed to explosive stressors in the inshore and offshore portions of the Study Area, while crocodilians and terrapins would be exposed to explosive stressors at inshore locations. The time scale of individual explosions is very limited, and military readiness activities involving explosions are dispersed in space and time. Effects such as hearing loss or behavioral responses are expected to have a minor to moderate impact on individuals. More severe impacts (e.g., injury and mortality) could lead to permanent effects and have a moderate impact on individuals. Overall, long-term consequences for reptile populations are not expected.
- Energy: The impact of energy stressors on reptiles is expected to be negligible based on (1) Magnetic fields generated by electromagnetic devices used in military readiness activities are of relatively minute strength and generate relatively week electromagnetic energy. Reptile reactions to fields and electrical pulses may include no reaction, avoidance, habituation, changes in activity level, or attraction, but effects would only occur near the source where an individual reptile may be but population-level impacts are unlikely;

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**REPTILES SYNOPSIS**

Energy (continued): (2) high-energy lasers would only be used in open-ocean areas, so is not anticipated to impact crocodilians and terrapins as they would not occur where high-energy lasers are used; and (3) high-energy lasers are directed at surface targets and are designed to disable surface targets and turn off when they lose track of the target. The impacts of energy stressors would be limited to individual cases where a sea turtle might become temporarily disoriented or be injured. In addition, high-energy laser systems used automatically shut down when the target-lock is lost. Although a small number of individuals may be impacted by energy stressors, no population-level impacts would occur.

- Physical disturbance and strike: Vessels, in-water devices, military expended materials, and seafloor devices present a risk for physical disturbance and collision with reptiles. Because of the low numbers of reptiles potentially impacted by activities that may potentially cause a physical disturbance and strike, population-level effects are unlikely. Further, mitigation implemented in nearshore waters that protects critical habitat and limits vessel activities within aquatic vegetation habitat (i.e., *Sargassum*), would minimize the potential of physical disturbance or strike to reptiles.

- Entanglement: Sea turtles could be exposed to multiple entanglement stressors within the inshore and offshore training and testing locations. Entanglement stressors are not anticipated to impact crocodilians or terrapins because activities that expend materials that present a potential entanglement risk would not occur within crocodilian or terrapin habitats. The potential for impacts to sea turtles is dependent on the physical properties of the expended materials and the likelihood that a sea turtle would encounter a potential stressor and then become entangled in it. Physical characteristics of wires and cables, decelerators/parachutes, and biodegradable polymers combined with the sparse distribution of these items throughout the Study Area indicates a very low potential for sea turtles to encounter and become entangled in them. Long-term impacts on individual reptiles and reptile populations from entanglement stressors associated with military readiness activities are not anticipated.

  Ingestion: Military readiness activities have the potential to expose reptiles to multiple ingestion stressors and associated impacts within the inshore and offshore training and testing locations. The likelihood and magnitude of impacts depends on the physical properties of the military expended items and the feeding behaviors of the particular species of reptiles that occur in specific areas where potentially ingestible items are used. Adverse impacts from ingestion of military expended materials would be limited to the unlikely event that a reptile would be harmed by ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system. The likelihood that a reptile would encounter and subsequently ingest a military expended item associated with military readiness activities is considered low and long-term consequences to reptile populations are not anticipated.

## 3.8.1 INTRODUCTION

The following sections provide an overview of reptiles found in the Study Area and the potential of the proposed training and testing activities on reptiles. Impacts to reptiles from the Proposed Action were analyzed in the 2018 *Final Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (hereinafter referred to as the 2018 Final EIS/OEIS).

## 3.8.2 AFFECTED ENVIRONMENT

The affected environment provides context for evaluating the effects of the Action Proponents' military readiness activities to impact reptiles. With noted exceptions, the general background for reptiles in the Study Area is not meaningfully different from what is described in the 2018 Final EIS/OEIS. See Appendix F (Biological Resources Supplemental Information) for detailed information on the affected environment of reptiles. The details are specified in this section when they directly affect the analysis.

The Study Area is generally consistent with that analyzed in the 2018 Final EIS/OEIS. Additions to the Study Area include pierside training and testing events and transit along established navigation channels from pierside locations to offshore range complexes in the Gulf of Mexico. United States (U.S.) Coast Guard activities are similar in nature to Navy activities and fall under the same stressor categories.

### 3.8.2.1 General Background

Reptiles evaluated in this Supplemental Environmental Impact Statement (EIS)/Overseas EIS (OEIS) include sea turtles—green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), loggerhead sea turtle (*Caretta caretta*), and leatherback sea turtle (*Dermochelys coriacea*); crocodilians—American crocodile (*Crocodylus acutus*) and American alligator (*Alligator mississippiensis*); and the diamondback terrapin (*Malaclemys terrapin*). There is updated information regarding density distribution and abundance, population status, group size, habitat use, movement and behavior, and general threats to species in the Study Area.

#### 3.8.2.1.1 Group Size

Group size for sea turtles can vary from solitary to large groups during foraging, mating, and nesting. Crocodilians will gather in groups to defend against predators as juveniles and during courtship and feeding as adults. Diamondback terrapins may hibernate individually or in large groups.

Updated information includes grouping behavior for sea turtles during nesting, foraging, and mating seasons as well as observations of multi-species communities of sea turtles foraging together in the northern Gulf of Mexico.

#### 3.8.2.1.2 Habitat Use

Habitat use by sea turtles includes sandy beaches for nesting and water column and sea floor for diving, foraging, mating, and migration. Crocodilians utilize wetland edges on dry land for nesting and hunt and stock prey within brackish and fresh water estuarine habitats. Diamondback terrapins lay eggs on land, but remaining time is spent in coastal swamp, estuarine, lagoon, tidal creek, mangrove, and salt marsh habitats. Updated information includes the following:

- In 2022, the Naval Undersea Warfare Center Division Newport, Rhode Island provided updated density models for green, Kemp's ridley, leatherback, and loggerhead sea turtles in the Atlantic Ocean spanning from the northern Florida Keys to the Gulf of Maine and out to the United States Exclusive Economic Zone.

- In 2022, density models were produced for green, Kemp's ridley, leatherback, and loggerhead sea turtle populations in the Gulf of Mexico.
- Observed habitat use as highly dependent on sea turtles' species and life stages.
- Updated research on overall habitat use and nesting ground preferences of sea turtles.

#### 3.8.2.1.3 Dive Behavior

Movement and behavior as described for reptiles includes migration patterns and seasons as well as dive behavior during foraging, resting, and migrating. Updated information includes the following:

- Sea turtle dive depth and duration by species, age, location of animal, and activity (e.g., foraging, mating, and resting) in the Gulf of Mexico.
- Diving behavior and its implications for mitigation, monitoring, and development of sound conservation strategies.

#### 3.8.2.1.4 Hearing and Vocalization

Information on hearing and vocalization in reptiles has changed since the publication of the 2018 Final EIS/OEIS. See Appendix D (Acoustic and Explosive Impacts Supporting Information) of this Supplemental EIS/OEIS for detailed information.

#### 3.8.2.1.5 General Threats

General threats to reptiles include water quality impacts, commercial and recreational fishing industries, disease and parasites, invasive species, climate change, and marine debris. Updated information includes the following:

- Plastic pollution as a threat to sea turtle species.
- Impacts of recreational fisheries on sea turtle species as a result of bycatch and entanglement.
- Updated reports of boat strikes, particularly to sea turtles in the Gulf of Mexico.

### 3.8.2.2 Endangered Species Act-Listed Species

Table 3.8-1 shows the ESA-listed reptiles that occur in the Study Area. Figure 3.8-1 through Figure 3.8-11 show the designated and proposed critical habitat for reptile species in or near the Study Area. Changes in the ESA listings and critical habitat designations since the 2018 Final EIS/OEIS include:

- Proposed rule to designate marine critical habitat for six distinct population segments of green sea turtles on July 19, 2023 (88 *Federal Register* 46572).

Table 3.8-1: Status and Occurrence of Endangered Species Act-Listed Reptiles in the Study Area

| *Species Name and Regulatory Status* | | | *Species Occurrence in the Study Area* | | |
|---|---|---|---|---|---|
| ***Common Name*** | ***Scientific Name*** | ***ESA Status/Critical Habitat*** | ***Range Complex/Testing Range*** | ***Range Complex Inshore Areas*** | ***Piers/Ports/Coast Guard Stations*** |
| **Family Cheloniidae (hard-shelled sea turtles)** | | | | | |
| Green sea turtle (North Atlantic DPS) | *Chelonia mydas* | Threatened[1]/ Designated and Proposed | All locations[4] | All locations[4] | Pierside<br>NSB New London; NS Newport; NS Norfolk; JEB Little Creek; Norfolk Naval Shipyard; NSB Kings Bay[4]; NS Mayport[4]; Port Canaveral<br><br>Civilian Ports<br>Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC[4]; Wilmington, NC[4]; Kings Bay, GA[4]; Savannah, GA; Mayport, FL[4]; Port Canaveral, FL[4]; Tampa, FL[4]; Beaumont, TX; Corpus Christi, TX; Pascagoula, MS; Gulfport, MS<br><br>Coast Guard Stations<br>Boston, MA; New London, CT; Newport, RI; Montauk, NY; Atlantic City, NJ; Virginia Beach, VA; Portsmouth, VA; Elizabeth City, NC; Charleston, SC; Mayport, FL[4]; Cape Canaveral, FL[4]; Fort Pierce, FL[4]; Dania, FL[4];Miami, FL[4]; Key West, FL[4]; St. Petersburg, FL[4]; Pensacola, FL[4]; New Orleans, LA[4]; Corpus Christi, TX[4] |
| Hawksbill sea turtle | *Eretmochelys imbricata* | Endangered/ Designated | JAX RC; JAX Inshore RC; SFOMF; Key West RC; GOMEX RC; Naval Surface Warfare Center, Panama City Division Testing Range; Other AFTT Areas | JAX RC Inshore; Key West RC Inshore; GOMEX RC Inshore | Pierside<br>NS Mayport; Port Canaveral<br><br>Civilian Ports<br>Mayport, FL; Port Canaveral, FL; Tampa, FL; Pascagoula, MS; Gulfport, MS; Beaumont, TX; Corpus Christi, TX<br><br>Coast Guard Stations<br>Mayport, FL; Cape Canaveral, FL; Fort Pierce, FL; Dania, FL; Miami, FL; Key West, FL; St. |

**Table 3.8-1: Status and Occurrence of Endangered Species Act-Listed Reptiles in the Study Area (continued)**

| *Species Name and Regulatory Status* | | | *Species Occurrence in the Study Area* | | |
|---|---|---|---|---|---|
| ***Common Name*** | ***Scientific Name*** | ***ESA Status/Critical Habitat*** | ***Range Complex/Testing Range*** | ***Range Complex Inshore Areas*** | ***Piers/Ports/Coast Guard Stations*** |
| | | | | | Petersburg, FL; Pensacola, FL; Corpus Christi, TX |
| Kemp's ridley sea turtle | *Lepidochelys kempii* | Endangered/ None | All locations | All locations | Pierside<br>NSB New London; NS Newport; JEB Little Creek; NS Norfolk; Norfolk Naval Shipyard; NSB Kings Bay; NS Mayport; Port Canaveral<br><br>Civilian Ports<br>Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC;<br>Wilmington, NC; Kings Bay, GA; Savannah, GA; Mayport, FL; Port Canaveral, FL; Tampa, FL; Pascagoula, MS; Gulfport, MS; Beaumont, TX; Corpus Christi, TX<br><br>Coast Guard Stations<br>Boston, MA; Montauk, NY; Atlantic City, NJ; New London, CT; Newport, RI; Virginia Beach, VA; Portsmouth, VA; Mayport, FL; Port Canaveral, FL; Fort Pierce, FL; Dania, FL<br>Miami, FL; Key West, FL; St. Petersburg, FL; Pensacola, FL; New Orleans, LA; Corpus Christi, TX |
| Loggerhead sea turtle (Northwest Atlantic Ocean DPS) | *Caretta caretta* | Threatened[2]/ Designated | All locations | All locations | Pierside<br>JEB Little Creek; NS Norfolk; Norfolk Naval Shipyard; NSB Kings Bay[5]; NS Mayport[5]; Port Canaveral[5]<br><br>Civilian Ports<br>Boston, MA; Earle, NJ; Delaware Bay, DE; Hampton Roads, VA; Morehead City, NC[5]; Wilmington, NC[5]; Kings Bay, GA[5]; Savannah, GA[5]; Mayport, FL[5]; Port Canaveral, |

**Table 3.8-1: Status and Occurrence of Endangered Species Act-Listed Reptiles in the Study Area (continued)**

| *Species Name and Regulatory Status* | | | *Species Occurrence in the Study Area* | | |
|---|---|---|---|---|---|
| ***Common Name*** | ***Scientific Name*** | ***ESA Status/Critical Habitat*** | ***Range Complex/Testing Range*** | ***Range Complex Inshore Areas*** | ***Piers/Ports/Coast Guard Stations*** |
| | | | | | FL[5]; Tampa, FL[5]; Pascagoula, MS; Gulfport, MS; Beaumont, TX[5]; Corpus Christi, TX[5]<br><br>Coast Guard Stations<br>Boston, MA; Newport, RI; Montauk, NY; Atlantic City, NJ; Virginia Beach, VA; Portsmouth, VA; Charleston, SC; Mayport, FL[5]; Cape Canaveral, FL[5]; Fort Pierce, FL[5]; Dania, FL[5]; Miami, FL[5]; Key West, FL[5]; St. Petersburg, FL[5]; Pensacola, FL[5]; New Orleans, LA[5]; Corpus Christi, TX[5] |
| **Family Dermochelyidae (leatherback sea turtle)** | | | | | |
| Leatherback sea turtle | *Dermochelys coriacea* | Endangered/ Designated | All locations | All locations | Pierside<br>NS Mayport; Port Canaveral<br><br>Civilian Ports<br>Delaware Bay, DE; Hampton Roads, VA; Hampton Roads, VA; Morehead City, NC; Wilmington, NC; Mayport, FL; Port Canaveral, FL<br><br>Coast Guard Stations<br>Virginia Beach, VA; Mayport, FL; Cape Canaveral, FL; Fort Pierce, FL; Dania, FL; Miami, FL; Key West, FL; St. Petersburg, FL; Pensacola, FL |
| **Family Crocodylidae (true crocodiles)** | | | | | |
| American crocodile | *Crocodylus acutus* | Threatened/ Designated | SFOMF (nearshore ocean only) | Key West RC Inshore | Pierside<br>-<br><br>Civilian Ports<br>Tampa, FL<br><br>Coast Guard Stations<br>Fort Pierce, FL; Dania, FL; Miami, FL; St. Petersburg, FL |
| American alligator | *Alligator mississippiensis* | Threatened due to | N/A | VACAPES RC Inshore; Navy | Pierside<br>NSB Kings Bay; NS Mayport; |

## Table 3.8-1: Status and Occurrence of Endangered Species Act-Listed Reptiles in the Study Area (continued)

| ***Species Name and Regulatory Status*** | | | ***Species Occurrence in the Study Area*** | | |
|---|---|---|---|---|---|
| ***Common Name*** | ***Scientific Name*** | ***ESA Status/Critical Habitat*** | ***Range Complex/Testing Range*** | ***Range Complex Inshore Areas*** | ***Piers/Ports/Coast Guard Stations*** |
| | | similarity of appearance[3]/ None | | Cherry Point RC Inshore; JAX RC Inshore; Key West RC Inshore; GOMEX RC Inshore | Port Canaveral<br><br>Civilian Ports<br>Wilmington, NC; Kings Bay, GA; Savannah, GA; Mayport, FL; Port Canaveral, FL; Tampa, FL; Beaumont, TX; Corpus Christi, TX<br><br>Coast Guard Stations<br>Charleston, SC; Mayport, FL; Cape Canaveral, FL; Fort Pierce, FL; Dania, FL; Miami, FL; St. Petersburg, FL; Pensacola, FL; New Orleans, LA; Corpus Christi, TX |

[1] On April 6, 2016, NMFS and the USFWS listed the Central West Pacific, Central South Pacific, and Mediterranean distinct population segments as endangered, while listing the other eight distinct population segments (Central North Pacific, East Indian-West Pacific, East Pacific, North Atlantic, North Indian, South Atlantic, Southwest Indian, and Southwest Pacific) as threatened. The Study Area shares portions of the geographic extents identified for the North Atlantic distinct population segment, including breeding populations along the U.S. Atlantic and Gulf of Mexico coasts. The green sea turtle has proposed and designated critical habitat in the Study Area (88 *Federal Register* 46572).

[2] On September 22, 2011, NMFS and the USFWS listed the North Pacific Ocean, South Pacific Ocean, North Indian Ocean, Northeast Atlantic Ocean, and Mediterranean Sea distinct population segments of the loggerhead sea turtle as endangered under the ESA, while the other four distinct population segments (the Southeast Indo-Pacific Ocean, Southwest Indian Ocean, Northwest Atlantic Ocean, and South Atlantic Ocean) are listed as threatened. The Study Area shares portions of the geographic extents identified for the Northwest Atlantic Ocean distinct population segment.

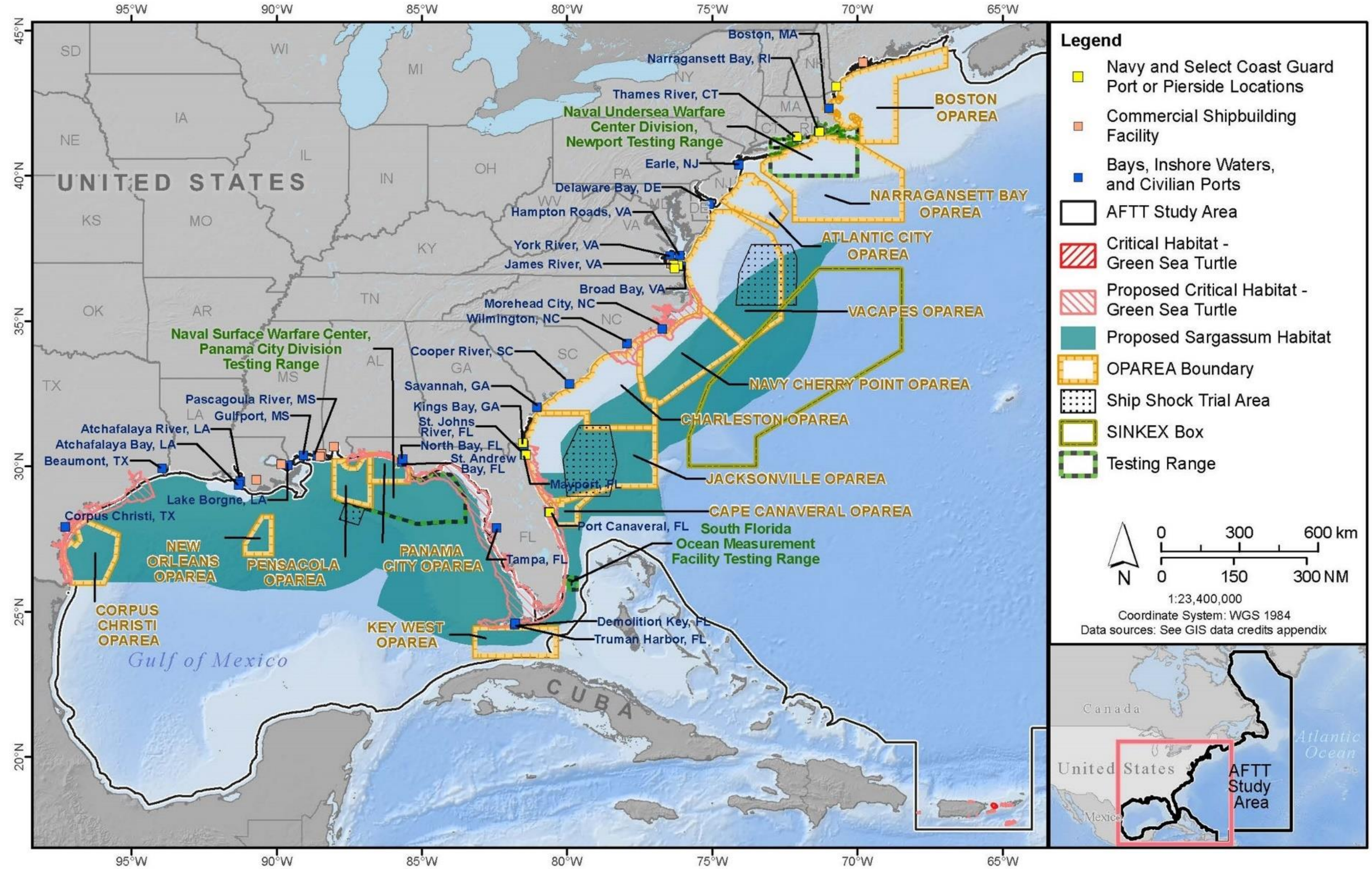
[3] The American alligator is listed under the ESA classification of “threatened due to similarity of appearance” to the American crocodile.

[4] Intersects with proposed green sea turtle critical habitat as shown in Figure 3.8-1 through Figure 3.8-4.

[5] Intersects with species’ designated critical habitat.

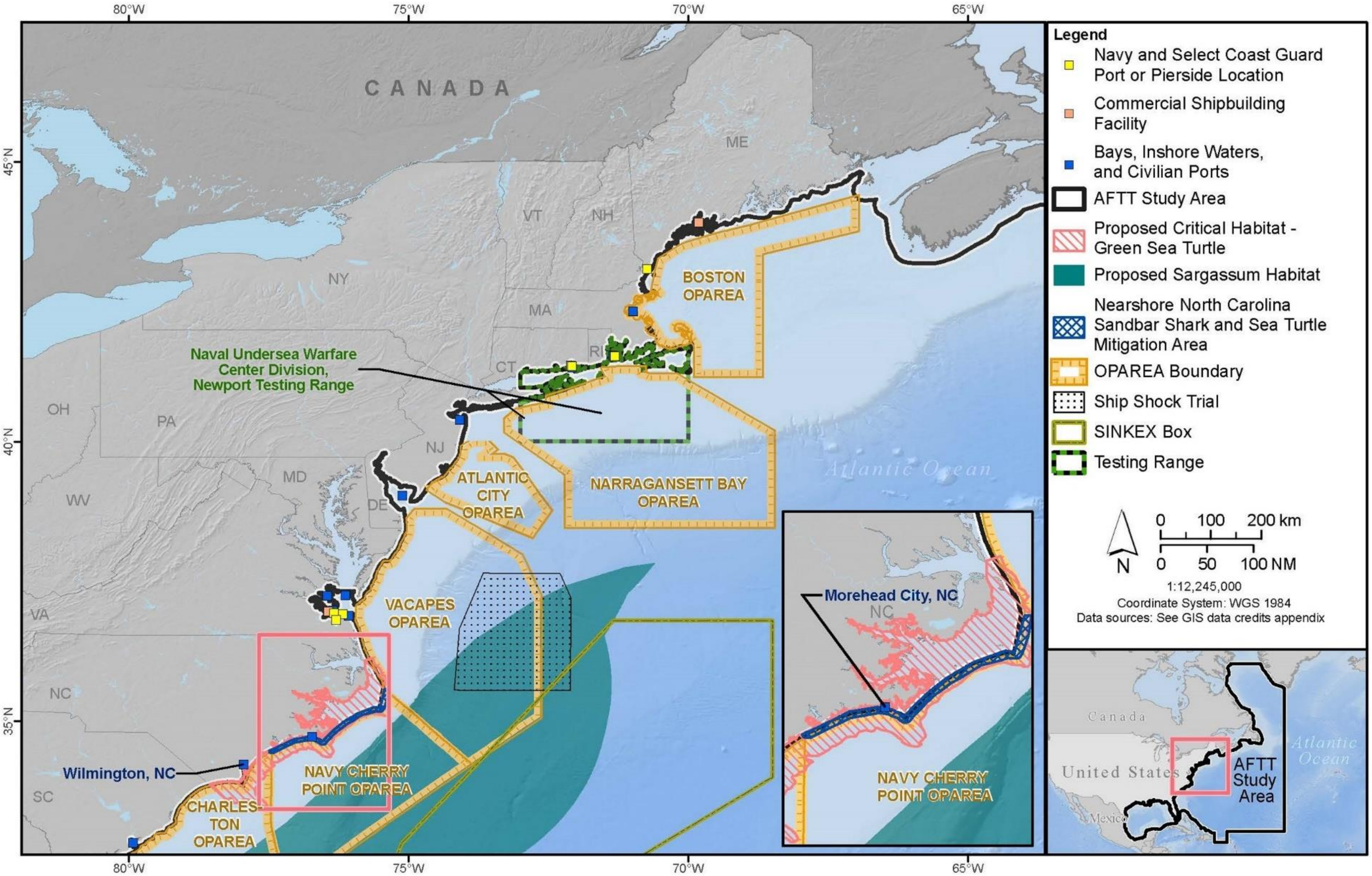
Sources: 35 *Federal Register* 8491, 35 *Federal Register* 18319, 41 *Federal Register* 41914, 43 *Federal Register* 32800, 43 *Federal Register* 43688; 44 *Federal Register* 17710, 44 *Federal Register* 75074, 52 *Federal Register* 21059, 63 *Federal Register* 46693, 76 *Federal Register* 58868. 79 *Federal Register* 39856, 79 *Federal Register* 51264, 81 *Federal Register* 20057, 85 *Federal Register* 48332.

Notes: DPS = Distinct Population Segment; ESA = Endangered Species Act; GOMEX = Gulf of Mexico; JAX = Jacksonville; N/A = not applicable; NMFS = National Marine Fisheries Service; NS = Naval Station; NSB = Naval Submarine Base; RC = Range Complex; U.S. = United States; USFWS = U.S. Fish and Wildlife Service



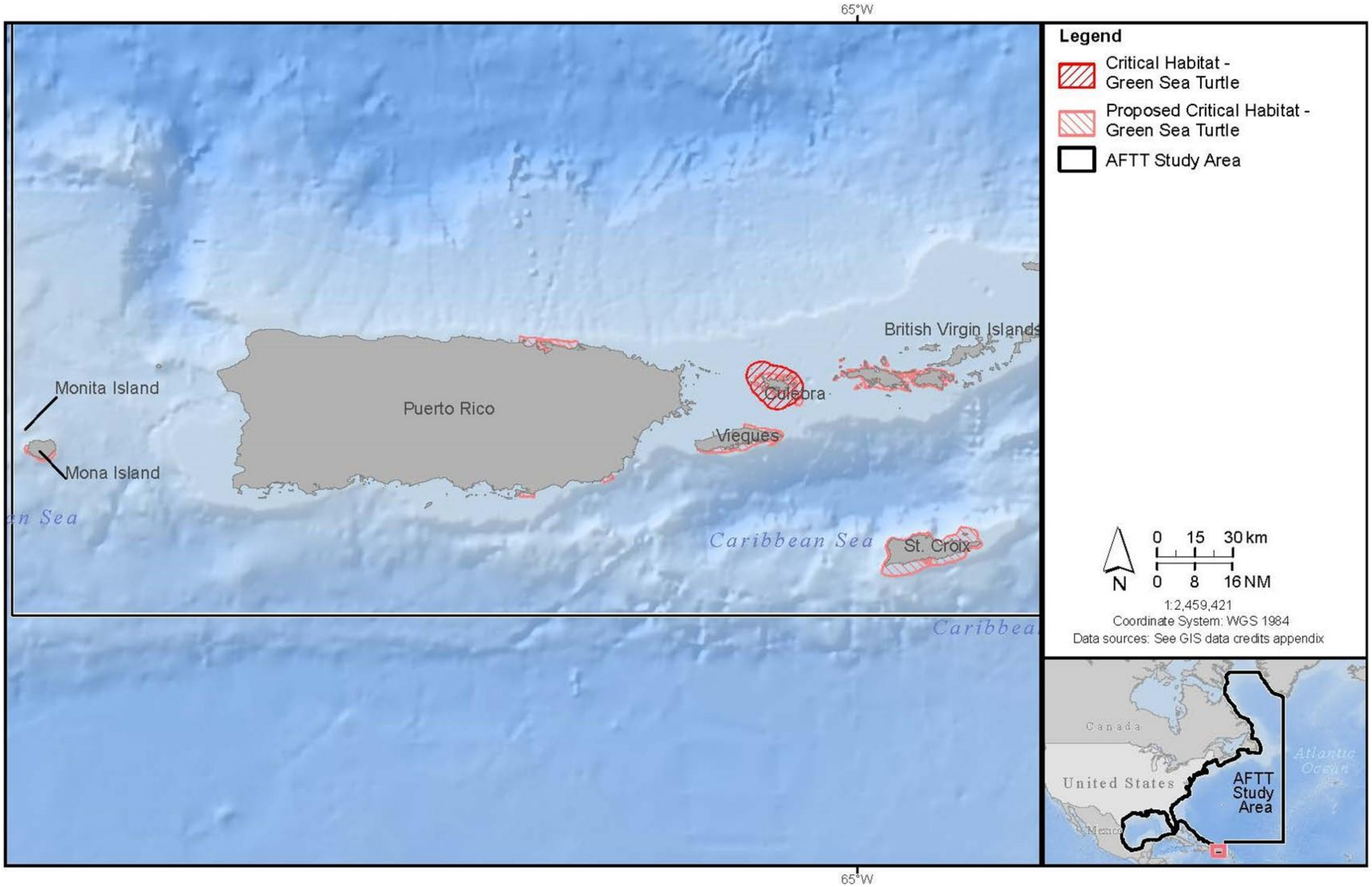

Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

**Figure 3.8-1: Designated and Proposed Critical Habitat for the Green Sea Turtle in the Study Area**



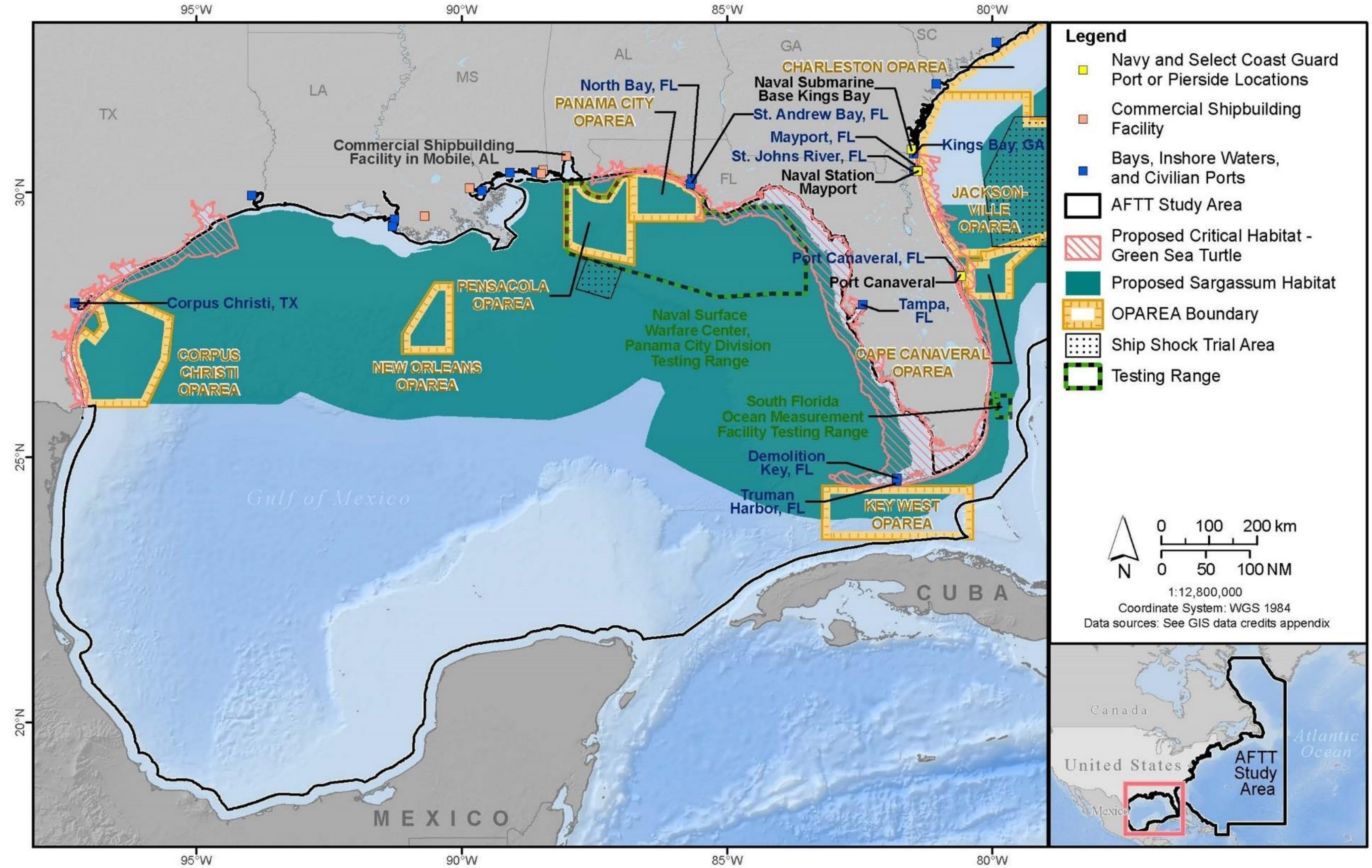

Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

**Figure 3.8-2: Proposed Critical Habitat for the Green Sea Turtle in the Northeast Portion of the Study Area**



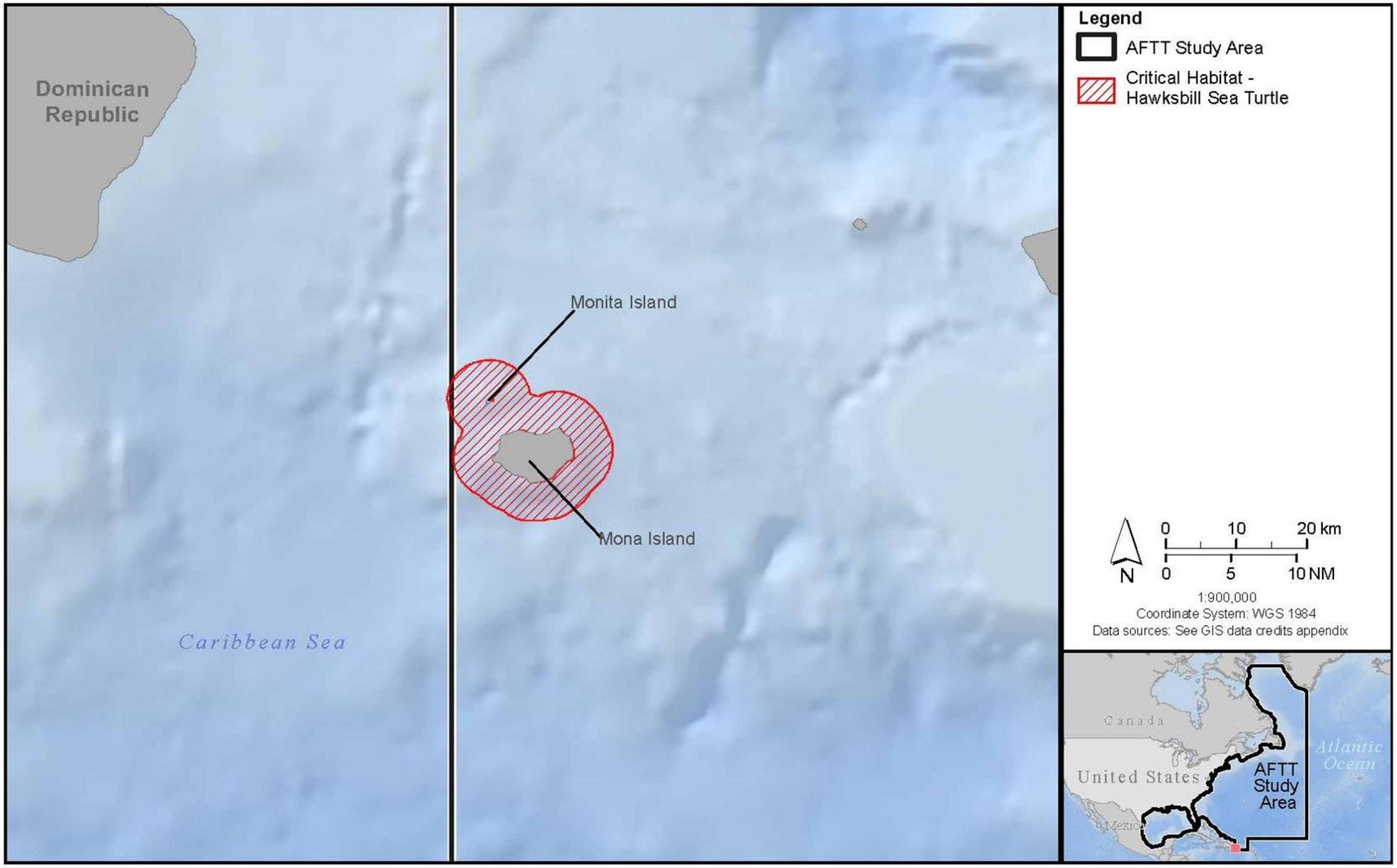

Notes: AFTT = Atlantic Fleet Training and Testing

**Figure 3.8-3: Designated and Proposed Critical Habitat for the Green Sea Turtle in the Caribbean Portion of the Study Area**



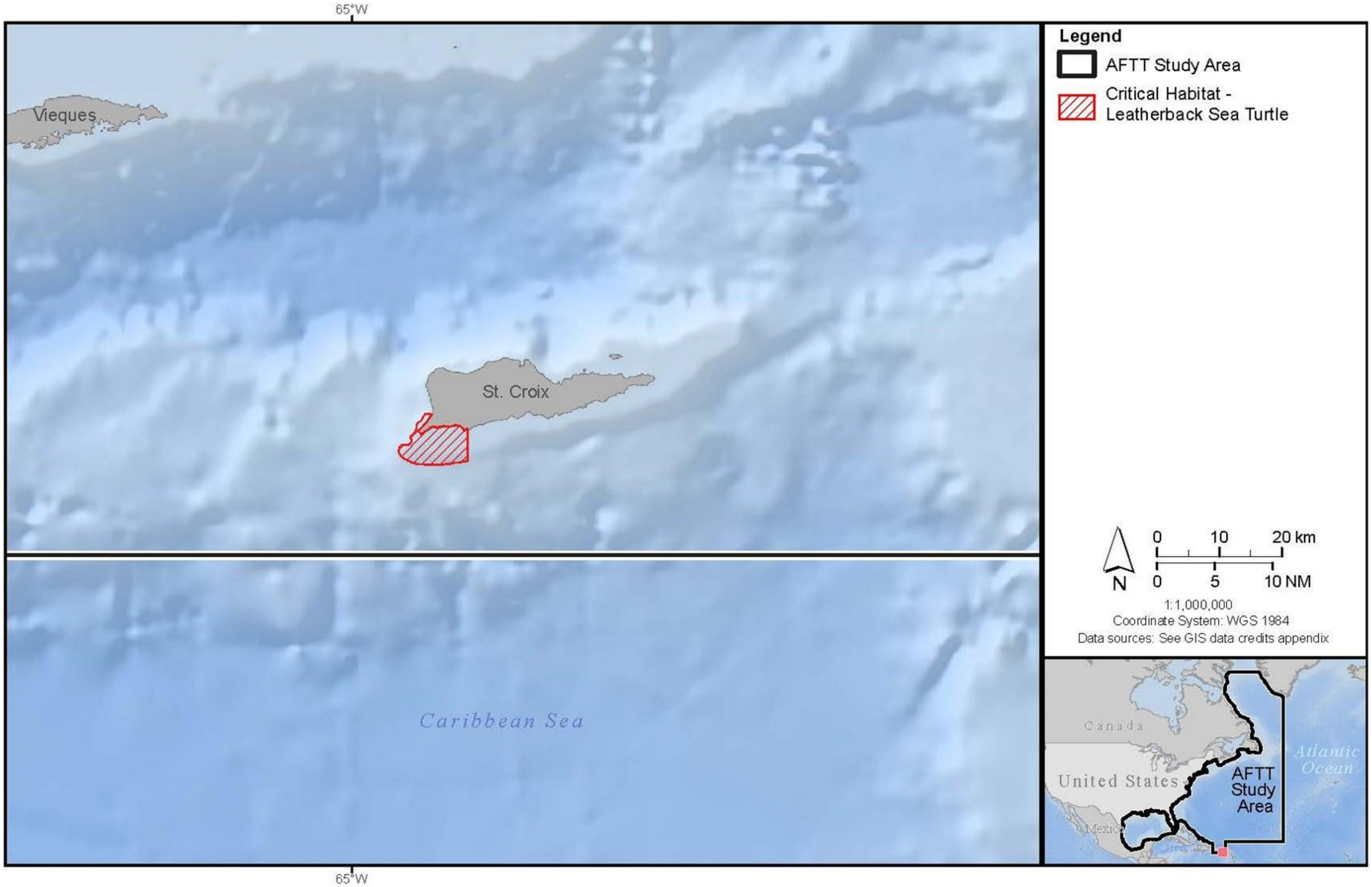

Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

**Figure 3.8-4: Proposed Critical Habitat for the Green Sea Turtle in the Gulf of Mexico Portion of the Study Area**



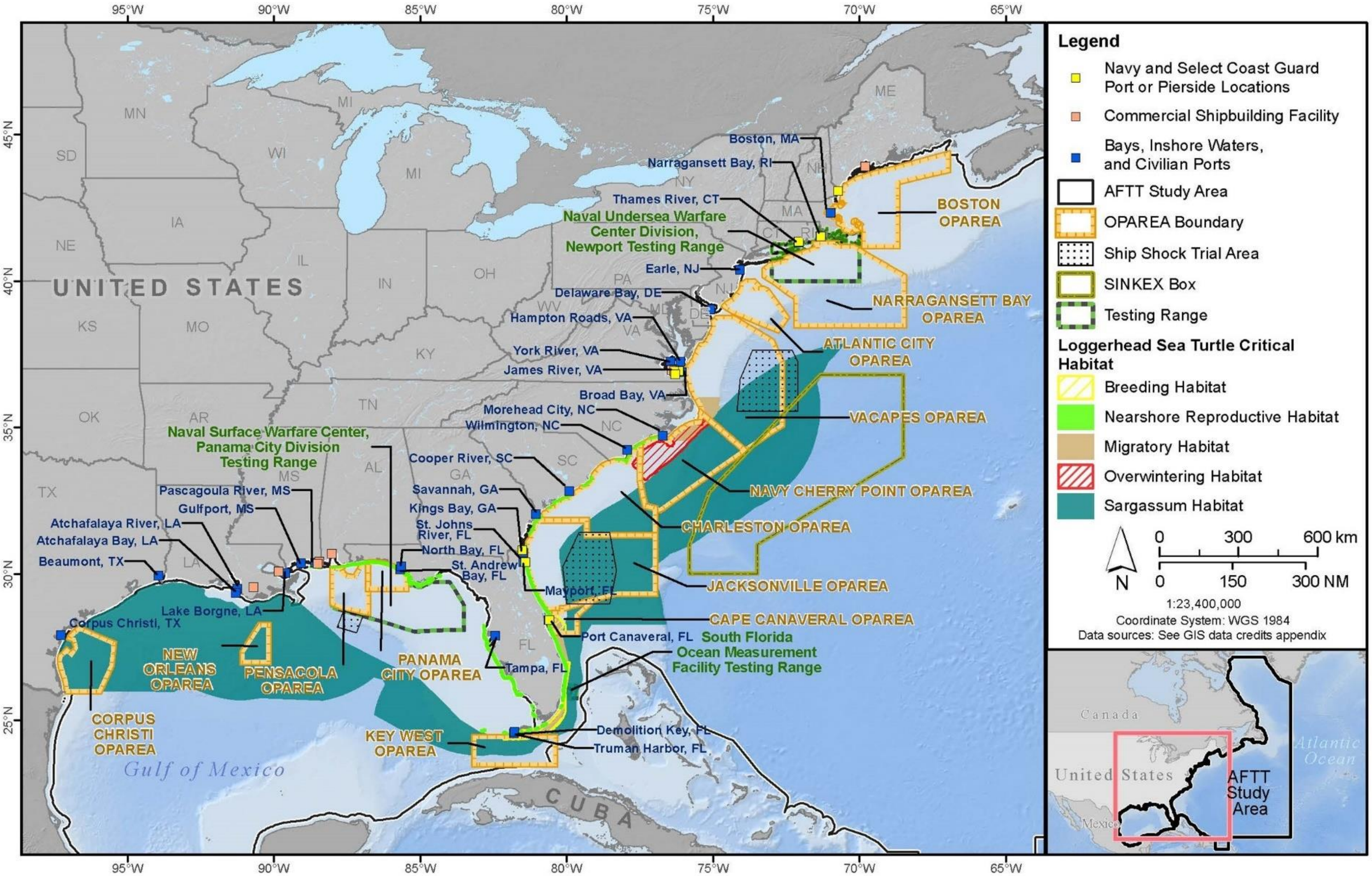

Note: AFTT = Atlantic Fleet Training and Testing

**Figure 3.8-5: Designated Critical Habitat for the Hawksbill Sea Turtle in the Caribbean Portion of the Study Area**



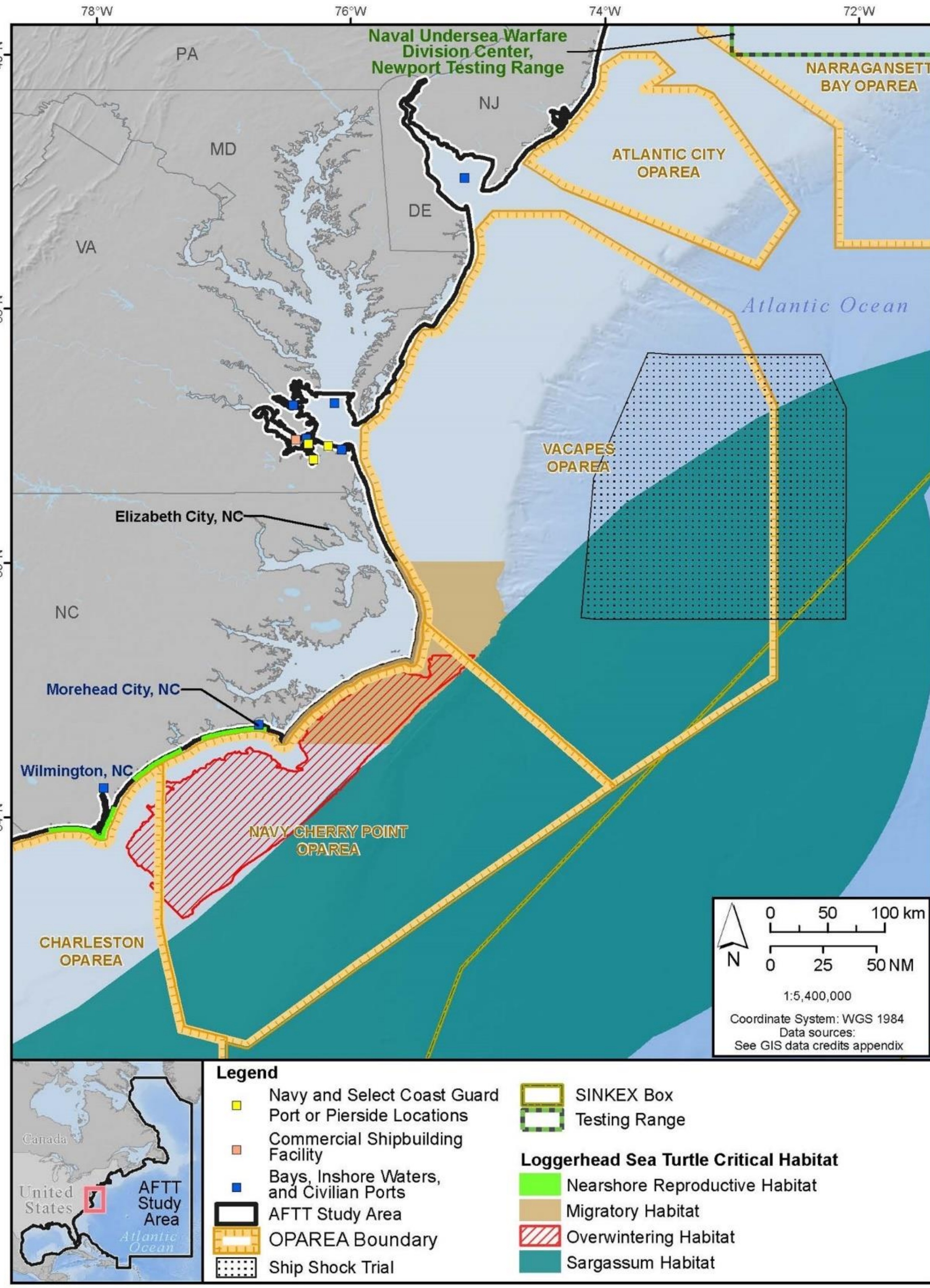

Note: AFTT = Atlantic Fleet Training and Testing

**Figure 3.8-6: Designated Critical Habitat for the Leatherback Sea Turtle near the Study Area**



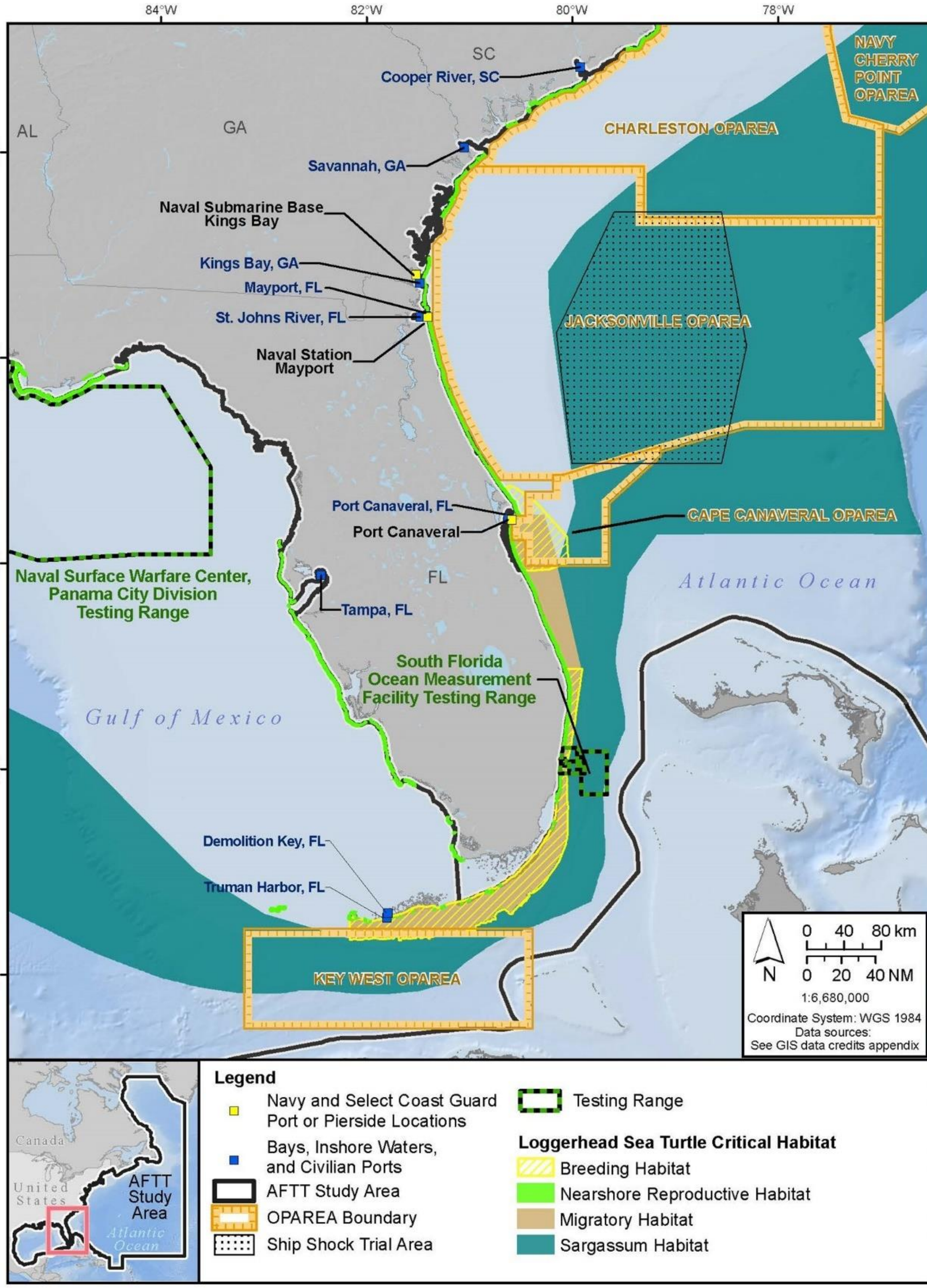

Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

**Figure 3.8-7: Designated Critical Habitat for the Loggerhead Sea Turtle in the Study Area**



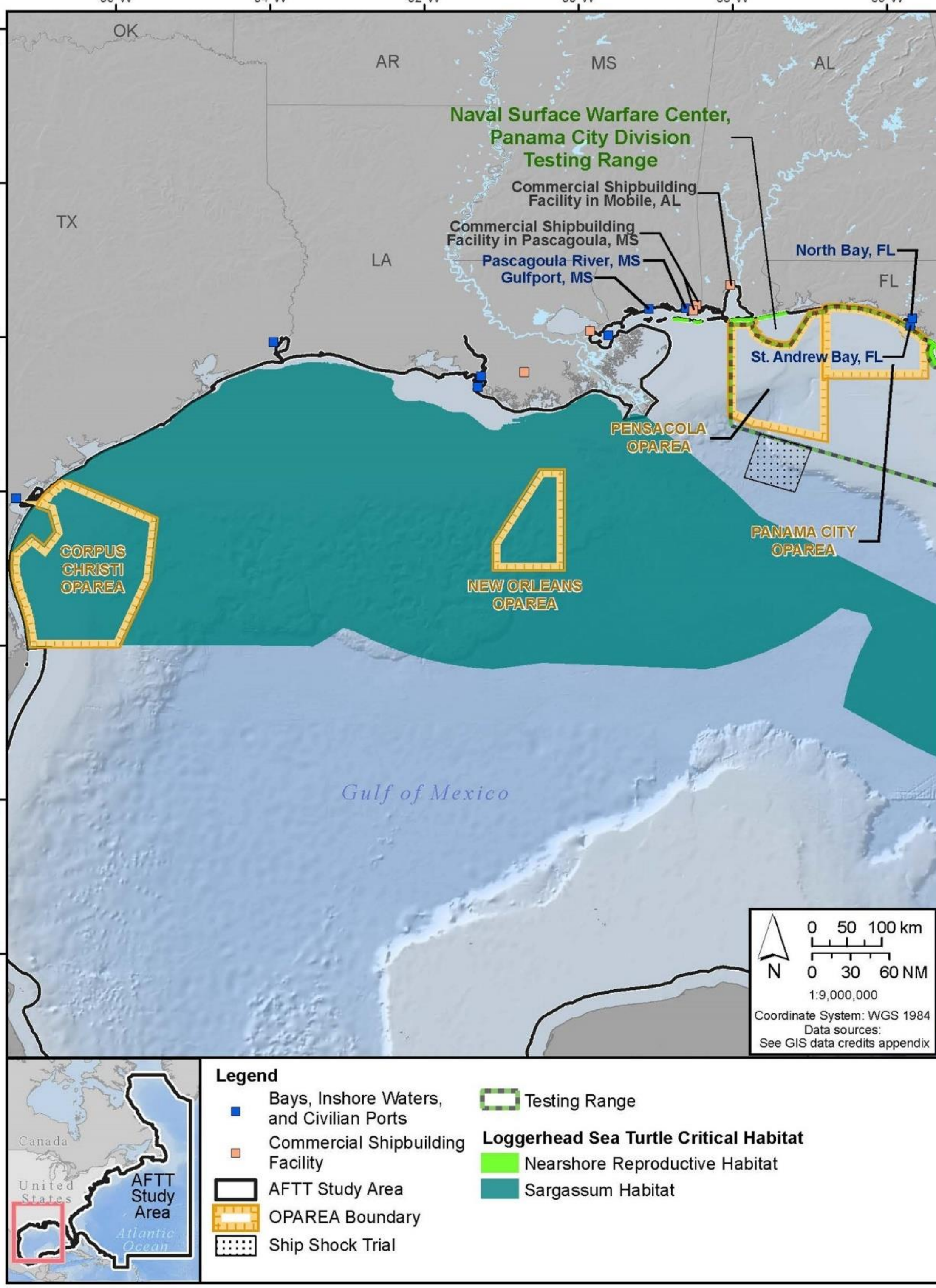

Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

**Figure 3.8-8: Designated Critical Habitat for the Loggerhead Sea Turtle in the Mid-Atlantic Portion of the Study Area**



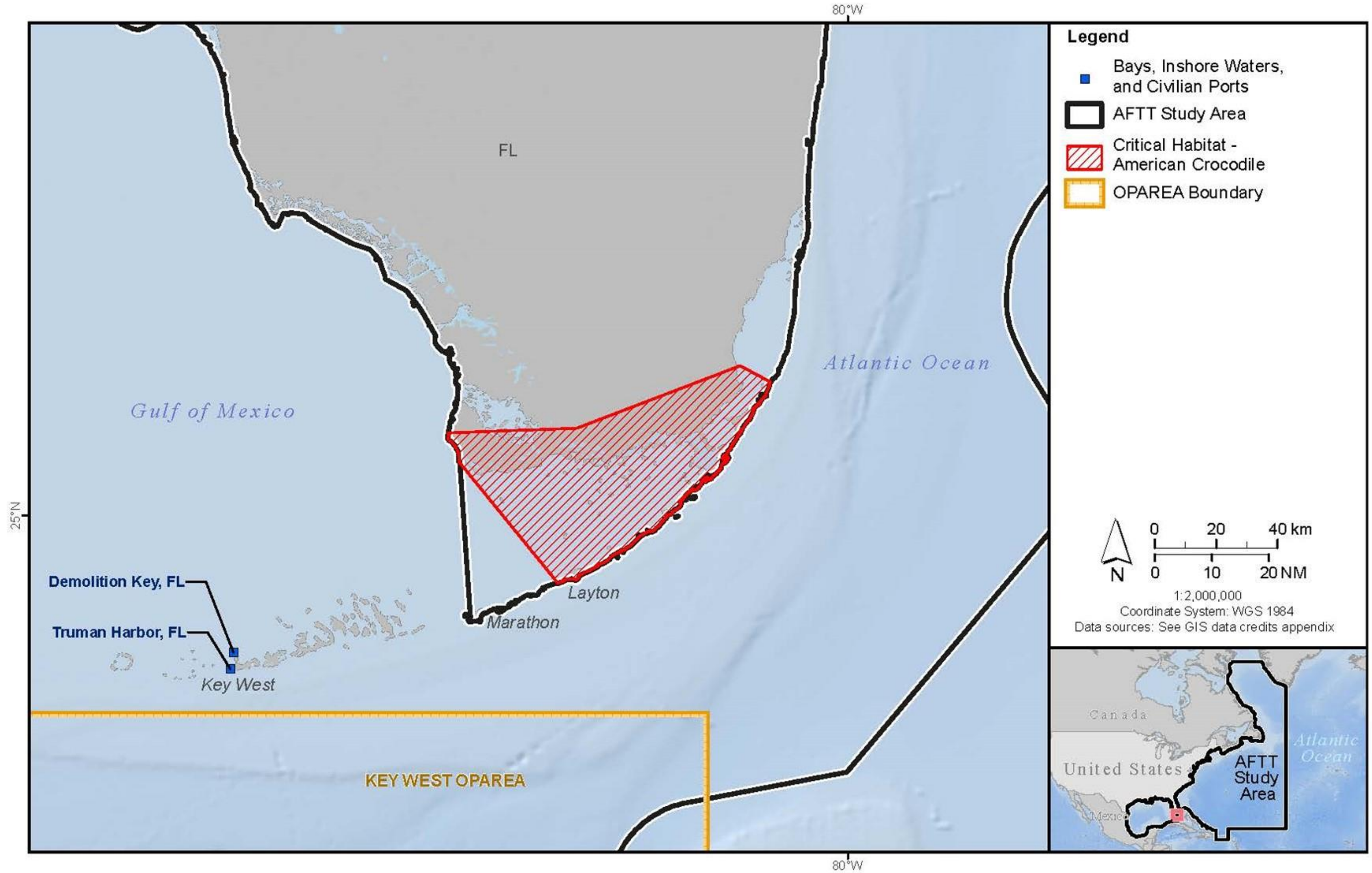

Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

**Figure 3.8-9: Designated Critical Habitat for the Loggerhead Sea Turtle in the Southeast Portion of the Study Area**




Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

**Figure 3.8-10: Designated Critical Habitat for the Loggerhead Sea Turtle in the Gulf of Mexico Portion of the Study Area**




Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

**Figure 3.8-11: Designated Critical Habitat for the American Crocodile in the Study Area**

#### 3.8.2.3 Species Not Listed under the Endangered Species Act

Although not listed under the ESA, the diamondback terrapin (*Malaclemys terrapin*) is present in the Study Area and is considered in this analysis. Diamondback terrapins occur along the east coast of the United States, from Cape Cod to Florida, as well as the Gulf coast from Florida to Texas and are most commonly found within salt marshes and shallow bays. They are typically found in brackish water and will travel out into the open ocean periodically to forage, but for a limited time due to their intolerance of high salinities (University of Georgia, 2023). Additional information is provided in Appendix F (Biological Resources Supplemental Information) of this Supplemental EIS/OEIS.

### 3.8.3 Environmental Consequences

Under the No Action Alternative for all stressors and substressors, the Action Proponents would not conduct any of the proposed military readiness activities in the Study Area. Therefore, baseline conditions of the existing environment for reptiles would either remain unchanged or would improve slightly after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further within this section.

This section describes and evaluates how, and to what degree, the activities described in Chapter 2 (Description of Proposed Action and Alternatives) and stressors described in Section 3.0.3.3 (Identifying Stressors for Analysis) could potentially impact reptiles known to occur in the Study Area.

The stressors vary in intensity, frequency, duration, and location within the Study Area. The activities that involve each of the following stressors are identified in Appendix A (Activity Descriptions) and Appendix B (Activity Stressor Matrices).

The stressors and substressors analyzed for reptiles include:

- **acoustic** (sonar and other transducers; air guns; pile driving; vessel noise; aircraft noise; and weapons noise)
- **explosive** (explosions in water)
- **energy** (in-water electromagnetic devices; high-energy lasers)
- **physical disturbance and strikes** (vessels and in-water devices; military expended materials; and seafloor devices)
- **entanglement** (wires and cables; decelerators/parachutes; biodegradable polymers)
- **ingestion** (military expended materials – munitions; military expended materials other than munitions)

A discussion of secondary stressors, to include potential impacts to habitat or prey availability, and potential impacts of all stressors combined are provided at the end of the section.

The analysis of potential impacts to reptiles considers standard operating procedures and mitigation measures that would potentially provide protection to reptiles. Standard operating procedures are detailed in Appendix A (Section A.2.7, Standard Operating Procedures). Mitigation measures relevant to reptiles are referenced in Table 3.8-2.

The stressors vary in intensity, frequency, duration, and location in the Study Area. The activities that involve each of the following stressors are identified in Appendix A (Activity Descriptions) and Appendix B (Activity Stressor Matrices).

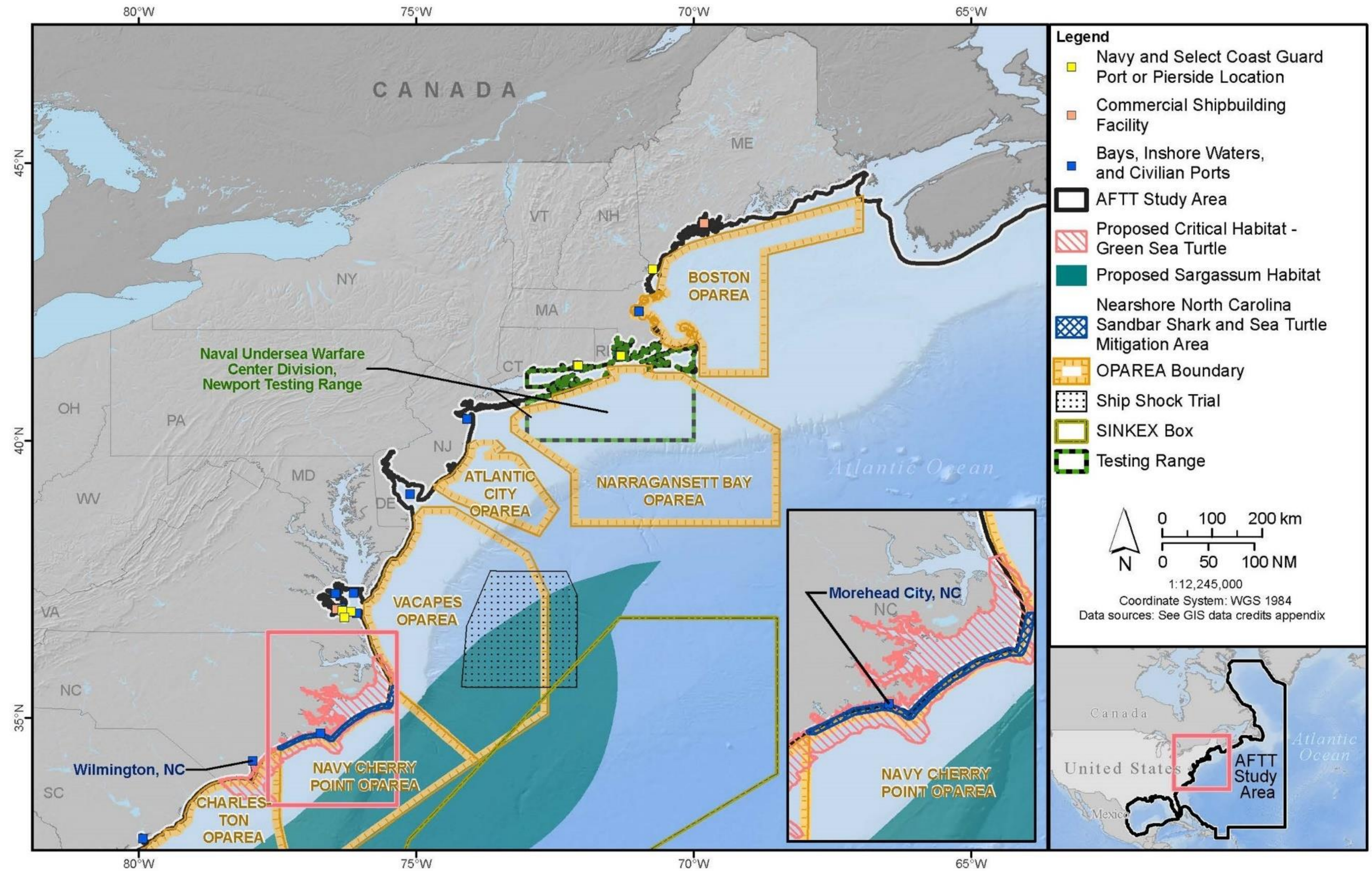
Details on all mitigation measures are provided in Chapter 5 (Mitigation). Figure 3.8-12 through Figure 3.8-16 depict the mitigation areas for reptiles.

**Table 3.8-2: Mitigation Requirements Summary by Stressor for Reptiles**

| *Applicable Stressor* | *Requirements Summary and Protection Focus* | *Section Reference* |
|---|---|---|
| Acoustics | Conduct visual observations for sea turtles during activities involving active acoustic sources, pile driving, and weapon firing noise. | Section 5.6.1.2 (Additional Details for Acoustic Stressors) |
| | Active sonar restrictions and lookouts posted at specified mitigation areas. | Section 5.7.7 (Inshore Manatee and Sea Turtle Mitigation Area) |
| Explosives | Restrictions on detonating explosives on or near the seafloor (e.g., explosive bottom-laid or moored mines) within a horizontal distance from artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks. | Section 5.7.2 (Artificial Reef, Live Hard Bottom, Submerged Aquatic Vegetation, and Shipwreck mitigation areas) |
| | Restrictions on detonating any in-water explosives within a horizontal distance from shallow-water coral reefs and other sensitive invertebrate habitats. | Section 5.7.1 (Shallow-Water Coral Reef Mitigation Areas) |
| | Conduct visual observations for sea turtles during events involving explosives. | Section 5.6.1.2 (Additional Details for Explosives) |
| | Restrictions on use of explosive stressors within specified mitigation areas. | Section 5.7.5 (Nearshore North Carolina Sandbar Shark and Sea Turtle Mitigation Area); Section 5.7.6 (Panama City Gulf Sturgeon and Sea Turtle Mitigation Area); Section 5.7.7 (Inshore Manatee and Sea Turtle Mitigation Area) |
| Physical disturbance and strike | Restrictions on:<br>(1) setting vessel anchors within the anchor swing circle radius from artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks (except in designated anchorages)<br>(2) placing non-explosive seafloor devices (that are not precisely placed) within a horizontal distance of 350 yards from artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks (except as described above for vessel anchors)<br>(3) place other seafloor devices too close to shallow-water coral reefs except in South Florida Ocean Measurement Facility Seafloor Mitigation Area<br>(4) Deploying non-explosive seafloor devices directly on artificial reefs, live hard bottom, submerged aquatic vegetation, or shipwrecks<br>(5) deploying non-explosive ordnance against surface targets too close to shallow-water coral reefs. | Section 5.7.2 (Artificial Reef, Live Hard Bottom, Submerged Aquatic Vegetation, and Shipwreck Mitigation Areas) |

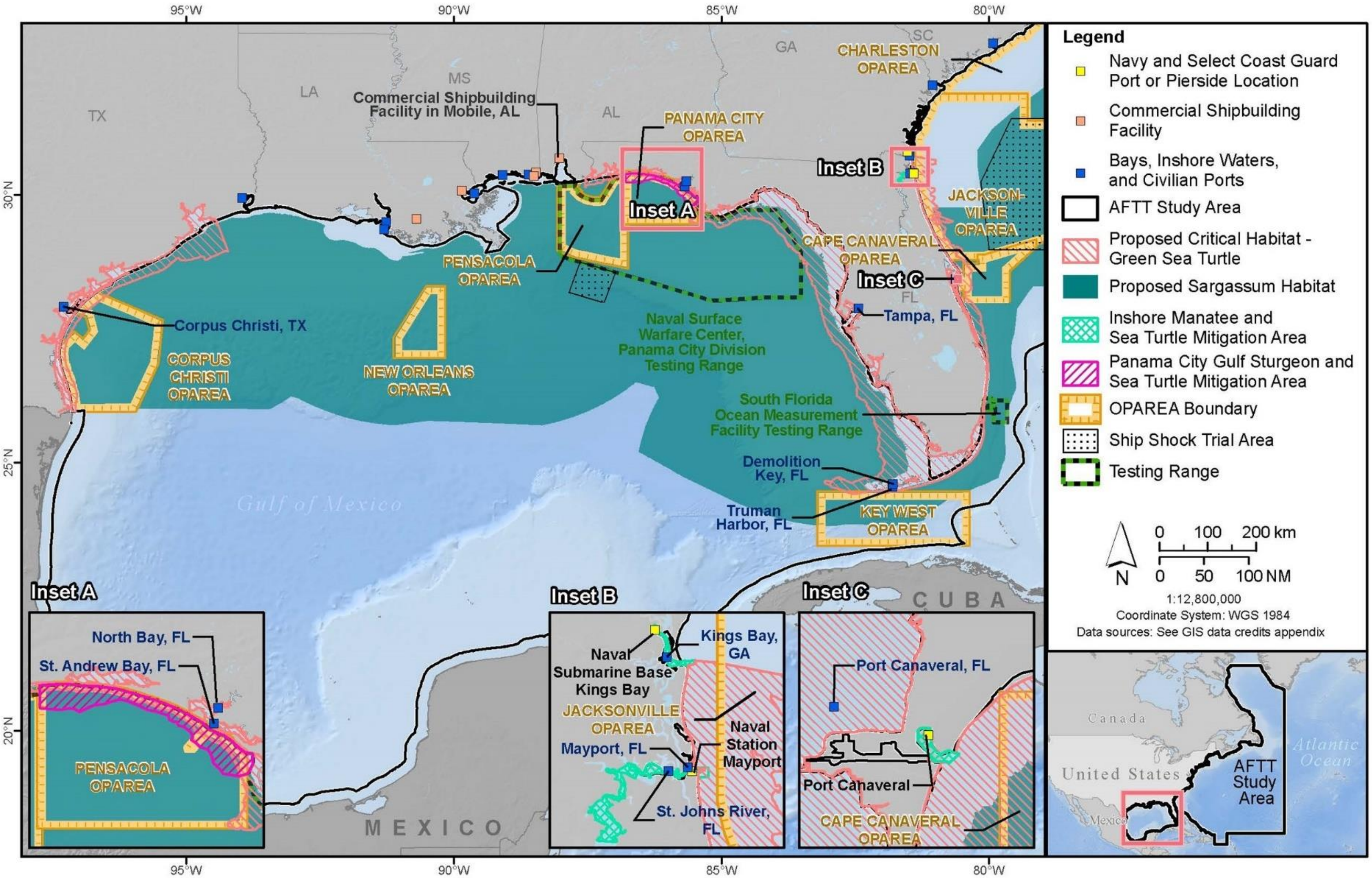
**Table 3.8-2: Mitigation Requirements by Stressor for Reptiles (continued)**

| *Applicable Stressor* | *Requirements Summary and Protection Focus* | *Section Reference* |
| --- | --- | --- |
| | Requirements to:<br>operate surface vessels in waters deep enough to avoid bottom scouring or prop dredging, with at least a 1-foot clearance between the deepest draft of the vessel (with the motor down) and the seafloor at mean low water. The mitigation will ensure that surface vessels and their propellers do not come into contact with shallow-water coral reefs, artificial reefs, live hard bottom, submerged aquatic vegetation, and shipwrecks. | Section 5.7.3 (Key West Range Complex Seafloor Mitigation Area) |
| | Requirements to:<br>(1) operate surface vessels in waters deep enough to avoid bottom scouring or prop dredging, with at least a 1-foot clearance between the deepest draft of the vessel (with the motor down) and the seafloor at mean low water<br>(2) use a real-time geographic information system and global positioning system (along with remote-sensing verification) during deployment, installation, and recovery of anchors and mine-like objects and during deployment of bottom-crawling unmanned underwater vehicles in waters deeper than 10 feet to avoid shallow-water coral reefs and live hard bottom<br>(3) minimize surface vessel movement and drift in accordance with mooring installation and deployment plans and will conduct activities during sea and wind conditions that allow vessels to maintain position and speed control during deployment, installation, and recovery of seafloor devices<br>(4) not anchor surface vessels or moor over shallow-water coral reefs or live hard bottom<br>(5) use semi-permanent anchoring systems that are assisted with riser buoys over soft bottom habitats to avoid contact of mooring cables with shallow-water coral reefs and live hard bottom | Section 5.7.4 (South Florida Ocean Measurement Facility Seafloor Mitigation Area) |
| | Requirements to:<br>When underway in the turning basins, channels, and waterways adjacent to Naval Station Mayport, vessels will comply with federal, state, and local Manatee Protection Zones and reduce speed in accordance with established operational safety and security procedures. This mitigation will also protect sea turtles and designated critical habitat for loggerhead sea turtles. | Section 5.7.7 (Inshore Manatee and Sea Turtle Mitigation Area) |



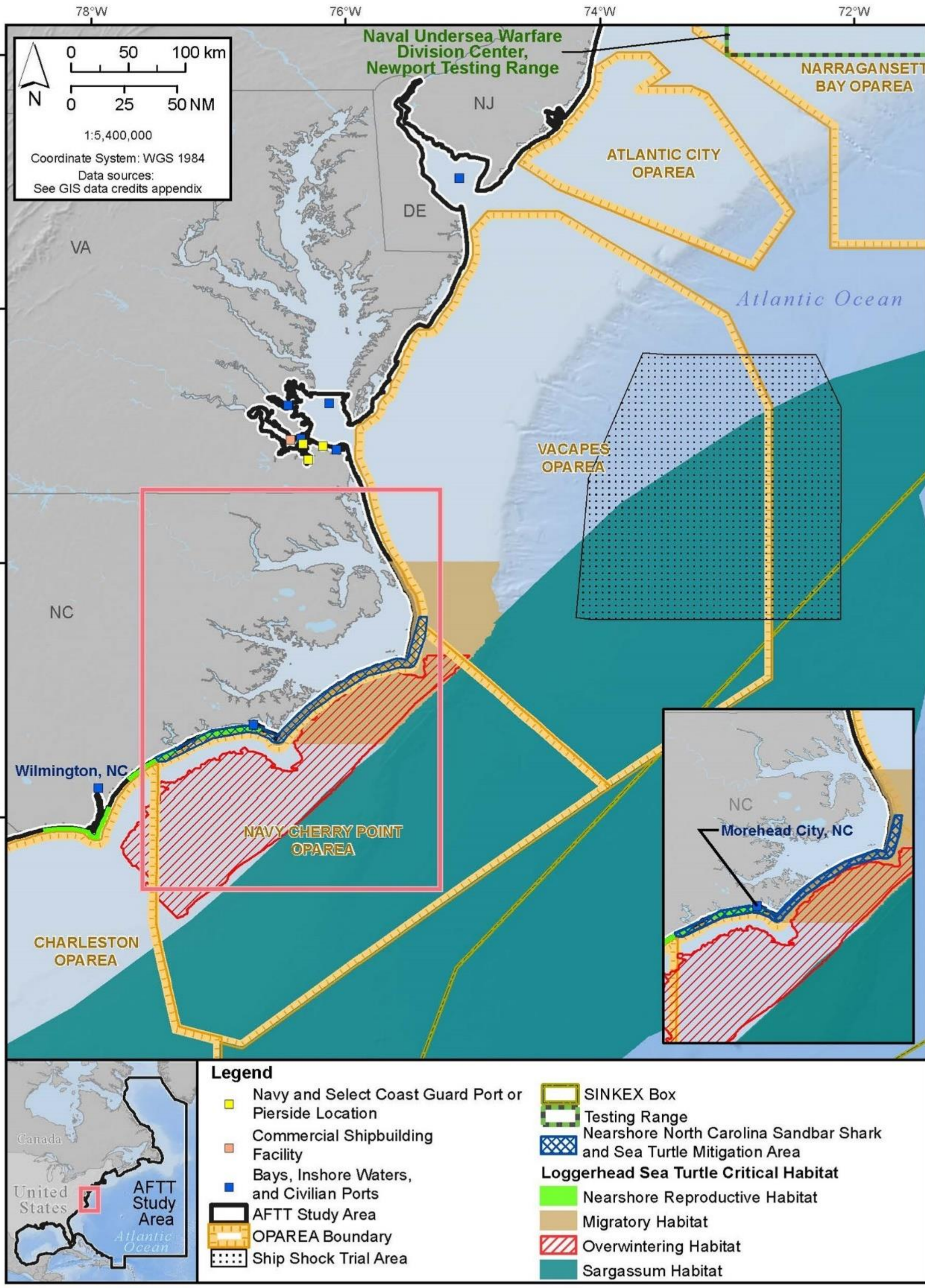

Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

**Figure 3.8-12: Mitigation Areas and Proposed Critical Habitat for the Green Sea Turtle in the Northeast Portion of the Study Area**



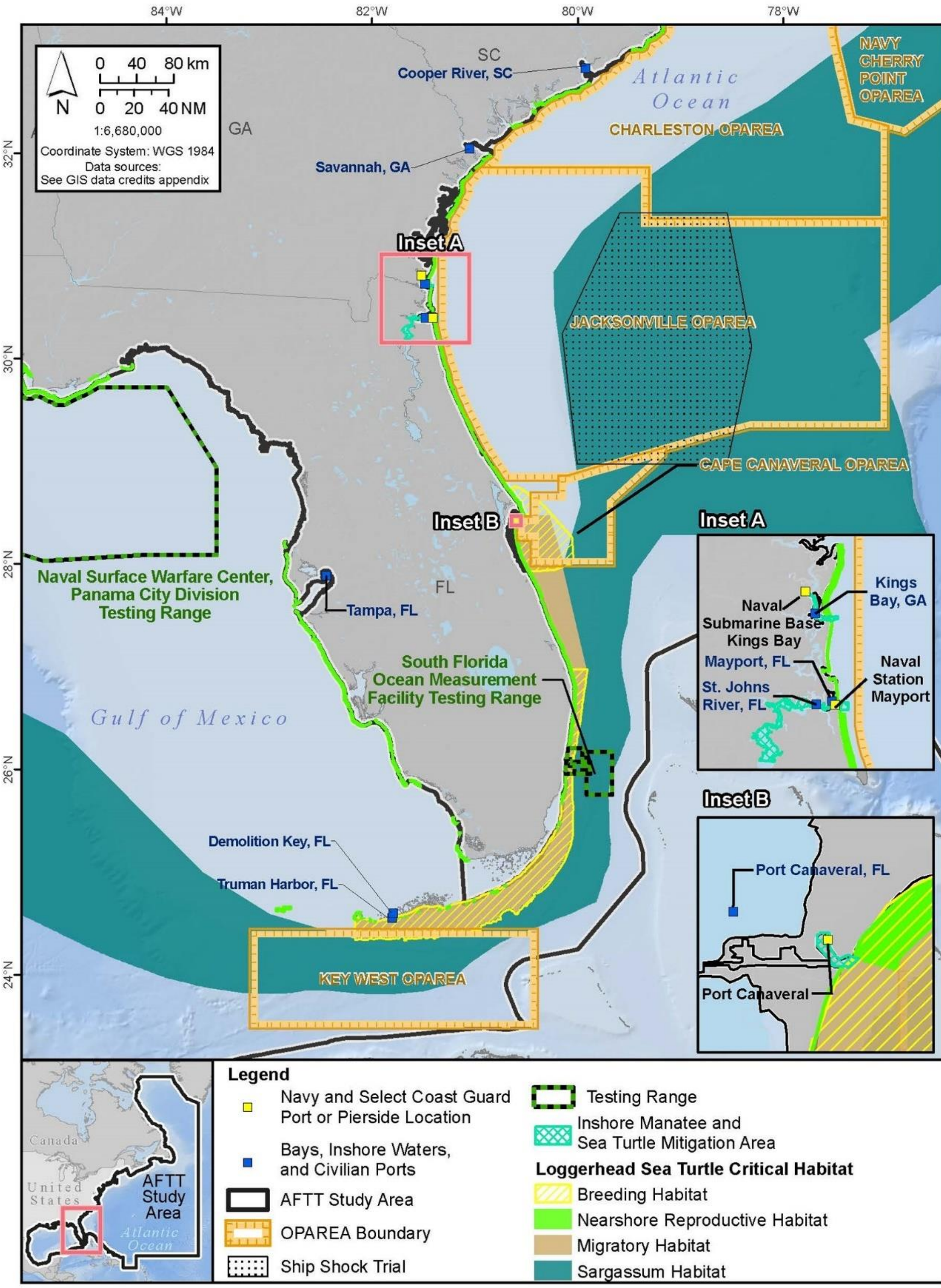

Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

**Figure 3.8-13: Mitigation Areas and Proposed Critical Habitat for the Green Sea Turtle within the Gulf of Mexico Portion of the Study Area**



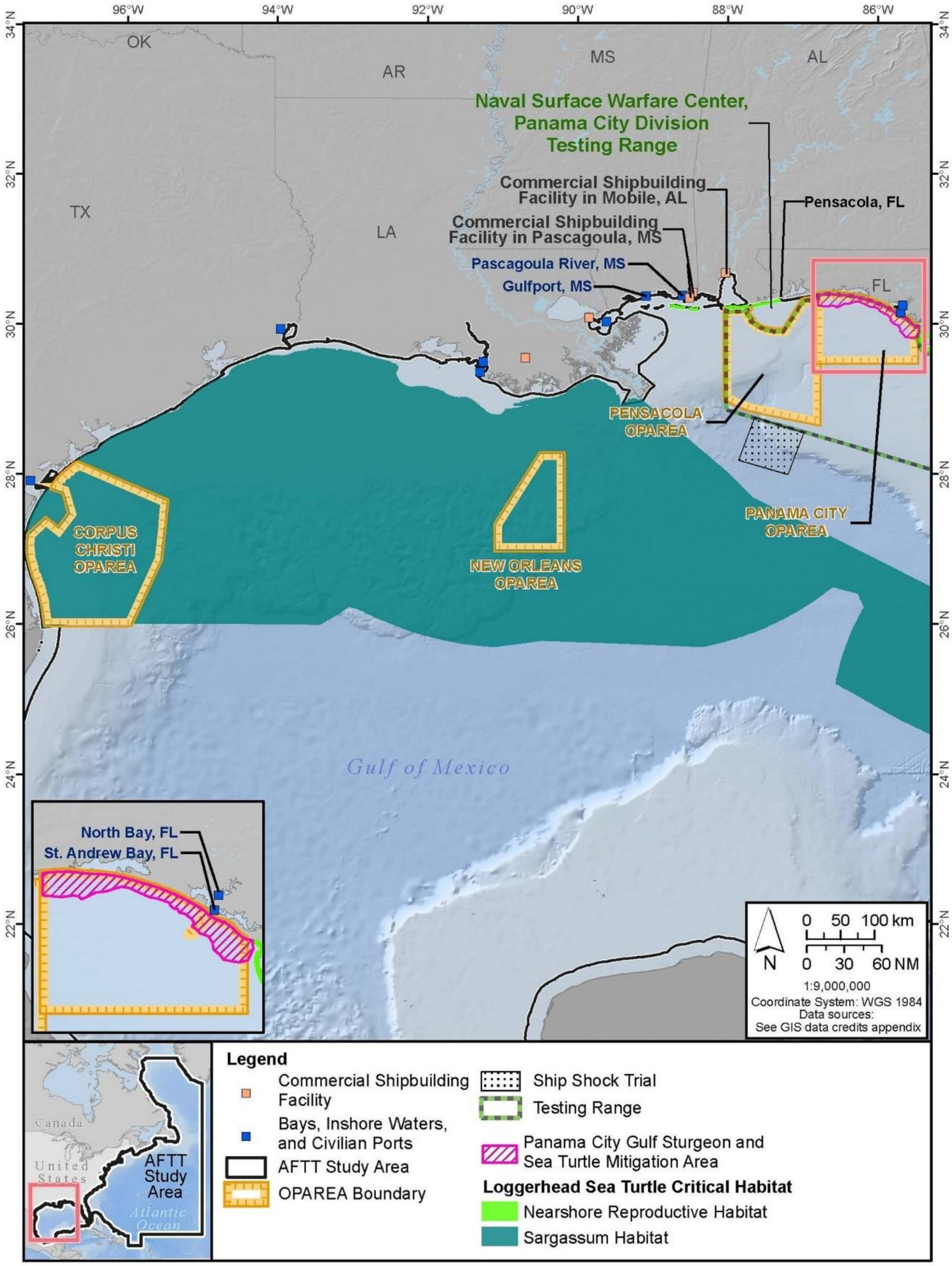

Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area; SINKEX = Sinking Exercise; VACAPES = Virginia Capes

**Figure 3.8-14: Mitigation Areas and Designated Critical Habitat for the Loggerhead Sea Turtle in the Mid-Atlantic Portion of the Study Area**




Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

**Figure 3.8-15: Mitigation Areas and Designated Critical Habitat for the Loggerhead Sea Turtle in the Southeast Portion of the Study Area**




Notes: AFTT = Atlantic Fleet Training and Testing; OPAREA = operating area

**Figure 3.8-16: Mitigation Areas and Designated Critical Habitat for the Loggerhead Sea Turtle in the Gulf of Mexico Portion of the Study Area**

The criteria for determining the significance of Proposed Action stressors on reptiles are described in Table 3.8-3. The abbreviated analysis under each substressor and alternative provides the technical support for these determinations, with reference to the 2018 Final EIS/OEIS or supporting appendices for details.

**Table 3.8-3: Criteria for Determining the Significance of Proposed Action Stressors on Reptiles**

| *Impact Descriptor* | *Context and Intensity* | *Significance Conclusions* |
|---|---|---|
| Negligible | Impacts to reptiles would be limited to temporary (lasting up to several hours) behavioral changes to a reptile or group of reptiles within localized areas of disturbance. Impacts on habitat would be temporary (e.g., temporary placement of an object on the sea floor in the vicinity of a foraging or resting sea turtle) and localized with no lasting damage or alteration. | Less than significant |
| Minor | Impacts to reptiles would be temporary or short-term (lasting several days to several weeks, respectively) but would not be outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. Impacts could include short-term auditory impairment without permanent physiological damage (e.g., temporary threshold shift due to underwater noise impacts). Behavioral responses to disturbance by some individuals or a group of reptiles could be expected, but only temporary disturbance of breeding, feeding, or other activities would occur, without any impacts on population levels. Displacement would be short-term and limited to the Study Area or its immediate surroundings. Impacts on habitat (e.g., placement of an object on the seafloor or loss of a small area of vegetation) would be easily recoverable with no long-term or permanent damage or alteration. | Less than significant |
| Moderate | Impacts to reptiles would be short term or long term (lasting several months or longer) and outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. Impacts could include physiological injury to individuals (e.g., auditory injury from underwater noise), repeated stress responses causing behavioral disturbance to numerous individuals that could be expected in the Study Area, its immediate surroundings, or beyond; or adverse impacts to breeding, feeding, growth, or other factors affecting population levels. However, they would not threaten the continued existence of a population or species. | Less than significant |
| Major | Impacts to reptiles would be short-term or long-term changes well outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. Behavioral and stress responses would be repeated or permanent (e.g., auditory injury from underwater noise, vessel strike resulting in mortality, a removal from or inability to access breeding, foraging, and/or rearing habitat). Impacts would affect any stage of a species' life cycles (i.e., breeding, feeding, growth, and maturity), alter population structure, genetic diversity, or other demographic factors, and/or cause mortality beyond a small number of individuals, resulting in a decrease in population levels. Displacement and stress responses would be short term or long term within and well beyond the Study Area. Reptile habitats would be degraded over the long term or permanently, such that the habitats would no longer possess the requirements to sustain the population. | Significant |

### 3.8.3.1 Acoustic Stressors

This section summarizes the potential impacts of acoustic stressors used during military readiness activities within the Study Area. The acoustic substressors included for analysis are: (1) sonar and other transducers, (2) air guns, (3) pile driving, (4) vessel noise, (5) aircraft noise, and (6) weapons firing. Table 3.8-4 contains brief summaries of background information that is relevant to the analyses of impacts for each acoustic substressor on reptiles (specifically sea turtles as data on other reptiles are not available). Detailed information on acoustic impact categories in general, as well as effects specific to each substressor, are provided in Appendix D (Acoustic and Explosive Impacts Supporting Information). For a listing of the types of activities that use or produce acoustic stressors, refer to Appendix A (Activity Descriptions) and Appendix B (Activity Stressor Matrices). The types and quantities of sonar sources, air guns, and pile driving, the number of events using vessels and aircrafts and the locations of those events under each alternative are shown in Section 3.0.3.3.1 (Acoustic Stressors).

The detailed assessment of these acoustic stressors under this Proposed Action is in Appendix E (Acoustic and Explosives Impacts Analysis). Changes in the predicted acoustic impacts are due to the following:

- Updates to criteria used to determine if acoustic stressors may cause auditory effects (TTS or AINJ) and behavioral responses. Changes to the auditory effects criteria include a 22 decibel (dB) (re 1 $\mu Pa^2 s$) decrease to the weighted non-impulsive sound exposure level thresholds.
- Revisions to the modeling of explosive effects in the Navy Acoustic Effects Model. See the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (U.S. Department of the Navy, 2024a).
- Updates to data on sea turtle presence, including estimated density of each species (number of animals per unit area), and depth distribution. For additional details, see the technical reports *U.S. Navy Marine Species Density Database Phase IV for the Atlantic Fleet Training and Testing Study Area (U.S. Department of the Navy, 2024b)* and *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii-Southern California Training and Testing Study Areas* (Oliveira et al., 2024).
- Changes in the locations, numbers, and types of modeled military readiness activities as described in Chapter 2 (Description of Proposed Action and Alternatives), and associated quantities (hours and counts) of acoustic stressors shown in Section 3.0.3.3.1 (Acoustic Stressors).
- As discussed in Section 3.8.3 (Environmental Consequences), the Action Proponents will implement visual observation mitigation under Alternative 1 and Alternative 2 to reduce potential impacts from acoustic stressors on reptiles. There is no reduction of model-predicted impacts due to visual observation mitigation. The Action Proponents will also implement geographic mitigation to reduce potential acoustic impacts within important sea turtle habitats as identified in Table 3.8-2.
- No reduction of model-predicted impacts due to animal avoidance of a sound source, unlike in prior analyses.

**Table 3.8-4: Acoustic Stressors Background Information Summary**

| *Substressor* | *Background Information Summary* |
|---|---|
| Sonar and other transducers | Sonar and other transducers may result in hearing loss, masking, physiological stress, or behavioral responses. Behavioral responses can depend on the characteristics of the signal, behavioral state of the animal, sensitivity and previous experience of an individual, and other contextual factors including distance of the source, movement of the source, physical presence of vessels, time of year, and geographic location.<br>• Reptiles are likely only susceptible to hearing loss when exposed to high levels of sound within their limited hearing range (most sensitive from 100 to 400 Hertz [Hz] and have limited hearing ability over 1 kilohertz [kHz]). This includes low-frequency sonar and other transducers that produce noise below 2 kHz.<br>• Due to the lack of any data on non-auditory injuries from sonar and other transducers, the estimated risk from low-frequency sonar is low, and the estimated risk from mid-frequency sonar is non-existent.<br>• Sonar and other transducers would have limited potential for masking.<br>• Information on acoustically induced stress responses in reptiles is limited and any physiological response or behavioral response is likely associated with a stress response.<br>• Information on behavioral responses to sonar and other transducers is limited and behavioral responses could consist of temporary avoidance, increased swim speed, or no observable response. |
| Vessel disturbance (including vessel noise) | Vessel disturbance (including the production of noise) may result in masking, physiological stress, or behavioral reactions. Behavioral responses to vessels can be caused by multiple factors, such as noise and the physical presence of vessels. Vessel sound exposure is rarely decoupled from the physical presence of a surface vessel. In some more industrialized or populated areas, non-military vessel noise can be a chronic and frequent stressor.<br>• Continuous vessel noise with low-frequency components of an appreciable received level (e.g., proximate vessel noise) within the limited hearing range for reptiles (most sensitive from 100 to 400 Hz and limited over 1 kHz) is most likely to result in masking.<br>• Information on acoustically induced stress responses in reptiles is limited and any physiological response or behavioral response is likely associated with a stress response.<br>• Information on behavioral responses to vessel noise is limited and can include amplification of existing behaviors, increased vigilance, or no observable response. |
| Aircraft disturbance (including aircraft noise) | Aircraft disturbance (including the production of noise) may result in physiological stress or behavioral reactions. Aircraft sound exposure is rarely decoupled from the physical presence of an aircraft. The brief and intermittent nature of aircraft would result in a very limited probability of any masking effects.<br>• Information on acoustically induced stress responses in reptiles is limited and any physiological response or behavioral response is likely associated with a stress response.<br>• Reptile behavioral reactions have not been studied like marine mammals. Given less sensitive hearing than marine mammals, reptiles could exhibit behavioral reactions to aircraft noise that are likely to be brief and minor. |
| Impulsive noise (includes air guns, pile driving, and weapons firing) | Impulsive noise may result in hearing loss, masking, physiological stress, or behavioral reaction. The intermittent nature of most impulsive sounds would result in very limited probability of any masking effects. Due to the rapid rise time and higher instantaneous peak pressure of impulsive noise, nearby noise is more likely to cause startle or avoidance responses. |

**Table 3.8-4: Acoustic Stressors Background Information Summary (continued)**

| *Substressor* | *Background Information Summary* |
| --- | --- |
| | • Reptiles are likely susceptible to hearing loss when exposed to high levels of sound within their limited hearing range (most sensitive around 100 to 400 Hz and limited over 1 kHz). This includes low-frequency components from air guns, pile driving, and weapons noise.<br>• Information on acoustically induced stress responses in reptiles is limited and any physiological response or behavioral response is likely associated with a stress response.<br>• Information on behavioral responses to repetitive impulsive noise over long durations (i.e., air guns) is limited and can include temporary avoidance, increased swim speed, changes in depth, and no observable response. Similar responses are expected for other sources that produce repetitive and long duration impulsive noise (e.g., pile driving). |

### 3.8.3.1.1 Impacts from Sonar and Other Transducers

Table 3.8-4 contains a summary of the background information used to analyze the potential impacts of sonars and other transducers (hereafter inclusively referred to as sonars) on reptiles. Other transducers include items such as acoustic projectors and countermeasure devices.

Sonars have the potential to affect reptiles by causing auditory injuries, temporary threshold shifts (TTSs), masking, non-injurious physiological responses (such as stress), or behavioral reactions. As discussed in Appendix E (Acoustic and Explosives Impacts Analysis), reptile hearing is most sensitive from 100 to 400 Hertz (Hz) and limited over 1 kilohertz (kHz). Therefore, only sonars below 2 kHz, including low-frequency sonar, are analyzed for their impacts to reptiles. As discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information), sea turtles, crocodilians, and terrapins have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of impacts to crocodilians and terrapins are assessed to be comparable to those for sea turtles.

#### 3.8.3.1.1.1 Impacts from Sonar and Other Transducers under Alternative 1

As discussed in Section 3.0.3.3.1 (Acoustic Stressors), a detailed comparison of sonar quantities analyzed in the 2018 Final EIS/OEIS with sonar quantities under this Proposed Action is not feasible due to changes in the source binning process. However, the overall use of sonars would decrease from the 2018 Final EIS/OEIS for both training and testing activities.

Under Alternative 1, the following changes exist from the 2018 Final EIS/OEIS for training activities using low-frequency sonar:

- There would be a small increase in unit level anti-submarine warfare activities in the Gulf of Mexico Range Complex and pierside location Naval Station Mayport.

For all other locations, there would be a decrease or a similar number of activities that involve the use of low-frequency sonar to the 2018 Final EIS/OEIS.

Under Alternative 1, the following changes exist from the 2018 Final EIS/OEIS for testing activities using low-frequency sonars:

- Under Anti-Submarine Warfare Testing activities, there would be new events in the high seas, Gulf of Mexico Range Complex Inshore, Joint Expeditionary Base Little Creek, Naval Station Mayport, Naval Station Norfolk, Naval Submarine Base King Bay, and Naval Submarine Base New London.

- Under Pierside Sonar Testing activities, there would be new events in the Gulf of Mexico Range Complex Inshore.
- Under At-Sea Sonar Testing activities, there would be new events in the Gulf of Mexico, Northeast, and Virginia Capes Range Complexes.
- There would also be a notable increase in Anti-Submarine Warfare activities in Bath, Maine, and Pascagoula, Mississippi.

Low-frequency sonars are operated less often than mid- or high-frequency sources throughout the Study Area. Activities using sonar would generally occur within Navy range complexes, on Navy testing ranges, around inshore locations, and specified ports and piers identified in Chapter 2 (Description of Proposed Action and Alternatives). Activities using sonar range from single source, limited duration events to multi-day events with multiple sound sources on different platforms. The types of sonars and the way they are used differ between primary mission areas. This in turn influences the potential for impacts to exposed reptiles.

The number of impacts to each turtle species due to exposure to sonar during training and testing under Alternative 1 are shown in Table 3.8-5 for a maximum year of activities and in Table 3.8-6 for seven years of activities. Appendix E (Acoustic and Explosives Impacts Analysis) provides additional details on modeled impacts to each species, including seasons and regions in which impacts are most likely to occur; which activities are most likely to cause impacts; and analysis of impacts to designated critical habitat for ESA-listed species, where applicable. Appendix E also shows total impacts to each species due to training or testing activities under this alternative and explains how impacts are summed to estimate maximum annual and seven-year total impacts.

Sonar-induced acoustic resonance and bubble formation phenomena are very unlikely to occur under realistic conditions, as discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information). Non-auditory injury and mortality from sonar are unlikely under realistic exposure conditions. Any impact to hearing could reduce the distance over which a reptile detects environmental cues, such as the sound of waves, or the presence of a vessel or predator. A reptile could respond to sounds detected within its limited hearing range if it is close enough to the source. Use of sonar would typically be transient and temporary, and there is no evidence to suggest that any behavioral response would persist after a sound exposure. In addition, a stress response could accompany any behavioral response. Although masking of biologically relevant sounds by the limited number of sonars operated in reptile hearing range is possible, this may only occur in certain circumstances. Reptiles most likely use sound to detect nearby broadband, continuous environmental signals, such as the sounds of waves crashing on the beach. Reptiles may rely on senses other than hearing such as vision or magnetic orientation and could potentially reduce any effects of masking caused by sonar use. The use characteristics of most low-frequency sonars, including limited band width, beam directionality, limited beam width, relatively low source levels, low duty cycle, and limited duration of use, would both greatly limit the potential for a reptile to detect these sources and limit the potential for masking of broadband, continuous environmental sounds.

Based on the updated background and analysis for training and testing under Alternative 1, impacts from sonars on reptiles would likely be limited to temporary or short-term impacts including stress, startle, and behavioral responses, and TTS, while long-term impacts would include auditory injuries. This is consistent with a moderate impact on reptile populations as defined in Table 3.8-3.

Under the Endangered Species Act (ESA), the use of sonars during military readiness activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle The use of sonars during training and testing activities would have no effect on the American crocodile.

The use of sonars is not applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and the American crocodile. Proposed critical habitat for the green sea turtle may be affected by the substressor (refer to Appendix E, Acoustic and Explosive Impacts Analysis, for details). Designated critical habitat for the loggerhead turtle is comprised of five different habitat types, which are nearshore reproductive, overwintering, breeding, constricted migratory, and *Sargassum* habitat. The use of sonars would impact the physical and biological features of the constricted migratory habitat in the mid-Atlantic and southeast regions by producing "noise pollution" from military activities (79 *Federal Register* 132). The impacts on this habitat would be considered insignificant, with no discernible impact on the conservation function of the physical and biological features. The physical and biological features identified for the nearshore reproductive, overwintering, breeding, and *Sargassum* habitats would not be impacted by the use of sonar and other transducers during training activities. The Action Proponents are consulting with the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) as required by section 7(a)(2) of the ESA.

#### 3.8.3.1.1.2 Impacts from Sonar and Other Active Sources under Alternative 2

Under Alternative 2, sonar use during training activities would increase compared to Alternative 1:

- The maximum number of Composite Unit Training Exercises would occur each year, and an additional Composite Unit Training Exercise would occur in the Gulf of Mexico Range Complex.

Impacts from sonars under Alternative 2 (Table 3.8-5 and Table 3.8-6) would increase for reptiles but the expected impacts are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing activities. The quantities of sonar and other transducer activity (i.e., hours and counts) under Alternative 2 would increase only slightly over Alternative 1.

**Table 3.8-5: Impacts Due to a Maximum Year of Sonar Training and Testing Activity under Alternative 1 and Alternative 2**

| *Species* | *Alternative 1* | | | *Alternative 2* | | |
|---|---|---|---|---|---|---|
| | *BEH* | *TTS* | *AINJ* | *BEH* | *TTS* | *AINJ* |
| Green sea turtle | 33 | 6,423 | 33 | 33 | 7,246 | 40 |
| Kemp's ridley sea turtle | 13 | 4,996 | 10 | 13 | 5,393 | 12 |
| Leatherback sea turtle | 11 | 1,944 | 9 | 11 | 2,164 | 10 |
| Loggerhead sea turtle | 83 | 34,570 | 178 | 84 | 40,107 | 217 |

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

**Table 3.8-6: Impacts Due to Seven Years of Sonar Training and Testing Activity under Alternative 1 and Alternative 2**

| Species | Alternative 1 | | | Alternative 2 | | |
|---|---|---|---|---|---|---|
| | BEH | TTS | AINJ | BEH | TTS | AINJ |
| Green sea turtle | 204 | 42,488 | 228 | 231 | 50,722 | 280 |
| Kemp's ridley sea turtle | 81 | 32,247 | 66 | 91 | 37,750 | 82 |
| Leatherback sea turtle | 66 | 12,815 | 57 | 75 | 15,141 | 69 |
| Loggerhead sea turtle | 516 | 232,111 | 1,226 | 583 | 280,743 | 1,515 |

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

### 3.8.3.1.2 Impacts from Air Guns

Table 3.8-4 contains a summary of the background information used to analyze the potential impacts of air guns on reptiles. The broadband impulses from air guns are within the hearing range of all reptiles. Potential impacts from air guns could include auditory injuries, TTS, behavioral reactions, physiological response, and masking. The ranges to auditory effects and behavioral responses for air guns are in in Appendix E (Acoustic and Explosives Impacts Analysis). As discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information) sea turtles, crocodilians, and terrapins have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of impacts to crocodilians and terrapins are assessed to be comparable to those for sea turtles.

#### 3.8.3.1.2.1 Impacts from Air Guns under Alternative 1

Air guns would not be used during training activities. The proposed use of air guns decreased overall for testing from the 2018 Final EIS/OEIS. During testing activities, small air guns would be fired over a limited period within a single day. Air gun use would only occur in two testing activities: semi-stationary equipment testing and acoustic and oceanographic research. While air gun use during semi-stationary equipment testing may occur nearshore at Newport, Rhode Island, air gun use during acoustic and oceanographic research may occur offshore in the Northeast, Virginia Capes, Jacksonville, and Gulf of Mexico Range Complexes.

The number of impacts to each species due to exposure to air guns during testing under Alternative 1 are shown in Table 3.8-7 for a maximum year of activities and in Table 3.8-8 for seven years of activities. Appendix E (Acoustic and Explosives Impacts Analysis) provides additional detail on modeled impacts to each species, including seasons and regions in which impacts are most likely to occur; which activities are most likely to cause impacts; and analysis of impacts to designated critical habitat for ESA-listed species, where applicable. Appendix E also shows total impacts to each species due to testing activities under this alternative and explains how impacts are summed to estimate maximum annual and seven-year total impacts.

Potential impacts from exposures to air guns include hearing loss and AINJ within a short distance, behavioral reactions, and physiological response. Due to the low duration of an individual air gun shot (approximately 0.1 second) and the low duty cycle of sequential shots, the potential for masking from air guns would be low. Additionally, pierside air gun use would only occur several times a year and would use a limited number of air gun shots, limiting the occurrence of masking. The use of air guns in offshore waters would not interfere with the detection of environmental cues in nearshore environments, such as the sound of waves crashing on the beach. Table 3.8-7 provides sea turtle impacts from the quantitative analysis using the number of air gun shots for a maximum year of testing activities under Alternative 1 and Alternative 2.

Based on the updated background and analysis for testing under Alternative 1, impacts from air guns on reptiles would be limited to temporary or short-term impacts including TTS. This is consistent with a minor impact on reptile populations as defined in Table 3.8-3.

Under the ESA, the use of air guns during testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of air guns is not applicable to the American crocodile.

The use of air guns is not applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. Proposed critical habitat for the green sea turtle may be affected by the substressor (refer to Appendix E, Acoustic and Explosive Impacts Analysis, for details). Designated critical habitat for the loggerhead turtle is comprised of five different habitat types, which are nearshore reproductive, overwintering, breeding, constricted migratory, and *Sargassum* habitat. The use of air guns would impact the physical and biological features of the constricted migratory habitat in the mid-Atlantic and southeast regions by producing "noise pollution" from military activities (79 *Federal Register* 132). The impacts on this habitat would be considered insignificant, with no discernible impact on the conservation function of the physical and biological features. The physical and biological features identified for the nearshore reproductive, overwintering, breeding, and *Sargassum* habitats would not be impacted by the use of air guns during training activities. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

#### 3.8.3.1.2.2 Impacts from Air Guns under Alternative 2

Air guns would not be used during training activities. Impacts from air guns under Alternative 2 (Table 3.8-7 and Table 3.8-8) are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for testing activities. The quantities of air gun activity (i.e., counts) under Alternative 2 are the same Alternative 1.

**Table 3.8-7: Impacts Due to a Maximum Year of Air Gun Testing Activity under Alternative 1 and Alternative 2**

| *Species* | *Alternative 1* | | | *Alternative 2* | | |
|---|---|---|---|---|---|---|
| | *BEH* | *TTS* | *AINJ* | *BEH* | *TTS* | *AINJ* |
| Green sea turtle | - | 1 | 0 | - | 1 | 0 |
| Kemp's ridley sea turtle | - | 1 | - | - | 1 | - |
| Leatherback sea turtle | - | 0 | - | - | 0 | - |
| Loggerhead sea turtle | - | 2 | 0 | - | 2 | 0 |

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

**Table 3.8-8: Impacts Due to Seven Years of Air Gun Testing Activity under Alternative 1 and Alternative 2**

| *Species* | *Alternative 1* | | | *Alternative 2* | | |
|---|---|---|---|---|---|---|
| | *BEH* | *TTS* | *AINJ* | *BEH* | *TTS* | *AINJ* |
| Green sea turtle | - | 4 | 0 | - | 4 | 0 |
| Kemp's ridley sea turtle | - | 1 | - | - | 1 | - |
| Leatherback sea turtle | - | 0 | - | - | 0 | - |
| Loggerhead sea turtle | - | 10 | 0 | - | 11 | 0 |

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

#### 3.8.3.1.3 Impacts from Pile Driving

Table 3.8-4 contains a summary of the background information used to analyze the potential impacts of pile driving noise on reptiles. This activity does not overlap with the American crocodile or their designated critical habitat. The impact and vibratory pile driving hammers would expose reptiles to impulsive and continuous non-impulsive broadband sounds, respectively. Potential impacts could include auditory injuries, TTS, behavioral reactions, physiological responses (stress), and masking. This analysis applies NMFS' recommended thresholds for behavioral responses to impact and vibratory pile driving. The ranges to auditory effects and behavioral responses for pile driving are in in Appendix E (Acoustic and Explosives Impacts Analysis). As discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information), sea turtles, crocodilians, and terrapins have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of impacts to crocodilians and terrapins are assessed to be comparable to those for sea turtles.

##### 3.8.3.1.3.1 Impacts from Pile Driving under Alternative 1

Impact and vibratory pile driving would not occur during testing activities. The activity type and location for pile driving activities for training have changed from the 2018 Final EIS/OEIS:

- Pile driving would occur as part of Port Damage Repair activities in Gulfport, Mississippi.
- Pile driving would no longer occur as part of the Elevated Causeway System at Joint Expeditionary Base Little Creek in the Virginia Capes Range Complex or Marine Corps Base Camp Lejeune in the Navy Cherry Point Range Complex.

Impact and vibratory pile driving during port damage repair training activities can occur throughout the year over a period of five days, and up to four times per year (20 days total) in Gulfport, Mississippi. Pile driving activities would occur intermittently in very limited areas and would be of temporary duration. This area is a commercial port lined with artificial shorelines and experiencing ambient noise levels that are already high due to vessel traffic.

Based on the updated background (refer to Appendix E, Acoustic and Explosive Impacts Analysis, for details) and previous analysis for training and testing under Alternative 1, pile driving noise impacts on reptiles would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual reptiles found within localized areas. This is consistent with a negligible impact on reptile populations as defined in Table 3.8-3.

Under the ESA, pile driving during training activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. Pile driving is not applicable to the American crocodile.

Pile driving is not applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, loggerhead sea turtle, and American crocodile. Pile driving is not applicable to proposed critical habitat for the green sea turtle. Designated critical habitat for the loggerhead turtle is comprised of five different habitat types, which are nearshore reproductive, overwintering, breeding, constricted migratory, and *Sargassum* habitat. The use of pile driving would impact the physical and biological features of the constricted migratory habitat in the mid-Atlantic and southeast regions by producing "noise pollution" from military activities (79 *Federal Register* 132). The impacts on this habitat would be considered insignificant, with no discernible impact on the conservation function of the physical and biological features. The physical and biological features identified for the nearshore reproductive, overwintering, breeding, and *Sargassum* habitats would not be impacted by the use of pile driving during training activities. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

#### 3.8.3.1.3.2 Impacts from Pile Driving under Alternative 2

Pile driving or removal would not occur during testing activities. Impacts from pile driving during training activities under Alternative 2 are not different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for training activities.

### 3.8.3.1.4 Impacts from Vessel Noise

Table 3.8-4 contains a summary of the background information used to analyze the potential impacts of vessel noise on reptiles. The broadband, non-impulsive, and continuous noise from vessels is within the hearing range of all reptiles. As discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information), sea turtles, crocodilians, and terrapins have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of impacts to crocodilians and terrapins are assessed to be comparable to those for sea turtles.

#### 3.8.3.1.4.1 Impacts from Vessel Noise under Alternative 1

For both training and testing activities, vessel activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of vessel noise, so impacts would be expected to be similar or lesser than previously concluded.

Based on the updated background and previous analysis for training and testing under Alternative 1, vessel noise impacts on reptiles could include brief behavioral reactions and short periods of masking while in the proximity of a vessel (refer to Appendix E, Acoustic and Explosive Impacts Analysis, for supporting details). This is consistent with a negligible impact on reptile populations as defined in Table 3.8-3.

Under the ESA, vessel noise generated during military readiness activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, loggerhead sea turtle, and leatherback sea turtle. Only vessel noise associated with training may affect American crocodile. Vessel noise from testing is not applicable to the American crocodile.

Vessel noise is not applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. Proposed critical habitat for the green sea turtle may be affected by the substressor. Designated critical habitat for the loggerhead turtle is comprised of five different habitat types, which are nearshore reproductive, overwintering, breeding, constricted migratory, and *Sargassum* habitat. The production of vessel noise would impact the physical and biological features of the constricted migratory habitat in the mid-Atlantic and southeast regions by producing "noise pollution" from military activities (79 *Federal Register* 132). The impacts on this habitat would be considered insignificant, with no discernible impact on the conservation function of the physical and biological features. The physical and biological features identified for the nearshore reproductive, overwintering, breeding, and *Sargassum* habitats would not be impacted by the production of vessel noise during training activities. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

#### 3.8.3.1.4.2 Impacts from Vessel Noise under Alternative 2

Under Alternative 2, an additional Composite Unit Level Training Exercise would occur in the Gulf of Mexico Range Complex that would not occur under Alternative 1. However, impacts from vessel noise under Alternative 2 are not meaningfully different from Alternative 1 and the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing activities. The number of activities including vessels or in-water devices increases only slightly over that of Alternative 1.

#### 3.8.3.1.5 Impacts from Aircraft Noise

Table 3.8-4 contains a summary of the background information used to analyze the potential impacts of aircraft noise on reptiles. Aircrafts produce broadband, non-impulsive, continuous noise during operation and transit that is within the hearing range of all reptiles. As discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information), sea turtles, crocodilians, and terrapins have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of impacts to crocodilians and terrapins are assessed to be comparable to those for sea turtles.

##### 3.8.3.1.5.1 Impacts from Aircraft Noise under Alternative 1

For both training and testing activities, aircraft activity would decrease overall from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of aircraft noise, so impacts would be expected to be similar or lesser than previously concluded.

Based on the updated background and previous analysis for training and testing under Alternative 1, aircraft noise impacts on reptiles would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual reptiles found within localized areas. Reptiles at or near the surface when an aircraft flies overhead at low altitude may startle, divert their attention to the aircraft, or avoid the immediate area by swimming away or diving. This is consistent with a negligible impact on reptile populations as defined in Table 3.8-3.

Under the ESA, aircraft noise generated during military readiness activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp’s ridley sea turtle, loggerhead sea turtle, and leatherback sea turtle. Only aircraft noise associated with training may affect American crocodile. Aircraft noise from testing is not applicable to the American crocodile.

Aircraft noise is not applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. Proposed critical habitat for the green sea turtle may be affected by the substressor. Designated critical habitat for the loggerhead turtle is comprised of five different habitat types, which are nearshore reproductive, overwintering, breeding, constricted migratory, and *Sargassum* habitat. The production of aircraft noise would impact the physical and biological features of the constricted migratory habitat in the mid-Atlantic and southeast regions by producing “noise pollution” from military activities (79 *Federal Register* 132). The impacts on this habitat would be considered insignificant, with no discernible impact on the conservation function of the physical and biological features. The physical and biological features identified for the nearshore reproductive, overwintering, breeding, and *Sargassum* habitats would not be impacted by the production of aircraft noise during training activities. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

##### 3.8.3.1.5.2 Impacts from Aircraft Noise under Alternative 2

Impacts from aircraft noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing activities. The number of activities including aircraft under Alternative 2 would increase only slightly over Alternative 1.

#### 3.8.3.1.6 Impacts from Weapons Noise

Table 3.8-4 contains a summary of the background information used to analyze the potential impacts of weapons noise on reptiles. Firing of guns, vibrations from the hull of ships, items that impact the water's surface, and items launched from underwater may produce weapons noise that are within the hearing range of all reptiles. As discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information), sea turtles, crocodilians, and terrapins have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of impacts to crocodilians and terrapins are assessed to be comparable to those for sea turtles.

##### 3.8.3.1.6.1 Impacts from Weapons Noise under Alternative 1

For both training and testing activities, weapons noise would decrease from the 2018 Final EIS/OEIS. This Supplemental EIS/OEIS will rely on the previous 2018 Final EIS/OEIS analysis of weapons noise, as impacts are expected to be similar to or less than previously analyzed.

Based on the updated background and previous analysis for training and testing under Alternative 1, the impact of weapons noise on reptiles would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual reptiles found within localized areas (refer to Appendix E, Acoustic and Explosive Impacts Analysis for supporting details). This is consistent with a negligible impact on reptile populations as defined in Table 3.8-3.

Under the ESA, weapons noise generated during military readiness activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. Weapons noise is not applicable to the American crocodile.

Weapons noise is not applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and the American crocodile. Proposed critical habitat for the green sea turtle may be affected by the substressor. Designated critical habitat for the loggerhead turtle is comprised of five different habitat types, which are nearshore reproductive, overwintering, breeding, constricted migratory, and *Sargassum* habitat. The production of weapons noise would impact the physical and biological features of the constricted migratory habitat in the mid-Atlantic and southeast regions by producing "noise pollution" from military activities (79 *Federal Register* 132). The impacts on this habitat would be considered insignificant, with no discernible impact on the conservation function of the physical and biological features. The physical and biological features identified for the nearshore reproductive, overwintering, breeding, and *Sargassum* habitats would not be impacted by the production of weapons noise during training activities. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

##### 3.8.3.1.6.2 Impacts from Weapons Noise under Alternative 2

Impacts from weapons noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing activities. The number of items generating weapons firing noise (e.g., non-explosive and explosive practice munitions) under Alternative 2 is the same as Alternative 1.

#### 3.8.3.2 Explosive Stressors

This section summarizes the potential impacts of explosives used during military readiness activities within the Study Area. Explosives analyzed for impacts to reptiles include those in water and those that detonate within 10 meters (m) of the water surface, which are analyzed as in-water explosives.

Table 3.8-9 summarizes background information that is relevant to the analyses of impacts for explosives. New applicable and emergent science regarding explosive impacts is presented in Appendix D (Acoustic and Explosive Impacts Supporting Information).

**Table 3.8-9: Explosive Stressors Background Information Summary**

| *Substressor* | *Background Information Summary* |
|---|---|
| Explosives in air | In-air detonations at or near the water surface could transmit sound and energy into the water and impact reptiles. However, detonations within a few tens of meters of the surface are analyzed as if detonating completely underwater and the background information described above would also apply. Detonations that occur at higher altitudes would not propagate enough sound and energy into the water to result in impacts to reptiles and therefore are not analyzed in this section. |
| Explosives in water | Explosives may result in mortality and non-auditory injury. Direct injury due to explosives depends on the charge size, the geometry of the exposure (e.g., distance and depth), and the size of the animal. The intermittent nature of most impulsive sounds would result in very limited probability of any masking effects. Due to the rapid rise time and higher instantaneous peak pressure of impulsive noise, nearby noise is likely to cause startle or avoidance responses. There are limited studies of reptile responses to sounds from impulsive sound sources, and all data come from sea turtles exposed to seismic air guns, as summarized in Table 3.8-4. |

The quantitative analyses of impacts due to explosives supplants the analyses in the 2018 Final EIS/OEIS due to updates to the following: modifications in the criteria and thresholds used to assess impacts, revisions to animal density (number per unit area) calculations, alternations to the acoustic effects modeling, and changes to the proposed use of explosives. The detailed assessment of explosive stressors under this Proposed Action is in Appendix E (Acoustic and Explosives Impacts Analysis). Changes in the predicted explosive impacts are due to the following:

- Updates to criteria used to determine if an exposure to explosive energy may cause auditory effects, non-auditory injury, mortality, and behavioral responses. Changes to the auditory effects criteria include: a 20 dB (re 1 μPa$^2$s) decrease in the weighted impulsive sound exposure level thresholds, and a 2 dB (re 1 μPa) decrease in the impulsive sound pressure level thresholds.
- Revisions to the modeling of explosive effects in the Navy Acoustic Effects Model. See the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (U.S. Department of the Navy, 2024a).
- Updates to data on sea turtle presence, including estimated density of each species (number of animals per unit area), and depth distribution. For additional details, see the technical reports *U.S. Navy Marine Species Density Database Phase IV for the Atlantic Fleet Training and Testing Study Area* (U.S. Department of the Navy, 2024b) and *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii-Southern California Training and Testing Study Areas* (Oliveira et al., 2024).
- Changes in the locations, numbers, and types of modeled military readiness activities as described in Chapter 2 (Description of Proposed Action and Alternatives), and associated quantities of explosives (counts) shown in Section 3.0.3.3.2 (Explosive Stressors).
- No reduction of model-predicted mortalities due to visual observation mitigation, unlike in prior analyses. As discussed in Section 3.8.3 (Environmental Consequences), the Action Proponents will implement visual observation mitigation under Alternative 1 and Alternative 2 to reduce potential impacts from explosives on sea turtles. The Action Proponents will also implement

geographic mitigation to reduce potential explosive impacts within important sea turtle habitats as identified in Table 3.8-2. Mitigation areas for seafloor resources, as described in Section 3.3 (Habitats), may also provide some level of protection from explosive impacts for sea turtles that feed among, shelter, or otherwise inhabit these habitats.

- No reduction of model-predicted impacts due to animal avoidance of a sound source, unlike in prior analyses.

### 3.8.3.2.1 Impacts from Explosives

Explosions produce loud, impulsive, broadband sounds with sharp pressure peaks that can be injurious. Potential impacts from explosive energy and sound include non-auditory injury (including mortality), auditory effects (auditory injuries and TTS), behavioral reactions, physiological response, and masking. Ranges to effects for mortality, non-auditory injury, and behavioral responses are shown in Appendix E (Acoustic and Explosives Impacts Analysis). Explosive noise is very brief and intermittent, and detonations usually occur over a limited area for a brief period rather than being widespread. The potential for masking is limited. Reptiles may behaviorally respond, but responses to single detonations or small numbers of clusters may be limited to startle responses. As discussed in Appendix D (Acoustic and Explosive Impacts Supporting Information), sea turtles, crocodilians, and terrapins have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of impacts to crocodilians and terrapins are assessed to be comparable to those for sea turtles.

#### 3.8.3.2.1.1 Impacts from Explosives under Alternative 1

The use of explosives would generally decrease from the 2018 Final EIS/OEIS for both training and testing activities. Notably, for testing there would be no use of bin E17 (> 14,500 – 58,000 pounds [lb.] net explosive weight [NEW]) and reduced use of bin E16 (> 7,250 to 14,500 lb. NEW) for ship shock trials. There is also a reduction in the use of most of the largest explosive bins for both training and testing, and an extremely large decrease in explosives associated with medium-caliber gunnery (bin E1 [0.1 to 0.25 lb. NEW]).

Most explosive activities would occur in the Virginia Capes, Navy Cherry Point, Jacksonville, and Gulf of Mexico Range Complexes, although activities with explosives would also occur in other areas as described in Appendix A (Activity Descriptions). Activities involving in-water explosives from medium- and large-caliber naval gunfire, missiles, bombs, or other munitions are conducted more than 12 nautical miles from shore. Certain activities with explosives may be conducted closer to shore at locations identified in Appendix A, including the training activity Mine Neutralization Explosive Ordnance Disposal and testing activities Semi-Stationary Equipment Testing and Line Charge Testing.

The number of impacts to each species due to exposure to explosives during training and testing under Alternative 1 is shown in

Table 3.8-10 for a maximum year of activities and in Table 3.8-11 for seven years of activities. Appendix E (Acoustic and Explosives Impacts Analysis) provides additional detail on modeled impacts to each species, including seasons and regions in which impacts are most likely to occur; which activities are most likely to cause impacts; and analysis of impacts to designated critical habitat for ESA-listed species, where applicable. Appendix E also shows total impacts to each species due to training or testing activities under this alternative and explains how impacts are summed to estimate maximum annual and seven-year total impacts.

**Table 3.8-10: Impacts Due to a Maximum Year of Explosive Training and Testing Activity under Alternative 1 and Alternative 2**

| Species | Alternative 1 | | | | | Alternative 2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | BEH | TTS | AINJ | INJ | MORT | BEH | TTS | AINJ | INJ | MORT |
| Green sea turtle | 3,353 | 1,647 | 33 | 3 | 1 | 3,364 | 1,651 | 33 | 3 | 1 |
| Kemp's ridley sea turtle | 6,584 | 2,858 | 52 | 2 | 0 | 6,590 | 2,860 | 53 | 2 | 0 |
| Leatherback sea turtle | 734 | 3,554 | 70 | 4 | 1 | 738 | 3,557 | 71 | 4 | 1 |
| Loggerhead sea turtle | 25,672 | 10,653 | 227 | 9 | 3 | 25,741 | 10,686 | 228 | 9 | 3 |

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; INJ = Non-Auditory Injury; MORT = Mortality; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero)

**Table 3.8-11: Impacts Due to Seven Years of Explosive Training and Testing Activity under Alternative 1 and Alternative 2**

| Species | Alternative 1 | | | | | Alternative 2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | BEH | TTS | AINJ | INJ | MORT | BEH | TTS | AINJ | INJ | MORT |
| Green sea turtle | 22,565 | 9,059 | 210 | 16 | 4 | 22,639 | 9,093 | 213 | 16 | 4 |
| Kemp's ridley sea turtle | 45,834 | 19,607 | 353 | 2 | 0 | 45,880 | 19,620 | 360 | 2 | 0 |
| Leatherback sea turtle | 4,942 | 10,343 | 217 | 10 | 3 | 4,974 | 10,362 | 218 | 10 | 3 |
| Loggerhead sea turtle | 174,632 | 65,720 | 1,434 | 60 | 10 | 175,124 | 65,948 | 1,444 | 61 | 10 |

Notes: AINJ = Auditory Injury; BEH = Significant Behavioral Response; INJ = Non-Auditory Injury; MORT = Mortality; TTS = Temporary Threshold Shift
A dash (-) indicates no estimation of take (true zero).

A reptile's behavioral response to a single detonation or explosive cluster is expected to be limited to a short-term startle response or other behavioral responses, as the duration of noise from these events is very brief. Limited research and observations from air gun studies in Appendix D (Acoustic and Explosive Impacts Supporting Information) suggest that if sea turtles are exposed to repetitive impulsive sounds (analogous to impulsive sounds from explosives) in close proximity, they may react by increasing swim speed, avoiding the source, or changing their position in the water column. There is no evidence to suggest that any behavioral response would persist beyond the sound exposure. In addition, a stress response could accompany any behavioral response. Because the duration of most explosive events is brief, the potential for masking is low. Impacts including TTS, auditory injury, and non-auditory injury could reduce the fitness of an individual animal, causing a reduction in foraging success, reproduction, or increased susceptibility to predators. This reduction in fitness would be temporary for recoverable impacts, such as TTS. Full recovery from a TTS is expected to take a few minutes to a few days, depending on the severity of the initial shift.

Based on the updated background and analysis for training and testing under Alternative 1, impacts from explosives on reptiles would be limited to temporary or short-term impacts including behavioral and stress-startle responses and TTS, and long-term impacts including auditory injury, non-auditory injury, and mortality. This is consistent with a moderate impact on reptile populations as defined in Table 3.8-3.

Under the ESA, the use of explosives during military readiness activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of explosives for both training and testing may affect the American crocodile.

The use of explosives is not applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. Proposed critical habitat for the green sea turtle may be affected by the substressor. *Sargassum* habitat for green sea turtle proposed critical habitat would not be impacted by the sound from the use of explosives due to procedural mitigation of floating vegetation. Designated critical habitat for the loggerhead turtle is comprised of five different habitat types, which are nearshore reproductive, overwintering, breeding, constricted migratory, and *Sargassum* habitat. The use of explosives would impact the physical and biological features of the constricted migratory habitat in the mid-Atlantic and southeast regions by producing "noise pollution" from military activities (79 *Federal Register* 132). The impacts on this habitat would be considered insignificant, with no discernible impact on the conservation function of the physical and biological features. The physical and biological features identified for the nearshore reproductive, overwintering, breeding, and *Sargassum* habitats would not be impacted by the use of explosives during training activities. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

##### 3.8.3.2.1.2 Impacts from Explosives under Alternative 2

Impacts from explosives under Alternative 2 (Table 3.8-10 and Table 3.8-11) would increase for reptiles but are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing activities. The quantities of explosive activity (i.e., counts) under Alternative 2 would increase only slightly over Alternative 1.

### 3.8.3.3 Energy Stressors

This section analyzes the potential impacts of energy stressors used during military readiness activities in the Study Area. Detailed background information is provided in Appendix G (Non-Acoustic Impacts Supporting Information).

Table 3.8-12 contains brief summaries of background information that is relevant to analyses of impacts for each energy substressor (in-water electromagnetic devices and high-energy lasers).

#### 3.8.3.3.1 Impacts from In-Water Electromagnetic Devices

Table 3.8-12 contains a summary of the background information used to analyze the potential impacts of in-water electromagnetic devices on reptiles. For a listing of the types of activities that create an electromagnetic field under water, refer to Appendix B (Activity Stressor Matrices). The in-water devices producing an electromagnetic field are towed or unmanned mine countermeasure systems. The electromagnetic field is produced to simulate a vessel's magnetic field. In an actual mine-clearing operation, the intent is that the electromagnetic field would trigger an enemy mine designed to sense a vessel's magnetic field. In-water electromagnetic energy associated with the Proposed Action alternatives produce a strong enough field for effects on reptiles within a meter of their source.

**Table 3.8-12: Energy Stressors Background Information Summary**

| *Substressor* | *Background Information Summary* |
|---|---|
| In-water electromagnetic devices | Available information suggests sensitivity of reptiles to magnetic and electric fields. The range of Earth's magnetic field is 25 to 65 microteslas.<br>• At all life stages, some sea turtle species orient to Earth's magnetic field aiding in directional swimming and positioning within the oceanic currents (Christiansen et al., 2016; Putman & Mansfield, 2015). Growing evidence suggests that sea turtle |

**Table 3.8-12: Energy Stressors Background Information Summary (continued)**

| *Substressor* | *Background Information Summary* |
|---|---|
| | hatchlings imprint on the magnetic field of their natal beach, aiding them in the return for nesting once they reach maturity (Lohmann & Lohmann, 2019).<br>• It is suspected that alligators and terrapins can detect electromagnetic fields, but these predominantly inshore reptiles typically exhibit low dispersal distances from natal beaches and are more likely to rely on environmental cues (e.g., visual, shoreline shape, currents) to navigate to natal beaches than Earth's magnetic field (Brothers & Lohmann, 2015, 2018; Mathis & Moore, 1988; Putman et al., 2015; Sheridan et al., 2010).<br>• Use of in-water magnetic devices has the potential to mask navigation magnetic fields and cause disorientation of reptiles. Sea turtles have been shown to detect changes in magnetic fields, which may cause them to deviate from their original direction. For example, a loggerhead hatchling was recorded swimming eastward while exposed to a magnetic field of 52 microteslas and then switched to a westward direction when the magnetic field was decreased to 43 microteslas (Lohmann & Lohmann, 1996).<br>• The static magnetic fields generated by electromagnetic devices used in training and testing activities are a maximum strength of approximately 2,300 microteslas with the strength of the field decreasing further from the device. At a distance of 4 meters (m) from the source of a 2,300-microtesla magnetic field, the strength of the field is approximately 50 microteslas, which is within the range of Earth's magnetic field (25 to 65 microteslas). At 8 m, the strength of the field is approximately 40% of Earth's magnetic field, and only 10% at 24 m away from a 2,300 microtesla magnetic field at the source. At a distance of 200 m, the magnetic field would be approximately 0.2 microteslas (U.S. Department of the Navy, 2005), which is less than 1% of the strength of Earth's magnetic field. This is likely within the range of detection for sea turtle species, but at the lower end of the sensitivity range.<br>• Magnetic fields generated by electromagnetic devices used in military readiness activities are of relatively minute strength. Reptile reactions to fields and electrical pulses may include no reaction, avoidance, habituation, changes in activity level, or attraction, but effects would only occur near the source and would not significantly impact reptiles. |
| In-air electromagnetic devices | The use of in-air electromagnetic devices during training and testing activities is not applicable to reptiles because in-air electromagnetic energy does not transmit underwater, nor would use of these devices be close enough in proximity to crocodilian and terrapin habitat and sea turtle nesting locations to have an effect on these animals. As a result, in-air electromagnetic devices will not be analyzed further in this section. |
| High-energy lasers | High-energy laser weapons training and testing involves the use of up to 30 kilowatts of directed energy as a weapon against small surface vessels and airborne targets which are deployed from surface ships and helicopters and directed at targets in open-ocean areas where sea turtles may be present.<br>• The primary concern for high-energy weapons training and testing is the potential for a sea turtle to be struck by a high-energy laser beam at or near the water's surface, which could result in injury or death from traumatic burns from the beam.<br>• The potential for exposure to a high energy laser beam decreases as the water depth increases. Because laser platforms are typically helicopters and ships, sea turtles at sea would likely move away or submerge in response to other stressors, such as ship or aircraft noise, although some sea turtles would not exhibit a |

**Table 3.8-12: Energy Stressors Background Information Summary (continued)**

| Substressor | Background Information Summary |
|---|---|
| | response to an oncoming vessel or aircraft, increasing the risk of contact with the laser beam.<br>• Per the Navy's strike analysis, the probability of a strike to green sea turtle in the Virginia Capes Range Complex and loggerhead sea turtles in the Jacksonville Range Complex from a high energy laser is less than a probability of 0.1 (see Appendix I, Military Expended Materials and Direct Strike Impact Analysis).<br>• High-energy laser weapons are designed to disable surface targets and turn off when they lose track of the target. Marine reptiles cannot fly into the beam before it turns off and would therefore not be exposed to the laser. |

Notes: % = percent; m = meters

#### 3.8.3.3.1.1 Impacts from In-Water Electromagnetic Devices under Alternative 1

For both training and testing activities, in-water electromagnetic device activity decreased overall from the 2018 Final EIS/OEIS (see Table 3.0-6, Number and Location of Activities Using In-Water Electromagnetic Devices).

Under Alternative 1 for training:

- In-water electromagnetic device use would occur in two areas (Key West Range Complex and Virginia Capes Range Complex Inshore where it was not previously analyzed for the 2018 Final EIS/OEIS.
- There would also be notable increases in in-water electromagnetic devices in the Virginia Capes and Gulf of Mexico Range Complexes. For all other locations, there would either be a decrease or similar amount of in-water electromagnetic devices.

Under Alternative 1 for testing:

- In-water electromagnetic devices would occur in two areas (Northeast Range Complexes and Hampton Roads, Virginia) where they were not previously analyzed for the 2018 Final EIS/OEIS.
- There would also be a notable increase in in-water electromagnetic devices in the Naval Surface Warfare Center Panama City Testing Range. For all other locations, there would either be a decrease or cessation of in-water electromagnetic devices.

For locations without a notable increase in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity (to magnetic fields) of reptiles within the training locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of in-water electromagnetic device activity remains an accurate characterization of the Proposed Action in those locations.

For the locations not previously analyzed, introduction of electromagnetic device use has the potential to impact magnetic navigation and homing ability for sea turtles that may be exposed in those areas (see Table 3.8-12).

Based on the relative amount and location of in-water electromagnetic device use, and the general description of impacts, the potential exposure is not expected to yield any lasting effects to reptile habitat, reproduction, growth, survival, and is not expected to result in population-level impacts or affect the distribution or abundance of reptiles.

The analysis conclusions for in-water electromagnetic device use with training and testing activities under Alternative 1 are consistent with a negligible impact on reptile populations.

Under the ESA, the use of in-water electromagnetic devices during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of in-water electromagnetic devices during training would have no effect on American crocodiles. The use of in-water electromagnetic devices during testing would not be applicable to American crocodiles.

The use of in-water electromagnetic devices would not be applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. There would be no effect to proposed critical habitat for the green sea turtle, or designated critical habitat for the loggerhead sea turtle. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

#### 3.8.3.3.1.2 Impacts from In-Water Electromagnetic Devices under Alternative 2

Impacts from in-water electromagnetic devices under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including use of in-water electromagnetic devices under Alternative 2 is the same as Alternative 1.

### 3.8.3.3.2 Impacts from High-Energy Lasers

Table 3.8-12 contains a summary of the background information used to analyze the potential impacts of high-energy lasers on reptiles. For a listing of the types of activities that use high-energy lasers, refer to Appendix B (Activity Stressor Matrices). High-energy lasers would only be used in open-ocean areas for training and testing activities; therefore, crocodilian and terrapin species are not included in the analysis for potential impacts from high-energy lasers because they would not be in areas where high-energy lasers would be used. High-energy laser weapons are designed to disable surface targets. Sea turtles could be exposed to the laser only if the beam misses the target.

#### 3.8.3.3.2.1 Impacts from High-Energy Lasers under Alternative 1

For training activities, the use of high-energy lasers increased from the 2018 Final EIS/OEIS, and for testing activities, the use of high-energy lasers decreased (Table 3.0-7, Number and Location of Activities Using High-Energy Lasers).

Under Alternative 1 for training:

- High-energy lasers would occur in one location not previously analyzed (Navy Cherry Point Range Complex) in for the 2018 Final EIS/OEIS. There would also be notable increases in high-energy lasers at the Virginia Capes and Jacksonville Range Complexes.

Under Alternative 1 for testing:

- High-energy lasers would no longer occur in two locations (South Florida Ocean Measurement Facility and Key West Range Complex) that they occurred in for the 2018 Final EIS/OEIS. For all other locations, there would be a decrease in high-energy lasers.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of high-energy laser activity remains an accurate characterization of the Proposed Action in those locations.

High-energy lasers would only be used in open-ocean areas for training and testing activities; therefore, crocodilian and terrapin species are not included in the analysis for potential impacts from high-energy lasers because they would not be in areas where high-energy lasers would be used. The only potential effect on sea turtles from the use of high-energy lasers is direct exposure to laser light incident on the water's surface at the time a sea turtle is at or near the water's surface, and for the exposure to cause injury. A sea turtle could only be exposed if a laser beam missed the intended target and inadvertently struck a nearby sea turtle. The statistical probability analysis (see Appendix I [Military Expended Materials and Direct Strike Impact Analysis] indicates that the probability of a sea turtle being hit by a high-energy laser beam is less than 1 percent therefore it is considered discountable.

The probability analysis does not take into account that high-energy laser systems used in military readiness activities automatically shut down when target-lock is lost; meaning that is a high energy laser beam aimed at a small boat on the surface, either from an aircraft or surface vessel, moves off the target, the system ceases projecting laser light, preventing any energy from striking the water or a nearby sea turtle. Therefore, even though ESA-listed sea turtles may be present at the time the high-energy lasers are used, there is no plausible route of effects to these listed species. Further, high-energy laser use has no direct pathway to impact the physical and biological features identified for proposed or designated critical habitat (79 *Federal Register* 39856, 88 *Federal Register* 46572) due to the directed energy of the laser, the dissipation of energy as water depth increases, and the temporary duration of the activities.

The analysis conclusions for high energy laser use with training and testing activities under Alternative 1 are consistent with no impact on reptile populations.

Under the ESA, the use of high-energy lasers during training and testing activities as described under Alternative 1 would have no effect on the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, or loggerhead sea turtle or proposed and designated critical habitat. The use of high-energy laser would not be applicable to the American crocodile or its designated critical habitat. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

##### 3.8.3.3.2.2 Impacts from High-Energy Lasers under Alternative 2

Impacts from high-energy lasers under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including high-energy lasers under Alternative 2 would be the same as Alternative 1.

### 3.8.3.4 Physical Disturbances and Strike Stressors

This section analyzes the potential impacts of the various types of physical disturbance and strike stressors used by the Action Proponents during military readiness activities in the Study Area. The physical disturbance and strike stressors that may impact reptiles include (1) vessels and in-water devices; (2) military expended materials, including non-explosive practice munitions and fragments from high-explosive munitions; (3) seafloor devices; and (4) pile driving. General discussion of impacts can also be found in Section 3.0.3.6.3 (Conceptual Framework for Assessing Effects from Physical Disturbance or Strike).

Table 3.8-13 contains brief summaries of background information that is relevant to analyses of impacts from physical disturbance and strike substressors (vessels and in-water devices, military expended materials, seafloor devices, and pile driving). Details on the updated information in general, as well as effects specific to each substressor, are provided in Appendix G (Non-Acoustic Impacts Supporting Information).

**Table 3.8-13: Physical Disturbance and Strike Stressors Background Information Summary**

| ***Substressor*** | ***Background Information Summary*** |
|---|---|
| Vessels and in-water devices | Vessels:<br>• In the Study Area, commercial traffic is heaviest in the nearshore waters, near major ports and in the shipping lanes along the entire United States (U.S.) East Coast and along the northern coast of the Gulf of Mexico while Navy vessel traffic is primarily concentrated between the mouth of the Chesapeake Bay, Virginia, and Jacksonville, Florida (Mintz, 2016). Action Proponent traffic (U.S. Navy and U.S. Coast Guard combined) accounted for less than 2% of all vessel traffic (in terms of ship hours) within the vicinity of U.S. East Coast range complexes (Mintz, 2016). While commercial traffic is relatively steady throughout the year, Action Proponent vessel usage within the range complexes is episodic, based on specific exercises being conducted at different times of the year (Mintz, 2016); however, Action Proponent vessel use within inshore waters occurs regularly and primarily consists of high-speed small vessel movements.<br>• Strikes of reptiles could cause permanent injury or death from bleeding or other trauma, paralysis and subsequent drowning, infection, or inability to feed. The likelihood of recovery from a strike is influenced by the reptiles' age, reproductive state, and general condition.<br>• With the exception of hatchlings and pre-recruitment juveniles, sea turtles spend a majority of their time submerged (Renaud & Carpenter, 1994; Sasso & Witzell, 2006), though green sea turtles were observed to stay within the top 3 meters of water despite deeper water being available (Hazel et al., 2009; Hazel et al., 2007).<br>• Basking on the water's surface is common for all species in the Study Area as a strategy to thermoregulate and rest and is most common during inter-nesting periods. The reduced and idle activity associated with basking at the water's surface puts sea turtles at increased risk of a vessel strikes.<br>• Foraging behavior for some reptile species would limit their time at the surface. For example, Kemp's ridley and loggerhead sea turtles can spend extended periods foraging at depth, even in open-ocean areas (DiMatteo et al., 2022; Roberts et al., 2022; Sasso & Witzell, 2006; Seney, 2016; Servis et al., 2015).<br>• Increased occurrence of some sea turtle species within the nearshore areas of Chesapeake Bay (Barco et al., 2018a; Barco et al., 2017; Barco et al., 2018b; DiMatteo et al., 2022) expose them to smaller and faster vessels with increased risk of strike.<br>• American alligators are likely sensitive to approaching vessels, often demonstrating avoidance behaviors to both motorized and non-motorized recreational boating in lakes (Lewis et al., 2014), and are likely at higher risk for strike in narrow shallow channels that would restrict the movements of a fleeing alligator. American crocodiles are also at risk of a strike along the nearshore areas of west and east coast of Florida where frequency of sightings has increased over the years (U.S. Fish and Wildlife Service, 2022).<br>• Terrapins have been observed to not react to approaching vessels, which puts them at an increased risk of strike, particularly in high-density, small-vessel recreation areas (Lester, 2012; Lester et al., 2012).<br>In-water devices:<br>• In-water devices are generally smaller (several inches to 111 feet) than most Navy vessels.<br>• Devices that could pose a collision risk to reptiles are those operated at high speeds and those that are unmanned.<br>• Since some in-water devices are identical to support craft (typically less than 15 meters in length), reptiles could respond to the physical presence of the device similar to |

**Table 3.8-13: Physical Disturbance and Strike Stressors Background Information Summary (continued)**

| *Substressor* | *Background Information Summary* |
|---|---|
| | how they respond to the physical presence of a vessel. Physical disturbance from the use of in-water devices is not expected to result in more than a momentary behavioral response. These responses would likely include avoidance behaviors (swimming away or diving) and cessation of normal activities (e.g., foraging).<br>• Most in-water devices, such as unmanned underwater vehicles, move slowly or are closely monitored by observers. However, detecting the presence of reptiles is more difficult than marine wildlife (i.e., marine mammals).<br>• Towed devices are unlikely to strike a sea turtle because of the observers on the towing platform and other standard safety measures employed when towing in-water devices. |
| Military expended materials | Reptiles could be struck by military expended materials at the surface and on the seafloor as items settle on the bottom, and could also be disturbed by materials sinking through the water column, but the number of individuals affected would be low in the context of population size:<br>• For sea turtles, although disturbance or strike from an item as it falls through the water column is possible, it is not likely because the objects generally sink through the water slowly and can be avoided by most sea turtles. Materials will slow in their velocity as they approach the bottom of the water. Juvenile or adult sea turtles (e.g., Kemp's ridley, green, loggerhead, or hawksbill sea turtles) that happen to be in the vicinity foraging in benthic habitats will likely avoid the object. Sea turtles that are sleeping on the bottom may exhibit a startle response and shift away from an object sinking slowly to the bottom with negligible risk of injury.<br>• Direct strike potential is greatest at or near the surface for reptiles. However, reptiles may respond to other types of stressors (e.g., vessel noise or visual disturbance) and flee the vicinity of the inshore activity, thereby reducing the potential for physical disturbance and strike.<br>• It is unlikely that military expended materials would strike American alligators in these waters because materials would not be expended in small creeks and similar habitats. American alligators would be at higher risk for strike in more relatively open waters like rivers and estuaries where materials may be expended.<br>• Diamondback terrapins likely detect approaching vessels, but do not typically exhibit avoidance behaviors (Lester, 2012; Lester et al., 2012); therefore, terrapins are likely at increased strike risk by military expended materials when transiting an open water area or foraging at the surface.<br>• Most missiles and projectiles are fired at and hit their targets, so only a very small portion hit the water with their maximum velocity and force.<br>• Expended aerial targets and aerial target fragments hit the water's surface with relatively high velocity and force, although they fall rather than being fired.<br>• Disturbance or strike as expended materials sink through the water column is possible but not likely because most objects sink slowly and can be avoided.<br>• Propelled fragments produced by an exploding bomb are large and decelerate rapidly, posing little risk to reptiles.<br>• Sediment disturbance and turbidity caused by materials settling on the seafloor would be temporary and localized to the immediate vicinity where the materials land.<br>• The Navy reviewed torpedo design features and a large number of previous anti-submarine warfare torpedo exercises to assess the potential for torpedo strikes on marine mammals, and its conclusions are also relevant to reptiles. The acoustic homing programs of Navy torpedoes are sophisticated and would not confuse the |

**Table 3.8-13: Physical Disturbance and Strike Stressors Background Information Summary (continued)**

| *Substressor* | *Background Information Summary* |
|---|---|
| | acoustic signature of a marine mammal with a submarine/target. It is reasonable to assume that acoustic signatures of sea turtles would also not be confused with a submarine or target.<br>• Review of torpedo records indicates there has never been an impact on a sea turtle or other reptile. In thousands of exercises in which torpedoes were fired or in-water devices used, there have been no recorded or reported instances of a marine species strike from a torpedo or any other in-water device. |
| Seafloor devices | Seafloor devices may be either stationary (e.g., mine shapes, anchors, bottom-placed instruments) or move slowly along the bottom (e.g., bottom-crawling unmanned underwater vehicles) where they may temporarily disturb the bottom and reptiles before being recovered. Strikes and disturbance of reptiles by seafloor devices are possible but not likely:<br>• Benthic-foraging sea turtles (e.g., Kemp's ridley, green, loggerhead, or hawksbill sea turtles), American alligators, and diamondback terrapins would most likely encounter a seafloor device but would likely avoid it.<br>• Seafloor devices do not pose a significant strike risk to sea turtles, terrapins, or alligators. |
| Pile driving | Reptiles are mobile and would be able to avoid the physical disturbance and strike stressors associated with pile driving activities. There is no direct pathway to impact reptiles from this stressor. |
| Aircraft and aerial targets | Aircraft and aerial targets do not overlap reptile species ranges, proposed, or designated critical habitat distributions and therefore will not be discussed further. |

The Action Proponents will implement mitigation tailored to reducing the impact of physical disturbance and strike within sensitive areas where reptiles are known to occur, including areas of designated or proposed critical habitat (see Figure 3.8-11 through Figure 3.8-15). The mitigation areas referenced in Table 3.8-2 and in Chapter 5 (Mitigation) will reduce or eliminate the impact of disturbance from potential vessel strike or strikes associated with in-water devices, military expended material and seafloor devices.

#### 3.8.3.4.1 Impacts from Vessels and In-Water Devices

Table 3.8-13 contains a summary of the background information used to analyze the potential impacts of vessels and in-water devices on reptiles. For a listing of the types of activities that involve vessels and in-water devices, refer to Appendix B (Activity Stressor Matrices).

The mitigation identified in Table 3.8-2 will reduce or eliminate the potential impacts from vessel disturbance within aquatic vegetation habitats (*Sargassum*) where reptiles may occur.

##### 3.8.3.4.1.1 Impacts from Vessels and In-Water Devices under Alternative 1

For both training and testing activities, vessel and in-water device activity decreased overall from the 2018 Final EIS/OEIS (see Table 3.0-9, Number and Location of Activities Including Vessels and Table 3.0-10, Number and Location of Activities Including In-Water Devices).

Under Alternative 1 for training:

- Vessel activity would occur in one new port and pierside location (Gulfport, Mississippi) where it did not occur in the 2018 Final EIS/OEIS and one location (Pascagoula, Mississippi) that was not previously analyzed in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease or similar amount of vessel activity.

- In-water device activity (including both expended and recovered materials) would occur in one location (Northeast Range Complexes Inshore) where it was not previously analyzed. For all other locations, there would either be a decrease, similar amount, or cessation of in-water device activity.

Under Alternative 1 for testing:

- Vessel activity would occur in five locations (Other AFTT Areas; Northeast Range Complexes Inshore, Virginia Capes Range Complex Inshore, Gulf of Mexico Range Complexes Inshore, and Hampton Roads, Virginia) where it was not previously analyzed. There would also be notable increases in vessel activity at the Naval Surface Warfare Center Panama City Division Testing Range; Pascagoula, Mississippi; and Naval Station Norfolk. For all other locations, there would either be a decrease, similar amount, or cessation of vessel activity.
- In-water device activity (including both expended and recovered water-based targets) would occur in four locations (Gulf of Mexico Range Complex Inshore; Bath, Maine; Newport, Rhode Island; and Pascagoula, Mississippi) where they were not previously analyzed. For all other locations, there would either be a decrease or similar amount of in-water device activity.

For locations without a notable increase in vessel and in-water device activity, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general occurrence of reptiles within the training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of vessel or in-water device activity remains an accurate characterization of the Proposed Action in those locations. Section 3.0 (Introduction) also describes high-speed vessel activity as not changing from what was analyzed in the 2018 Final EIS/OEIS and summarized below.

For the new inshore and port and pierside locations, the potential for a vessel strike to reptiles is a factor that was not previously a concern for those areas before. However, non-Action Proponent/recreational vessels already frequent these locations, and thus the risk of vessel strike to reptiles would not be anticipated to increase substantially with Action Proponent vessel activities.

Based on the relative amount and location of vessels and in-water devices under Alternative 1 for training and testing and the general description of impacts (see Table 3.8-13), there would be a small area of disturbance and potential risk of strike to reptiles that may occur but that would be mitigated through measures implemented as shown in Table 3.8-2 and discussed in Chapter 5 (Mitigation). The effects of the substressors on reptiles are not expected to result in detectable changes to reptile habitat, reproduction, growth, or survival, and are not expected to result in population-level impacts or affect the distribution or abundance of reptiles.

Due to the potential overlap of vessel and in-water device activity, particularly in areas where there may be increased distribution of sea turtles, there is the potential of injury and/or mortality from a strike. Therefore, the analysis conclusions for vessel and in-water device use with training and testing activities under Alternative 1 are consistent with a minor to moderate impact on reptile populations.

Under the ESA, the use of vessels and in-water devices during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. Vessel and in-water device use may affect American crocodile for training activities. The use of vessels and in-water devices with testing activities is not applicable to American crocodiles.

There would be no effect to proposed critical habitat for the green sea turtle, or designated critical habitat for the loggerhead sea turtle. The use of vessels and in-water devices is not applicable to the designated critical habitat for the hawksbill sea turtle, leatherback sea turtle, and American crocodile. For green sea turtle designated critical habitat, there would be no effect from vessel use, and the use of in-water devices would not be applicable. Training activities that use vessels and in-water devices would not impact the prey species found in *Sargassum* habitat or the nearshore habitat conditions that are essential for nearshore reproductive, benthic foraging, and resting habitat. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

#### 3.8.3.4.1.2 Impacts from Vessels and In-Water Devices under Alternative 2

Impacts from vessels and in-water device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including vessels or in-water devices increases only slightly over that of Alternative 1.

### 3.8.3.4.2 Impacts from Military Expended Materials

Table 3.8-13 contains a summary of the background information used to analyze the potential impacts of military expended materials on reptiles. For a listing of the types of activities that include military expended materials, refer to Appendix B (Activity Stressor Matrices).

The mitigation measures identified in Table 3.8-2 will reduce or eliminate the potential impacts by locating some activities that include military expended materials away from nearshore areas that are designated and/or proposed critical habitat for reptiles which also include avoidance of *Sargassum* habitat (see Chapter 5, Mitigation). In other areas where activities that include military expended materials are proposed, the impact is limited by the distance from shore (e.g., most heavy munitions limited to areas outside of state coastal waters, depending on the state) which places most impacts seaward.

#### 3.8.3.4.2.1 Impacts from Military Expended Materials under Alternative 1

For both training and testing activities, the number of military expended materials decreased overall from the 2018 Final EIS/OEIS (see Table 3.0-12, Number and Location of Explosives that May Result in Fragments Used during Military Readiness Activities; Table 3.0-13, Number and Location of Targets Expended during Military Readiness Activities; Table 3.0-14, Number and Location of Other Military Materials Expended during Military Readiness Activities; and Table 3.0-17, Number and Location of Wires and Cables Expended during Military Readiness Activities).

Under Alternative 1 for training:

- Military expended materials would occur in one location not previously analyzed (Gulf of Mexico Range Complex Inshore), and there would be a notable increase in the Key West Range Complex Inshore from the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease, similar amount, or cessation of military expended materials.

Under Alternative 1 for testing:

- Military expended materials would occur in three locations (Other AFTT Areas; Naval Submarine Base Kings Bay, and Port Canaveral, Florida) where it was not previously analyzed in the 2018 Final EIS/OEIS. For all other locations, there would be a decrease of military expended materials.

For locations without a notable increase in military expended materials, the analysis from the 2018 Final EIS/OEIS remains valid, and the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of reptiles within training and testing locations has not changed.

For locations not previously analyzed, the impact analysis that was conducted in the 2018 Final EIS/OEIS has changed. Aspects of the analysis include the potential for lighter expended materials (e.g., decelerators/parachutes) to drift into shallow, inshore habitats covered earlier in this section for military readiness activities.

The primary concern is the potential for a sea turtle, American crocodile, or diamondback terrapin to be struck with military expended material at or near the water's surface, which could result in injury or death. For sea turtles, although disturbance or strike from an item as it falls through the water column is possible, it is not likely because the objects generally sink through the water slowly and can be avoided by most sea turtles. Materials will slow in their velocity as they approach the bottom of the water and will likely be avoided by any juvenile or adult sea turtles (e.g., Kemp's ridley, green, loggerhead, or hawksbill sea turtles) that happen to be in the vicinity foraging in benthic habitats. Therefore, the discussion of military expended materials strikes focuses on the potential of a strike at the surface of the water. Other reptiles (such as American crocodiles and terrapins) could be on the water's surface. However, these reptiles may respond to other types of stressors (e.g., vessel noise or visual disturbance) and flee the vicinity of the inshore activity, thereby reducing the potential for physical disturbance and strike. Where inshore training and testing activities are adjacent to any terrapin rookery locations, terrapins (nesting females and hatchlings) may be at higher risk of physical disturbance and strike because more individual terrapins would be expected to occur in inshore waters in close proximity to these locations.

While no strike from military expended materials has ever been reported or recorded on a reptile, the possibility of a strike still exists. Therefore, the potential for sea turtles to be struck by military expended materials was evaluated using statistical probability modeling to estimate potential direct strike exposures to a sea turtle. American alligators, American crocodiles, and diamondback terrapins were not included in the model because these species occur in relatively more shallow water habitats and would likely respond to other stressors from inshore training and testing activities. Further, use of military expended materials would not occur in mitigation areas that protect nearshore habitats (i.e., *Sargassum* and designated critical habitats), thereby further protecting the species that occur within these nearshore waters, such as crocodilians or terrapins. Other mitigation measures would include lookouts and establishing distance restrictions from sea turtles for gunnery activities that are conducted using surface targets.

To estimate potential direct strike exposures of sea turtles, a scenario was calculated using the sea turtle species with the highest average monthly density in areas with the highest amounts of military expended material expenditures, specifically Virginia Capes and Jacksonville Range Complexes (see Appendix I, Military Expended Materials and Direct Strike Impact Analysis). To estimate the potential of military expended materials to strike a sea turtle, the impact area of all military expended materials was totaled over one year in the area with the highest combined amounts of military expended materials for the Proposed Action. Green sea turtles were used for Virginia Capes Range Complex and loggerhead sea turtles were used for Jacksonville Range Complex as a proxy species for modeling impacts because these sea turtle species have the highest seasonal density within the corresponding areas; therefore, green and loggerhead sea turtles provide the most conservative estimate of potential strikes. Under Alternative 1, the estimated potential exposure (strikes) probability to green sea turtles from military expended materials at Virginia Capes Range Complex and for loggerhead sea turtles in the Jacksonville Range Complex was less than 1 percent during training and testing (see Appendix I, Military Expended Materials and Direct Strike Impact Analysis).

Adult sea turtles are generally at the surface for short periods and spend most of their time submerged; however, hatchlings and juveniles of all sea turtle species spend more time at the surface while in ocean currents, and all sea turtle life stages bask on the surface. Leatherback sea turtles of all age classes are more likely to be foraging at or near the surface in the open ocean than other species, but the likelihood of being struck by a projectile remains very low because of the wide spatial distribution of leatherbacks relative to the point location of an activity. Furthermore, projectiles are aimed at targets, which will absorb the impact of the projectile. Other factors that further reduce the likelihood of a sea turtle being struck by an expended munition include the recovery of all non-explosive torpedoes as well as target-related materials that are intact after the activity.

Based on the relative amount, impact footprint, and location of material expended and the general description of impacts, activities involving military expended materials are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of reptile species at the population level. However, due to the potential for overlap of activities that expend military expended materials within areas where reptiles, particularly sea turtles, are abundant, behavioral or stress-related impacts may cause injury to or avoidance by individual sea turtles of foraging grounds. Therefore, the analysis conclusions for military expended materials used for training and testing activities under Alternative 1 are consistent with a minor to moderate impact on reptile populations.

Under the ESA, the use of military expended materials during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. Military expended materials may affect the American crocodile for training activities. Military expended materials not applicable to the American crocodile for testing activities.

The use of military expended materials is not applicable to the designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. There would be no effect to proposed critical habitat for green sea turtles, or designated critical habitat for loggerhead sea turtles. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

#### 3.8.3.4.2.2 Impacts from Military Expended Materials under Alternative 2

Impacts from military expended materials under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species and critical habitat are the same for both training and testing. The increase in footprint from Alternative 1 to 2 is only 0.026 acres and located mostly in the Gulf of Mexico Range Complex, with relatively small footprints in the other range complexes.

#### 3.8.3.4.3 Impacts from Seafloor Devices

Table 3.8-13 contains a summary of the background information used to analyze the potential impacts of seafloor devices on reptiles. For a listing of the types of activities that include seafloor devices, refer to Appendix B (Activity Stressor Matrices).

Proposed mitigation identified in Table 3.8-2 will reduce or eliminate the potential impacts by locating most seafloor devices away from sensitive habitats (i.e., *Sargassum* and designated critical habitats).

##### 3.8.3.4.3.1 Impacts from Seafloor Devices under Alternative 1

For both training and testing activities, the proposed use of seafloor devices increased overall from the 2018 Final EIS/OEIS (see Table 3.0-15, Number and Location of Activities that Use Seafloor Devices).

Under Alternative 1 for training:

- Seafloor device use would occur in one new location (Gulfport, Mississippi) where it did not occur in the 2018 Final EIS/OEIS and four locations (Northeast Range Complexes; Other AFTT Areas; Jacksonville Range Complex Inshore, and Naval Station Mayport) where it was not previously analyzed in the 2018 Final EIS/OEIS. There would also be notable increases in seafloor devices at the Virginia Capes Range Complex (offshore and Inshore locations) and Key West Range Complex Inshore. For all other locations, there would either be a decrease, cessation, or similar amount of seafloor device use.

Under Alternative 1 for testing:

- Seafloor device use would occur in five locations (Virginia Cape Range Complex Inshore, Key West Range Complex Inshore, Naval Submarine Base New London, Naval Station Mayport, and Port Canaveral, Florida) where it was not previously analyzed in the 2018 Final EIS/OEIS. There would also be notable increases in seafloor devices in the Northeast and Jacksonville Range Complexes, and in the Naval Surface Warfare Center Panama City Division Testing Range. For all other locations, there would either be a decrease or similar amount of seafloor devices.

For locations without a notable increase in seafloor devices, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of reptiles within training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of seafloor device activity remains an accurate characterization of the Proposed Action in those locations.

For the new location and locations not previously analyzed, standard operating procedures and seafloor resource mitigation measures as well as avoidance of sensitive habitat (i.e., *Sargassum* and critical habitats) that apply to mine shapes and other devices moored to the bottom, help to avoid impacting sensitive habitats for reptiles.

Seafloor devices include items placed on, dropped on, or moved along the seafloor such as mine shapes, anchor blocks, anchors, bottom-placed instruments, and bottom-crawling unmanned underwater vehicles. The likelihood of any reptile species encountering seafloor devices is considered low because these items are either stationary or move very slowly along the bottom. The inshore training locations may potentially be inhabited by diamondback terrapins, American alligator, and American crocodile.

In the unlikely event that a reptile is in the vicinity of a seafloor device, the slow movement and stationary characteristics of these devices would not be expected to physically disturb or alter natural behaviors of sea turtles, alligators, or terrapins. Objects fall through the water slowly until they rest on the seafloor and could be avoided by most reptiles and do not pose a significant strike risk to sea turtles, terrapins, or alligators. However, presence of seafloor devices placed on the bottom for several hours, particularly in areas where sea turtles forage along the bottom, can cause behavioral responses such as startle responses and avoidance of the area. Therefore, the analysis conclusions for seafloor device use for training and testing activities under Alternative 1 are consistent with a negligible to minor impact on reptile populations.

Under the ESA, the use of seafloor devices during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of seafloor devices would have no effect on the American crocodile.

There would be no effect to proposed critical habitat for the green sea turtle, or designated critical habitat for the loggerhead sea turtle. The use of seafloor devices is not applicable to designated critical habitats for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

##### 3.8.3.4.3.2 Impacts from Seafloor Devices under Alternative 2

Impacts from seafloor device activities under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of activities including seafloor devices under Alternative 2 would increase only slightly over Alternative 1.

#### 3.8.3.4.4 Impacts from Pile Driving

Pile driving occurs during training activities and would have no effect on reptiles because they are mobile and would be able to avoid the physical disturbance and strike stressors associated with pile driving activities. However, pile driving is also analyzed as an acoustic substressor for reptiles found in Section 3.8.3.1 (Acoustic Stressors).

##### 3.8.3.4.4.1 Impacts from Pile Driving under Alternative 1

Under Alternative 1 for training:

- Pile driving would occur in one new location (Gulfport, Mississippi) that it did not occur in for the 2018 Final EIS/OEIS.
- Pile driving would no longer occur as part of the Elevated Causeway System at Joint Expeditionary Base Little Creek in the Virginia Capes Range Complex or Marine Corps Base Camp Lejeune in the Navy Cherry Point Range Complex.

There would be no pile driving or removal associated with testing activities.

Pile driving is not expected to result in a strike or meaningful disturbance of marine reptiles that was not accounted for under the pile driving noise analysis. The analysis conclusions for physical disturbance and strike with training activities under Alternative 1 are consistent with no impact on reptile populations.

Under the ESA, pile driving during training and testing activities as described under Alternative 1 would have no effect to green, hawksbill, Kemp's ridley, leatherback, or loggerhead sea turtles or proposed and designated critical habitat. Pile driving would not be applicable to the American crocodile or its designated critical habitat. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

##### 3.8.3.4.4.2 Impacts from Pile Driving under Alternative 2

Impacts from pile driving during training under Alternative 2 are no different from Alternative 1 and therefore the conclusions for ESA-listed species, critical habitat, and significance are the same.

There would be no pile driving associated with testing activities.

### 3.8.3.5 Entanglement Stressors

Most expended materials do not have the characteristics required to entangle marine species. Wires and cables, decelerators/parachutes, and biodegradable polymer are the expended materials most likely to entangle reptiles. Because expended materials that present entanglement risk to marine species are not expended in crocodilian or terrapin habitats, and because it is reasonable to assume that military expended materials would not drift into crocodilian or terrapin habitats, entanglement stressors are not analyzed for potential impacts on the American crocodile, American alligator, or the diamondback terrapin.

Table 3.8-14 contains a brief summary of background information that is relevant to analysis of impacts from entanglement substressors (wires and cables, decelerators/parachutes, and biodegradable polymer). Details on the updated information in general, as well as effects specific to each substressor are provided in Appendix G (Non-Acoustic Impacts Supporting Information).

**Table 3.8-14: Entanglement Stressors Background Information Summary**

| *Substressor* | *Background Information Summary* |
|---|---|
| Wires and cables | Fiber-optic cables, torpedo guidance wires, sonobuoy wires, and expendable bathythermograph wires would be expended during military readiness activities. Risk factors for entanglement of sea turtles include animal size (and life stage), sensory capabilities, and foraging methods:<br>• Most entanglements discussed in the literature are attributable to sea turtle entrapments with fishing gear or other non-military materials that float or are suspended at the surface.<br>• Deployed tactical fiber breaks if it is looped beyond its bend radius (3.4 millimeters) or exceeds its tensile strength (12 pounds). If the fiber becomes looped around an underwater object or sea turtle, it does not tighten unless it is under tension. Such an event would be unlikely based on its method of deployment and its resistance to looping after it is expended.<br>• The tactical fibers are often designed with controlled buoyancy to minimize the fiber's effect on vehicle movement. The tactical fiber would be suspended within the water column during the activity, and then be expended and sink to the seafloor [effective sink rate of 1.45 centimeters/second (Raytheon Company, 2015)] where it would be susceptible to abrasion and burial by sedimentation.<br>• Encounter rates with fiber optic cables by sea turtles are limited by the small number of cables that are expended. Other factors that increase the risk of sea turtle interactions with fiber-optic cables include the amount of time a fiber-optic cable is in the same vicinity of a sea turtle; however, these cables will only be within the water column during the activity and while they sink. |

**Table 3.8-14: Entanglement Stressors Background Information Summary (continued)**

| *Substressor* | *Background Information Summary* |
|---|---|
| Decelerators/parachutes | At water impact, the decelerator/parachute assembly is expended and sinks away from the unit.<br>• Small and medium decelerator/parachute assemblies may remain at the surface for 5 to 15 seconds before drifting to the bottom, where they become flattened and more of a physical disturbance stressor than an entanglement stressor.<br>• Large and extra-large decelerators/parachutes may remain at the surface or suspended in the water column for a longer time due to the lack of weight, but eventually also sink to the bottom and become flattened.<br>Decelerators/parachutes or decelerator/parachute cords may put sea turtles at risk of entanglement, particularly while at the surface. A sea turtle would have to surface to breathe or grab prey from under the decelerator/parachute and swim into the decelerator/parachute or its cords to become entangled. |
| Biodegradable polymers | Biodegradable polymer materials are configured into a non-woven mat that can be deployed on the water surface. Once wet, the fiber mats turn into more of a viscous fiber material which increases their ability to adhere to surfaces. The materials would degrade into smaller pieces within a few days to weeks, after which time the entanglement potential would cease.<br>• Military readiness activities that use biodegradable polymers to cause vessel entanglement have the potential to also entangle reptiles.<br>• Unlike other entanglement stressors, biodegradable polymers only retain their strength for a relatively short period of time; therefore, the potential for entanglement by a sea turtle would be limited. Furthermore, the longer the biodegradable polymer remains in the water, the weaker it becomes making it more brittle and likely to break.<br>• Hatchlings, however, would not likely be able to escape entrapment if they became entangled in a biodegradable polymer. Biodegradable polymers would only be a risk to hatchlings while the biodegradable polymer retained its tensile strength.<br>• For larger life stages, risk of entanglement is likely in the timeframe of a few hours after expenditure of the biodegradable polymers. For hatchlings, the risk would extend over a few weeks until the biodegradable polymer loses its tensile strength.<br>• Due to the wide dispersion and low numbers of biodegradable polymers as well as the patchy distribution of sea turtles, there is a low likelihood of sea turtles, especially hatchlings, interacting with biodegradable polymers while they are an entanglement risk. |

### 3.8.3.5.1 Impacts from Wires and Cables

Table 3.8-14 contains a summary of the background information used to analyze the potential impacts of wires and cables on sea turtles. For a listing of the types of activities that include wires and cables, refer to Appendix B (Activity Stressor Matrices).

#### 3.8.3.5.1.1 Impacts from Wires and Cables under Alternative 1

For training activities, the use of wires and cables increased overall from the 2018 Final EIS/OEIS, and for testing activities, the use of wires and cables decreased overall (see Table 3.0-17, Number and Location of Wires and Cables Expended during Military Readiness Activities).

Under Alternative 1 for training:

- The use of wires and cables would occur in one location (Key West Range Complex) where it was not previously analyzed in the 2018 Final EIS/OEIS. There would also be a notable increase in the use of wires and cables in the Virginia Capes and Jacksonville Range Complexes. For all other locations, there would either be the same amount or a similar amount of wires and cables.

Under Alternative 1 for testing:

- The use of wires and cables would occur in one area (Other AFTT Areas) where it was not previously analyzed in the 2018 Final EIS/OEIS. There would also be a notable increase in wires and cables in the Virginia Capes and Key West Range Complexes. For all other locations, there would either be a decrease or similar amount of wires and cables.

For locations without a notable increase in wires and cables, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of sea turtles within the training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of wire and cable releases remains an accurate characterization of the Proposed Action in those locations.

For the training and testing locations not previously analyzed, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of sea turtles (including hatchlings and pre-recruitment juveniles) encountering a wire or cable and becoming entangled remains low.

Based on the relative amount and location of wires and cables and the general description of effects, the impact on individuals and populations would be minor to moderate because the area exposed to the stressor has potential to overlap with the distribution ranges of sea turtles. Therefore, the risk of entanglement and exposure to behavioral responses or potential injury would be increased in areas (e.g. foraging grounds) where densities of sea turtles may be more abundant. However, wire and cable use would be dispersed such that few individuals would likely be exposed to more than one event, and exposures would be localized. The effects of wire and cable use on sea turtles may result in changes to distribution or abundance of sea turtle species in the locations they are used. Therefore, the analysis conclusions for wire and cable use associated with training and testing activities under Alternative 1 are consistent with a minor to moderate impact on reptile populations.

Under the ESA, the use of wires and cables during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of wires and cables would not be applicable to the American crocodile.

There would be no effect to proposed critical habitat for the green sea turtle, or designated critical habitat for the loggerhead sea turtle. The use of wires and cables during military readiness activities would not be applicable to the designated or proposed critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

#### 3.8.3.5.1.2 Impacts from Wires and Cables under Alternative 2

Impacts from wires and cables under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of wires and cables used under Alternative 2 would increase only slightly over Alternative 1.

#### 3.8.3.5.2 Impacts from Decelerators/Parachutes

Table 3.8-14 contains a summary of the background information used to analyze the potential impacts of decelerators/parachutes on sea turtles. For a listing of the types of activities that include decelerators/parachutes, refer to Appendix B (Activity Stressor Matrices).

##### 3.8.3.5.2.1 Impacts from Decelerators/Parachutes under Alternative 1

For both training and testing activities, decelerator/parachute use would increase from the 2018 Final EIS/OEIS (see Table 3.0-14, Number and Location of Other Military Materials Expended during Military Readiness Activities).

Under Alternative 1 for training:

- Decelerators/parachutes would be used in the same locations as they were used in the 2018 Final EIS/OEIS. However, there would be notable increases in the Virginia Capes and Jacksonville Range Complexes. For all other locations, there would be a similar amount of decelerators/parachutes.

Under Alternative 1 for testing:

- Decelerators/parachutes would be used in one area (Other AFTT Areas) where it was not previously analyzed in for the 2018 Final EIS/OEIS, and there would be a notable increase in the Northeast, Virginia Capes, and Key West Range Complexes. For all other locations, there would either be a decrease, or similar amount of decelerators/parachutes.

For locations without a notable increase in decelerators/parachutes, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of sea turtles within the training and testing locations has not changed. For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of ingestible munitions releases remains an accurate characterization of the Proposed Action in those locations.

For the training and testing locations not previously analyzed, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of reptiles encountering an ingestible munitions and consuming it remains low.

Although activities will occur in locations not previously analyzed, there would be no change in the impact analysis conducted in the 2018 Final EIS/OEIS because, although the increased number of decelerators/parachutes expended would cause a corresponding increase in the potential for entanglement, the probability would remain low relative to population numbers.

Based on the relative amount and location of decelerators/parachutes, most sea turtles would not encounter a decelerator/parachute. While in the water column, a sea turtle is less likely to become entangled because the decelerator/parachute would have to land directly on the sea turtle, or the sea turtle would have to swim into the decelerator/parachute or its cords before it sank. This is the case for the small and medium decelerators/parachutes; however, the likelihood for entanglement is higher for the large and extra-large decelerators/parachutes due to their size and the length of the attachment cords.

Hatchlings and pre-recruitment juveniles would not likely be able to escape entrapment if they became entangled in a decelerator/parachute at or near the water surface. The potential for a sea turtle to encounter an expended small or medium decelerator/parachute at the surface or in the water column is extremely low, and is even less probable at the seafloor, given the general improbability of a sea turtle being near the deployed decelerator/parachute, the sparse distribution of the small and medium decelerators/parachutes expended throughout the Study Area, as well as the patchy distribution and general behavior of sea turtles.

It should be noted that no known instances of sea turtle entanglement with a decelerator/parachute assembly have been reported.

The effects of decelerator/parachute use on sea turtles may result in detectable changes to reptile habitat, reproduction, growth, or survival, but are not expected to result in population-level impacts or affect the distribution or abundance of sea turtles. Decelerators/parachutes have no pathway to impact the physical and biological features identified for these habitats (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2013) due to the low concentration of decelerators/parachutes that are expended, the sparse distribution of the decelerators/parachutes expended in the deeper offshore waters throughout the Study Area, the fact that the wires and cables sink upon release, and the fact that assemblies are designed to sink rapidly through the water column . There is potential for overlap of activities that expend decelerators and parachutes with sea turtle distribution which increases risk of entanglement. Behavioral (stress-startle responses and avoidance) or potential for injury, especially for smaller sea turtles (juveniles), may occur in areas with higher density and abundance of sea turtles (such as foraging grounds). Therefore, the analysis conclusions for decelerator/parachute use associated with training and testing activities under Alternative 1 are consistent with a minor to moderate impact on reptile populations.

Under the ESA, the use of decelerators/parachutes during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp’s ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of decelerators/parachutes would not be applicable to the American crocodile.

There would be no effect to proposed critical habitat for green sea turtles, or designated critical habitat for loggerhead sea turtles. The use of decelerators/parachutes would not be applicable to designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

#### 3.8.3.5.2.2 Impacts from Decelerators/Parachutes under Alternative 2

Impacts from decelerators/parachutes under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of decelerators/parachutes used under Alternative 2 would increase only slightly over Alternative 1.

### 3.8.3.5.3 Impacts from Biodegradable Polymer

Table 3.8-14 contains a summary of the background information used to analyze the potential impacts of biodegradable polymer on sea turtles. For a listing of the types of activities that include biodegradable polymer, refer to Appendix B (Activity Stressor Matrices).

#### 3.8.3.5.3.1 Impacts from Biodegradable Polymer under Alternative 1

Biodegradable polymers would not be used during Action Proponent training activities under Alternative 1. The proposed use of biodegradable polymer decreased overall for testing from the 2018 Final EIS/OEIS.

Under Alternative 1 for testing:

- Activities using biodegradable polymer would occur in three locations not previously analyzed (Northeast Range Complexes, Navy Cherry Point Range Complex, and Joint Expeditionary Base Little Creek Fort Story). For all other locations, there would be a decrease in activities using biodegradable polymer.

For locations with a decrease in biodegradable polymer use, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of sea turtles within these locations has not changed.

For the training and testing locations not previously analyzed, these changes would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of a sea turtle encountering a biodegradable polymer and becoming entangled remains low.

Based on the relative amount and location of biodegradable polymer use, the vast majority of marine sea turtles would not encounter a biodegradable polymer regardless of the configuration being used. Due to the wide dispersion and low numbers of biodegradable polymers as well as the patchy distribution of sea turtles, there is a low likelihood of sea turtles, especially hatchlings and early pelagic juveniles, interacting with biodegradable polymers while they are an entanglement risk.

The effects of biodegradable polymer use on sea turtles are not expected to result in detectable changes to sea turtle behavior, habitat, reproduction, growth, or survival, and are not expected to result in population-level impacts or affect the distribution or abundance of sea turtles. Therefore, the analysis conclusions for biodegradable polymer use associated with testing activities under Alternative 1 are consistent with a negligible impact on reptile populations.

Under the ESA, the use of biodegradable polymers during testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp’s ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of biodegradable polymers would not be applicable to the American crocodile.

Biodegradable polymers may affect proposed critical habitat for green sea turtles and designated critical habitat for loggerhead sea turtles. The use of biodegradable polymers during testing activities would not be applicable to the designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. The Action Proponents are consulting with NMFS as required by section 7(a)(2) of the ESA.

#### 3.8.3.5.3.2 Impacts from Biodegradable Polymer under Alternative 2

There would be no use of biodegradable polymers associated with training activities.

Impacts from biodegradable polymer use during testing under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same.

### 3.8.3.6 Ingestion Stressors

The analysis of ingestion stressors on reptiles is differentiated by munitions and expended materials other than munitions.

The difference between the military expended materials categories is related to shape and material composition; munitions are aero- and/or hydrodynamic and composed of mostly hard metal or concrete whereas other types of military expended materials can be composed of a great variety of materials (e.g., metal, concrete, plastic, rubber, silicon, fabric) and components (e.g., circuit boards, batteries, electric motors).

This section analyzes the potential impacts of the various types of ingestion stressors used during military readiness activities in the Study Area. This analysis includes the potential impacts from the following types of military expended materials: non-explosive practice munitions (small- and medium-caliber), fragments from high-explosives, fragments from targets, chaff, flare casings (including plastic end caps and pistons), and decelerators/parachutes. As discussed in Appendix G (Non-Acoustic Impacts Supporting Information), biodegradable polymers break down and dissolve in the water column within weeks to a few months. Although they could be incidentally ingested by reptiles, the final breakdown product of biodegradable polymers is environmentally benign; therefore, it is not analyzed further as an ingestion stressor.

Table 3.8-15 contains a brief summary of background information that is relevant to analysis of impacts from ingestion stressors. Detailed background information supporting the ingestion stressor analysis is provided in Appendix G (Non-Acoustic Impacts Supporting Information).

**Table 3.8-15: Ingestion Stressors Background Information Summary**

| *Substressor* | *Background Information Summary* |
|---|---|
| Military expended materials – munitions | Many different types of explosive and non-explosive practice munitions are expended at sea during military readiness activities. Types of non-explosive practice munitions generally include projectiles, missiles, and bombs. Of these, only small- or medium-caliber projectiles would be small enough for a reptile to ingest in offshore and inshore waters:<br>• Small- and medium-caliber projectiles include all sizes up to and including 2.25 inches (57 millimeters) in diameter. These are solid metal munitions; therefore, even if a reptile did try to bite a larger munition, the munition would not break apart and be ingestible.<br>• Solid metal materials from high-explosive munitions would quickly move through the water column and settle to the seafloor; therefore, ingestion is not expected by most species.<br>• Ingestion of non-explosive practice munitions is not expected to occur in the water column because the munitions sink quickly.<br>• Fragments are primarily encountered by species that forage on the bottom. Other munitions and munition fragments such as large-caliber projectiles or intact training and testing bombs are too large for loggerhead, green, Kemp's ridley, and hawksbill sea turtles to consume and are made of metal so they cannot be broken up by sea turtles.<br>• Schuyler et al. (2014) noted that less than 10% of sea turtles (out of a sample size of 454 sea turtles) that ingested a wide range of debris suffered mortality, and 4% of sea turtles necropsied were killed by plastics ingestion (out of a sample size of 1,106 necropsied sea turtles). Because juvenile and adult green, loggerhead, Kemp's ridley, and hawksbill sea turtles feed along the seafloor, they are more likely to encounter munitions of ingestible size that settle on the bottom than leatherbacks that primarily feed at the surface and in the water column.<br>• Although there is the potential, particularly within nearshore areas, for crocodilians to consume munitions materials, ingestion risk of non-prey items is generally not a concern (Nifong & Silliman, 2017).<br>• Diamondback terrapins would be exposed to ingestion risks within inshore training and testing locations. They appear to be dietary generalists and opportunistic in foraging habits with a wide array of prey and forage items, which may increase the risk of ingestion for non-prey items. However, a large terrapin (particularly large females) are most at risk of ingesting non-prey items (Outerbridge et al., 2017). |

**Table 3.8-15: Ingestion Stressors Background Information Summary (continued)**

| Substressor | Background Information Summary |
| --- | --- |
| Military expended materials other than munitions | Several different types of materials other than munitions are expended during military readiness activities in the Study Area that have the potential to be ingested by reptiles. These include target-related materials, chaff, flares, decelerators/parachutes, AMNS neutralizer, grenades, torpedo accessories, and biodegradable polymer:<br>• Sea turtles would be exposed to potential ingestion risk of target-related materials where these items are expended in offshore and inshore waters. American alligators may be exposed to target-related materials within inshore locations.<br>• Although chaff fibers are too small for sea turtles to confuse with prey and forage, there is some potential for chaff to be incidentally ingested along with other prey items, particularly if the chaff attaches to other floating marine debris. If ingested, chaff is not expected to impact sea turtles due to the low concentration that would be ingested and the small size of the fibers.<br>• Bottom-feeding sea turtles, such as green, hawksbill, Kemp's ridley, and loggerhead sea turtles, would be at increased risk if ingesting chaff end caps and pistons as these items could be deposited in potential benthic feeding areas before these items would be encrusted or buried.<br>• An extensive literature review and controlled experiments conducted by the United States Air Force demonstrated that self-protection flare use poses little risk to the environment or animals (U.S. Department of the Air Force, 1997). For sea turtles, these types of flares are large enough to not be considered an ingestion hazard. Nonetheless, sea turtles within the vicinity of flares could be exposed to light generated by the flares. It is unlikely that sea turtles would be exposed to any chemicals that produce either flames or smoke since these components are consumed in their entirety during the burning process. Animals are unlikely to approach or get close enough to the flame to be exposed to any chemical components.<br>• Ingestion of a small decelerator/parachute by a sea turtle at the surface or within the water column would be unlikely, since the decelerator/parachute would not be available for very long before it sinks. Once on the seafloor, if bottom currents are present, the canopy may temporarily billow and be available for potential ingestion by sea turtles within bottom-feeding habitats.<br>• Bottom-feeding sea turtles (e.g., green, hawksbill, Kemp's ridley, and loggerhead sea turtles) tend to forage in nearshore and coastal areas rather than offshore, where the majority of these decelerators/parachutes are used. Since these materials would most likely be expended in offshore waters too deep for benthic foraging, it would be unlikely for bottom foraging sea turtles to interact with these materials once they sink; however, leatherbacks that feed offshore and in the water column could mistake a floating parachute for prey (i.e., jellyfish).<br>• Although there is the potential, particularly within nearshore areas, for crocodilians to consume military expended materials other than munitions, ingestion risk of non-prey items is generally not a concern (Nifong & Silliman, 2017).<br>• Diamondback terrapins would be exposed to ingestion risks within inshore training and testing locations. They appear to be dietary generalists and opportunistic in foraging habits with a wide array of prey and forage items, which may increase the risk of ingestion for non-prey items. However, a large terrapin (particularly large females) are most at risk of ingesting non-prey items (Outerbridge et al., 2017).<br>• Within inshore waters, military readiness activities would expend shells into the water, which can potentially overlap with benthic foraging of sea turtles, American alligators, American crocodiles, or diamondback terrapins, placing them at a higher risk for ingestion. The risk is expected to be low due to the small vicinity in which these activities involving military expended material would occur. |

Notes: % = percent; AMNS = Airborne Mine Neutralization System

### 3.8.3.6.1 Impacts from Military Expended Materials – Munitions

Table 3.8-15 contains a summary of the background information used to analyze the potential impacts of military expended materials that are munitions on reptiles. For a listing of the types of activities that include military expended materials - munitions, refer to Appendix B (Activity Stressor Matrices). Detailed analysis for ingestion stressors is provided in Appendix G (Non-Acoustic Impacts Supporting Information).

#### 3.8.3.6.1.1 Impacts from Military Expended Materials – Munitions under Alternative 1

For both training and testing activities, military expended materials - munitions would decrease from the 2018 Final EIS/OEIS (see Table 3.0-11, Number and Location of Non-Explosive Practice Munitions Expended during Military Readiness Activities and Table 3.0-12, Number and Location of Explosives that May Result in Fragments Used during Military Readiness Activities).

Under Alternative 1 for training:

- Ingestible munitions (including fragments from explosive munitions) would occur in all but three of the locations they did in the 2018 Final EIS/OEIS. The three removed locations include Northeast Range Complexes Inshore, Virginia Capes Range Complex Inshore, and Jacksonville Range Complex Inshore. There would be a notable increase in the Key West Range Complex Inshore, but for all other locations, there would either be a decrease or similar amount of ingestible munitions.

Under Alternative 1 for testing:

- Ingestible munitions would occur in one location (Naval Undersea Warfare Center Division, Newport Testing Area) where they were not previously analyzed in the 2018 Final EIS/OEIS. For all other locations, there would be a decrease in the amount of ingestible munitions.

For locations without a notable increase in ingestible munitions, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of reptiles within the training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of ingestible munitions releases remains an accurate characterization of the Proposed Action in those locations.

For the training and testing locations not previously analyzed, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of reptiles encountering an ingestible munitions and consuming it remains low.

The heavy materials comprising munitions would degrade into fragments that remain in the sediment posing an ingestion risk through trophic transfer to sea turtles that forage on contaminated filter-feeder prey. Based on the relative amount and location of expended munitions and the general description of effects, an impact on individual reptiles is unlikely, and impacts on populations would probably not be detectable. The effects of military expended munitions use as an ingestion stressor on reptiles are not expected to result in detectable changes to reptile habitat, reproduction, growth, or survival, and are not expected to result in population-level impacts or affect the distribution or abundance of reptiles. However, due to the potential of overlap with expended munitions and that sea turtles, specifically, are known to ingest non-prey items, there is the risk to their digestion, foraging behavior, and injury. Therefore, the analysis conclusions for military expended material use associated with training and testing activities under Alternative 1 are consistent with a minor to moderate impact on reptile populations.

Under the ESA, the use of military expended materials - munitions during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of military expended materials - munitions during training may affect the American crocodile, but would not be applicable for testing activities.

There would be no effect to proposed critical habitat for green sea turtles, or designated critical habitat for loggerhead sea turtles. The use of military expended materials - munitions would not be applicable to the designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

##### 3.8.3.6.1.2 Impacts from Military Expended Materials – Munitions under Alternative 2

Impacts from military expended materials – munitions under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing. The number of ingestible munitions or munition fragments used under Alternative 2 would increase only slightly over Alternative 1.

#### 3.8.3.6.2 Impacts from Military Expended Materials Other Than Munitions

Table 3.8-15 contains a summary of the background information used to analyze the potential impacts of military expended materials other than munitions on reptiles. For a listing of the types of activities that include military expended materials other than munitions, refer to Appendix B (Activity Stressor Matrices). Detailed analysis for ingestion stressors is provided in Appendix G (Non-Acoustic Impacts Supporting Information).

##### 3.8.3.6.2.1 Impacts from Military Expended Materials Other Than Munitions under Alternative 1

For both training and testing activities, military expended materials other than munitions would decrease from the 2018 Final EIS/OEIS (see Supplemental EIS/OEIS Table 3.0-14, Number and Location of Other Military Materials Expended during Military Readiness Activities).

Under Alternative 1 for training:

- Ingestible military expended materials other than munitions would no longer occur at one location (Virginia Capes Range Complex Inshore) that they did in the 2018 Final EIS/OEIS. However, there would be a notable increase in military expended materials other than munitions at the Virginia Capes Range Complex and the Key West Range Complex. For all other locations, there would either be a decrease or similar amount of military expended materials other than munitions.

Under Alternative 1 for testing:

- Ingestible military expended materials other than munitions would occur in one location (Other AFTT Areas) that was not previously analyzed in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease or similar amount of military expended materials other than munitions.
- Activities using biodegradable polymer would occur in three locations not previously analyzed (Northeast Range Complexes, Navy Cherry Point Range Complex, and Joint Expeditionary Base Little Creek) for the 2018 Final EIS/OEIS. For all other locations, there would be a decrease in the activities using biodegradable polymer (Table 3.0-18, Number and Location of Activities Including Biodegradable Polymers during Testing).

For locations without a notable increase in ingestible military expended materials other than munitions, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.8.2 (Affected Environment) do not alter the analysis because the general distribution and sensitivity of reptiles within training and testing locations has not changed.

For locations with notable increases in activity, the impact analysis that was conducted in the 2018 Final EIS/OEIS would not change because the infrequent and localized nature of ingestible military expended materials other than munitions releases remains an accurate characterization of the Proposed Action in those locations.

For the training and testing locations not previously analyzed, these increases would not change the impact analysis that was conducted in the 2018 Final EIS/OEIS because the likelihood of reptiles encountering ingestible military expended materials other than munitions and consuming it remains low.

The impact analysis that was conducted in the 2018 Final EIS/OEIS remains valid because the likelihood of reptiles encountering ingestible military expended material other than munitions and consuming it remains low.

In addition to metal or concrete fragments in the sediment, small plastic (or otherwise light) fragments may be consumed by a wide variety of sea turtles. Hard plastics and synthetic particles have been documented in the stomach contents of sea turtles (Duncan et al., 2018; Velez-Rubio et al., 2017). Ingestion of these materials can occur through various pathways in addition to direct consumption (i.e., adherence to aquatic vegetation, through trophic transfer and ingesting contaminated filter-feeding prey). Action Proponent activities would result in a small number of plastic particles introduced to the marine environment compared to other sources. Overall, the effects of military expended materials other than munitions on reptiles are not expected to result in detectable changes to reptile habitat, reproduction, growth, or survival, and are not expected to result in population-level impacts or affect the distribution or abundance of reptiles. However, due to the potential of overlap with expended materials other than munitions and that sea turtles, specifically, are known to ingest non-prey items, there is the risk to their digestion, foraging behavior, and injury. Therefore, the analysis conclusions for military expended materials other than munitions use associated with training and testing activities under Alternative 1 are consistent with a minor to moderate impact on reptile populations.

Under the ESA, the use of military expended materials other than munitions during training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp’s ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The use of military expended materials other than munitions would not be applicable to the American crocodile.

There would be no effect to proposed critical habitat for green sea turtles, or designated critical habitat for loggerhead sea turtles. The use of military expended materials other than munitions would not be applicable to the designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

#### 3.8.3.6.2.2 Impacts from Military Expended Materials Other Than Munitions under Alternative 2

Impacts from military expended materials other than munitions under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance impacts, ESA-listed species and critical habitat are the same for both training and testing. The number of ingestible non-munitions under Alternative 2 is the same as Alternative 1.

### 3.8.3.7 Secondary Stressors

This section analyzes potential impacts on reptiles exposed to stressors indirectly through impacts on their habitat (explosives and explosive byproducts, unexploded munitions, chemicals, and metals) and/or prey availability.

Table 3.8-16 contains brief summaries of background information that is relevant to the analyses of impacts for each substressor. Detailed updated information in general, as well as effects specific to each substressor are provided in Appendix G (Non-Acoustic Impacts Supporting Information).

**Table 3.8-16: Secondary Stressor Background Information Summary**

| *Indirect Links* | *Substressors* | *Background Information Summary* |
|---|---|---|
| Habitat | Explosives | • Explosions on or near the bottom in areas of soft substrate would not cause an overall reduction in the surface area or volume of sediment available to benthic invertebrate prey sources for reptiles.<br>• Activities that inadvertently result in explosions on or near hard bottom habitat or reefs could break hard structures and reduce the amount of colonizing surface available to encrusting organisms (e.g., corals, sponges). Refer to Section 3.3 (Habitats) for a more comprehensive summary of direct impacts to habitat. |
| | Explosive byproducts and unexploded munitions | Explosive byproducts and unconsumed explosives may potentially affect habitat, but the effects would likely be undetectable in the context of impacts on reptile populations because of extremely low concentrations and dilution of these materials in the Study Area:<br>• High-order explosions consume most of the explosive material, and byproducts would therefore not degrade sediment or water quality or result in indirect stressors to reptiles.<br>• Low-order detonations and unexploded munitions may result in the presence of explosive material in sediments or the water column. However, toxicity and other effects are generally associated with exposure to higher concentrations than those expected to occur due to military readiness activities.<br>• Munitions constituents and degradation products in sediments would likely be detectable only within a few feet, and the range of toxic sediment conditions could be less (inches). Due to low solubility and dilution, reptiles would be exposed to chemical byproducts in the water column only in the immediate vicinity of degrading explosives (inches or less). |
| | Chemicals | • Potentially harmful chemicals introduced into the marine environment consist mostly of propellants and combustion products, other fuels, polychlorinated biphenyls in target vessels, other chemicals associated with munitions, and simulants.<br>• Ammonium perchlorate (a rocket and missile propellant) is the most common chemical used. Other representative chemicals with potential to affect reptiles through impacts to their prey include propellant combustion products such as hydrogen cyanide and ammonia.<br>• Perchlorate from failed expendable items is therefore unlikely to compromise water quality to that point that it would act as a secondary stressor to sea turtles.<br>• Most propellants are consumed during normal operations, and the failure rate of munitions using propellants and other combustible materials is low. |

**Table 3.8-16: Secondary Stressor Background Information Summary (continued)**

| *Indirect Links* | *Substressors* | *Background Information Summary* |
|---|---|---|
| | | • Most byproducts occur naturally in seawater and are readily degraded by biotic and abiotic processes. All chemicals are quickly diluted by water movement.<br>• Target vessels are selected from a list of Navy-approved vessels that have been cleaned in accordance with U.S. Environmental Protection Agency guidelines. This procedure minimizes the amount of polychlorinated biphenyls entering the marine environment.<br>• Overall, concentrations of chemicals in sediment and water are not likely to cause injury or mortality to reptiles. |
| | Metals | • Metals are introduced into seawater and sediments as a result of military readiness activities involving vessel hulks, targets, munitions, and other military expended materials.<br>• Secondary effects may occur when marine invertebrates are exposed to concentrations above background levels by contact with the metal, contact with trace amounts in the sediment or water, and ingestion of contaminated sediments. This in turn creates trophic transfer when reptiles consume the contaminated prey source.<br>• Because metals tend to precipitate out of seawater and often concentrate in sediments, potential adverse indirect impacts are much more likely via sediment than water. However, studies have found the concentrations of metals in the sediments within military ranges or munitions disposal sites, where deposition of metals is very high, to be localized and rarely above biological effects levels.<br>• Impacts to sea turtle prey (i.e., invertebrates) would likely be limited to exposure in the sediment within a few inches of the object.<br>• Concentrations of metals in sea water are unlikely to be high enough to cause injury or mortality to reptiles. |
| Prey availability | All stressors | The potential for primary stressors to impact reptile prey populations is directly related to their impacts on biological resources (e.g., habitats, invertebrates, aquatic vegetation). Prey availability can be disturbed during the use of secondary stressors (explosives, explosives byproducts, unexploded munitions, metals, and chemicals).<br>• Metals and chemicals can be introduced into the seawater during training and testing activities, which could potentially impact the health or abundance of prey in the area. These impacts are expected to be negligible.<br>• The use of explosives and explosive byproducts could disperse prey in the area used. This would be a localized and short-term impact, and therefore be considered negligible.<br>• Inshore waters, which would receive small-caliber shells from training activities, have the potential to be deposited in substrates used by some sea turtles (in particular Kemp's ridley, loggerhead, and green sea turtles). |

#### 3.8.3.7.1 Impacts of Secondary Stressors under Alternative 1

The impacts of explosives and military expended materials in terms of physical habitat modification are described in Section 3.3 (Habitats). As stated previously, most detonations would occur in waters greater than 200 feet in depth and greater than 3 NM from shore, although mine warfare, demolition, and some testing of detonations would occur in shallow water close to shore. In deep waters, explosions would not likely remove habitat for sea turtles because explosions would not be on or proximate to the sea floor. These habitats include corals, seagrass beds, and other benthic habitats that are used by juvenile and adult sea turtle species.

The assessment of potential water and sediment quality degradation on aquatic life, including representative vegetation (seagrasses), is covered in Section 3.2 (Sediment and Water Quality). The analysis of sediment and water quality degradation in Section 3.2 is sufficient to cover the impact on habitat as utilized by reptiles.

The analysis included in Section 3.3 (Habitats) determined that, for Alternative 1, impacts to abiotic substrates from military expended materials would amount to 2.2 acres of habitat for vegetation that is not protected by standard operating procedures or mitigations measures (e.g., live hard bottom), resulting in little impact on the ability of substrates to support associated vegetated communities. Explosive craters would impact mostly microalgae growing in soft-intermediate substrate, where there are no mitigation areas. The indirect impact due to substrate disturbance would be relatively minor and inconsequential because of the small areas of the seafloor that would be affected and the temporary nature of the impact. Substrate would be disturbed, but not removed, and hence would be available for recovery of disturbed vegetation.

The analysis included in Section 3.2 (Sediment and Water Quality) determined that neither state nor federal standards/guidelines for sediments nor water quality would be violated by Alternative 1. Therefore, because these standards and guidelines are structured to protect human health and the environment, and the proposed activities do not violate them, no indirect impacts are anticipated on reptile habitat by military readiness activities proposed by under Alternative 1.

In-water explosions have the potential to injure or kill prey species that reptiles feed on within a small area affected by the blast; however, impacts would not substantially impact prey availability as discussed in Section 3.4 (Vegetation), Section 3.5 (Invertebrates), and Section 3.6 (Fishes). With respect to potential pollution as discussed under Section 3.2 (Sediment and Water Quality), literature on vegetation does not suggest any elevated sensitivity to pollutants from the Proposed Action. Military readiness activities in the Study Area would be unlikely to impact coral reefs (a direct or indirect source of prey and forage items for juvenile, sub-adult, and adult hawksbill sea turtles) because the Action Proponents implement measures within mitigation areas for shallow water coral reefs (see Chapter 5, Mitigation). Also, activities are not initiated near concentrated *Sargassum* mats (see Section 3.4, Vegetation, and Chapter 5, Mitigation), where hatchlings and pre-recruitment juvenile sea turtle prey is found. These mitigation measures would continue under the Proposed Action. Activities that involve the use of explosives typically occur at depths that exceed areas that support seagrass beds for foraging juvenile, sub-adult, and adult green sea turtles. For inshore military readiness activities, impacts on prey availability for crocodilians and terrapins, if they occurred, would not likely be measurable because of the types of activities that would occur in inshore training and testing locations, and because of the generalist diet of crocodilians and terrapins.

The impacts of the Proposed Action on secondary stressors were considered negligible to moderate (depending on the primary stressor) to reptiles.

Under the ESA, the secondary stressors associated with training and testing activities as described under Alternative 1 may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. Secondary stressors during training activities may affect the American crocodile, but would have no effect for testing activities.

There would be no effect to proposed critical habitat for green sea turtles, or designated critical habitat for loggerhead sea turtles. Secondary stressors would not be applicable to the designated critical habitat for the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and American crocodile. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA.

#### 3.8.3.7.2 Impacts of Secondary Stressors under Alternative 2

Impacts from secondary stressors under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same for both training and testing.

### 3.8.3.8 Combined Stressors

As described in Section 3.0.3.5 (Resource-Specific Impacts Analysis for Multiple Stressors), this section evaluates the potential for combined impacts of all stressors from the Proposed Action. The analysis and conclusions for the potential impacts from each of the individual stressors are discussed in the sections above. Stressors associated with proposed military readiness activities do not typically occur in isolation but rather occur in some combination. For example, mine neutralization activities include elements of acoustic, physical disturbance and strike, entanglement, ingestion, and secondary stressors that are all coincident in space and time. An analysis of the combined impacts of all stressors considers the potential consequences of additive and synergistic stressors from the Proposed Action, as described below.

There are generally two ways that a reptile could be exposed to multiple additive stressors. The first would be exposure to multiple sources of stress from a single event or activity (e.g., a mine warfare event may include the use of a sound source and a vessel). The potential for a combination of these impacts from a single activity would depend on the range of effects of each of the stressors and the response or lack of response to that stressor. Second, a reptile could be exposed to multiple military readiness activities over the course of its life, however, military readiness activities are generally separated in space and time in such a way that it would be unlikely that any individuals would be exposed to stressors from multiple activities within a short timeframe (hours to days). However, animals with a home range intersecting an area of concentrated activity have elevated exposure risks relative to animals that simply transit the area through a migratory corridor.

Multiple stressors may also have synergistic effects. For example, individuals that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical strike and disturbance stressors via a decreased ability to detect and avoid threats. Individuals that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to malnourishment and disorientation, leading to increase in likelihood of entanglement and physical strike stressors. These interactions are speculative, and without data on the combination of multiple stressors, the synergistic impacts from the combination of stressors are difficult to predict in any meaningful way.

The following analysis makes the reasonable assumption that the majority of exposures to individual stressors are non-lethal, and instead focuses on consequences potentially impacting fitness (e.g., physiology, behavior, reproductive potential).

#### 3.8.3.8.1 Combined Impacts of All Stressors under Alternative 1

Based on the general description of impacts, the combined impacts under Alternative 1 of all stressors would not be expected to impact reptile populations because (1) a reptile could be exposed to multiple military readiness activities over the course of its life, however, military readiness activities are generally separated in space and time in such a way that it would be unlikely that any individual sea turtle would be exposed to stressors from multiple activities within a short timeframe, and (2) mitigation measures to reduce potential impacts to reptiles and their designated critical habitat would be implemented. Existing conditions would not change considerably from the 2018 Final EIS/OEIS. The combined impact of all stressors from Alternative 1 are considered moderate (due to limited potential for injury) to reptiles.

#### 3.8.3.8.2 Combined Impacts of All Stressors under Alternative 2

The combined impacts of stressors under Alternative 2 are not meaningfully different from Alternative 1 and therefore the conclusions for significance are the same for both training and testing.

### 3.8.4 Endangered Species Act Determinations

Under the ESA, the Action Proponents have concluded military readiness activities may affect the green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, loggerhead sea turtle, and leatherback sea turtle as summarized in Table 3.8-17. The Action Proponents have also concluded that military readiness activities may affect green sea turtle proposed critical habitat and loggerhead sea turtle designated critical habitat. Military readiness activities would have no effect on green, hawksbill, and leatherback sea turtle designated critical habitat. The Action Proponents have also concluded that military readiness activities may affect the American crocodile but would have no effect on its critical habitat. The Action Proponents are consulting with NMFS and USFWS as required by section 7(a)(2) of the ESA. The summary of effects determinations for each ESA-listed species is provided in Table 3.8-17 for training and testing.

**Table 3.8-17: Summary of ESA-Effects Determinations for Reptiles under Alternative 1 (Preferred Alternative)**

| Species | DPS/Critical Habitat | Effects Determinations by Stressor | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acoustic | | | | | | Explosive | | Energy | | | Physical Disturbance and Strike | | | | | | Entanglement | | | Ingestion | | |
| | | Sonar and Other Transducers | Air Guns | Pile Driving | Vessel Noise | Aircraft Noise | Weapons Noise | Explosives in Air | Explosives in Water | In-Air Electromagnetic Devices | In-Water Electromagnetic Devices | High-Energy Lasers | Vessels | In-Water Devices | Aircraft and Aerial Targets | Military Expended Materials | Seafloor Devices | Pile Driving | Wires and Cables | Decelerators/Parachutes | Biodegradable Polymers | Military Expended Materials-Munitions | Military Expended Materials – Other | Indirect/Secondary |
| **Training Activities** | | | | | | | | | | | | | | | | | | | | | | | | |
| American Crocodile | Throughout range | NE | N/A | N/A | MA | MA | N/A | N/A | MA | N/A | NE | N/A | MA | MA | N/A | MA | NE | N/A | N/A | N/A | N/A | MA | N/A | MA |
| | Critical Habitat | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Green sea turtle | North Atlantic DPS | MA | N/A | MA | MA | MA | MA | N/A | MA | N/A | MA | NE | MA | MA | N/A | MA | MA | NE | MA | MA | N/A | MA | MA | MA |
| | Designated | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | NE | NE | N/A | N/A | N/A | N/A | NE | N/A | N/A | N/A | N/A | N/A | N/A |
| | Proposed | MA | N/A | N/A | MA | MA | MA | N/A | MA | N/A | NE | NE | NE | NE | N/A | NE | NE | NE | NE | NE | N/A | NE | NE | NE |
| Hawksbill sea turtle | Throughout range | MA | N/A | MA | MA | MA | MA | N/A | MA | N/A | MA | NE | MA | MA | N/A | MA | MA | NE | MA | MA | N/A | MA | MA | MA |
| | Designated | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | NE | N/A | N/A | N/A | N/A | N/A | NE | N/A | N/A | N/A | N/A | N/A | N/A |
| Kemp's ridley sea turtle | Throughout range | MA | N/A | MA | MA | MA | MA | N/A | MA | N/A | MA | NE | MA | MA | N/A | MA | MA | NE | MA | MA | N/A | MA | MA | MA |
| Loggerhead sea turtle | Northwest Atlantic DPS | MA | N/A | MA | MA | MA | MA | N/A | MA | N/A | MA | NE | MA | MA | N/A | MA | MA | NE | MA | MA | N/A | MA | MA | MA |
| | Designated | MA | N/A | N/A | MA | MA | MA | N/A | MA | N/A | NE | NE | NE | NE | N/A | NE | NE | NE | NE | NE | N/A | NE | NE | NE |
| Leatherback sea turtle | Throughout range | MA | N/A | MA | MA | MA | MA | N/A | MA | N/A | MA | NE | MA | MA | N/A | MA | MA | NE | MA | MA | N/A | MA | MA | MA |
| | Designated | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | NE | N/A | N/A | N/A | N/A | N/A | NE | N/A | N/A | N/A | N/A | N/A | N/A |
| **Testing Activities** | | | | | | | | | | | | | | | | | | | | | | | | |
| American Crocodile | Throughout range | NE | N/A | N/A | N/A | N/A | N/A | N/A | MA | N/A | N/A | N/A | N/A | N/A | N/A | N/A | NE | N/A | N/A | N/A | N/A | MA | N/A | NE |
| | Critical Habitat | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Green sea turtle | North Atlantic DPS | MA | MA | N/A | MA | MA | MA | N/A | MA | N/A | MA | NE | MA | MA | N/A | MA | MA | NE | MA | MA | MA | MA | MA | MA |
| | Designated | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | NE | N/A | N/A | N/A | N/A | N/A | NE | N/A | N/A | N/A | N/A | N/A | N/A |
| | Proposed | MA | MA | N/A | MA | MA | MA | N/A | MA | N/A | NE | NE | NE | NE | N/A | NE | NE | NE | NE | NE | MA | NE | NE | NE |
| Hawksbill sea turtle | Throughout range | MA | MA | N/A | MA | MA | MA | N/A | MA | N/A | MA | NE | MA | MA | N/A | MA | MA | NE | MA | MA | MA | MA | MA | MA |
| | Designated | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | NE | N/A | N/A | N/A | N/A | N/A | NE | N/A | N/A | N/A | N/A | N/A | N/A |
| Kemp's ridley sea turtle | Throughout range | MA | MA | N/A | MA | MA | MA | N/A | MA | N/A | MA | NE | MA | MA | N/A | MA | MA | NE | MA | MA | MA | MA | MA | MA |
| Loggerhead sea turtle | Northwest Atlantic DPS | MA | MA | N/A | MA | MA | MA | N/A | MA | N/A | MA | NE | MA | MA | N/A | MA | MA | NE | MA | MA | MA | MA | MA | MA |
| | Designated | MA | MA | N/A | MA | MA | MA | N/A | MA | N/A | NE | NE | NE | NE | N/A | NE | NE | NE | NE | NE | MA | NE | NE | NE |
| Leatherback sea turtle | Throughout range | MA | MA | N/A | MA | MA | MA | N/A | MA | N/A | MA | NE | MA | MA | N/A | MA | MA | NE | MA | MA | MA | MA | MA | MA |
| | Designated | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | NE | N/A | N/A | N/A | N/A | N/A | NE | N/A | N/A | N/A | N/A | N/A | N/A |

Notes: DPS = Distinct Population Segment; MA = may affect; NE = no effect; N/A = not applicable due to lack of geographic overlap with the stressor

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# References

Barco, S. G., M. L. Burt, R. A. DiGiovanni JR, W. M. Swingle, and A. S. Williard. (2018a). Loggerhead turtle *Caretta caretta* density and abundance in Chesapeake Bay and the temperate ocean waters of the southern portion of the Mid-Atlantic Bight. *Endangered Species Research, 37*, 269-287. DOI:10.3354/esr00917

Barco, S. G., S. A. Rose, and G. G. Lockhart. (2017). *Turtle Tagging and Tracking in Chesapeake Bay and Coastal Waters of Virginia: 2016 Annual Progress Report*. Norfolk, VA: Naval Facilities Engineering Command Atlantic.

Barco, S. G., S. A. Rose, G. G. Lockhart, and A. DiMatteo. (2018b). *Sea Turtle Tagging and Tracking in Chesapeake Bay and Coastal Waters of Virginia: 2017 Annual Progress Report*. Norfolk, VA: Naval Facilities Engineering Command Atlantic.

Brothers, J. R. and K. J. Lohmann. (2015). Evidence for geomagnetic imprinting and magnetic navigation in the natal homing of sea turtles. *Current Biology, 25*(3), 392–396.

Brothers, J. R. and K. J. Lohmann. (2018). Evidence that magnetic navigation and geomagnetic imprinting shape spatial genetic variation in sea turtles. *Current Biology, 28*(8), 1325–1329. DOI:https://doi.org/10.1016/j.cub.2018.03.022

Christiansen, F., N. F. Putman, R. Farman, D. M. Parker, M. R. Rice, J. J. Polovina, G. H. Balazs, and G. C. Hays. (2016). Spatial variation in directional swimming enables juvenile sea turtles to reach and remain in productive waters. *Marine Ecology Progress Series, 557*, 247–259.

DiMatteo, A., G. Lockhart, and S. Barco. (2022). Habitat models and assessment of habitat partitioning for Kemp's ridley and loggerhead marine turtles foraging in Chesapeake Bay (USA). *Endangered Species Research, 47*, 91–107. DOI:doi.org/10.3354/esr01168

Duncan, E. M., A. C. Broderick, W. J. Fuller, T. S. Galloway, M. H. Godfrey, M. Hamann, C. J. Limpus, P. K. Lindeque, A. G. Mayes, L. C. Omeyer, D. Santillo, R. T. E. Snape, and B. J. Godley. (2018). Microplastic ingestion ubiquitous in marine turtles. *Global Change Biology, 25*, 744–752. DOI:10.1111/gcb.14519

Hazel, J., I. R. Lawler, and M. Hamann. (2009). Diving at the shallow end: Green turtle behaviour in near-shore foraging habitat. *Journal of Experimental Marine Biology and Ecology, 371*(1), 84–92.

Hazel, J., I. R. Lawler, H. Marsh, and S. Robson. (2007). Vessel speed increases collision risk for the green turtle *Chelonia mydas*. *Endangered Species Research, 3*, 105–113.

Lester, L. A. (2012). *Direct and Indirect Effects of Recreational Boats on Diamondback Terrapins (Malaclemys terrapin).* (Unpublished doctoral dissertation). Drexel University, Philadelphia, PA. Retrieved from http://hdl.handle.net/1860/3982.

Lester, L. A., E. A. Standora, W. F. Bien, and H. W. Avery. (2012). Behavioral Responses of Diamondback Terrapins (*Malaclemys terrapin terrapin*) to Recreational Boat Sounds. In A. N. Popper & A. Hawkins (Eds.), *The Effects of Noise on Aquatic Life*. New York, NY: Springer Science + Business Media.

Lewis, J. D., J. W. Cain, III, and R. Denkhaus. (2014). Home range and habitat selection of an inland alligator (*Alligator mississippiensis*) population at the northwestern edge of the distribution range. *Southeastern Naturalist, 13*(2), 261–279.

Lohmann, K. J. and C. M. F. Lohmann. (1996). Orientation and open-sea navigation in sea turtles. *The Journal of Experimental Biology, 199*, 73–81.

Lohmann, K. J. and C. M. F. Lohmann. (2019). There and back again: natal homing by magnetic navigation in sea turtles and salmon. *Journal of Experimental Biology, 222*(Pt Suppl 1). DOI:10.1242/jeb.184077

Mathis, A. and F. R. Moore. (1988). Geomagnetism and the homeward orientation of the box turtle, *Terrapene carolina*. *Ethology, 78*(4), 265–274.

Mintz, J. D. (2016). *Characterization of Vessel Traffic in the Vicinities of HRC, SOCAL, and the Navy Operating Areas off the U.S. East Coast*. Alexandria, VA: Center for Naval Analyses.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. (2013). *Leatherback Turtle (Dermochelys coriacea) 5-Year Review: Summary and Evaluation*. Silver Spring, MD and Jacksonville, FL: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources; and U.S. Fish and Wildlife Service, Southeast Region, Jacksonville Ecological Services Field Office.

Nifong, J. C. and B. Silliman. (2017). Abiotic factors influence the dynamics of marine habitat use by a highly mobile “freshwater” top predator. *Hydrobiologia, 802*(1), 155–174.

Oliveira, E., M. DeAngelis, M. Chalek, J. Krumholz, and K. Anatone-Ruiz. (2024). *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy’s Atlantic and Hawaii-California Training and Testing Study Areas* (Undersea Warfare Center Division Newport Technical Report). Newport, RI: Undersea Warfare Center Division Newport.

Outerbridge, M. E., R. M. O'Riordan, T. Quirke, and J. Davenport. (2017). Restricted diet in a vulnerable native turtle, *Malaclemys terrapin* (Schoepff), on the oceanic islands of Bermuda. *Amphibian & Reptile Conservation, 11*(1), 25–35.

Putman, N. F. and K. L. Mansfield. (2015). Direct Evidence of Swimming Demonstrates Active Dispersal in the Sea Turtle “Lost Years.”. *Current Biology, 25*(9), 1221–1227.

Putman, N. F., P. Verley, C. S. Endres, and K. J. Lohmann. (2015). Magnetic navigation behavior and the oceanic ecology of young loggerhead sea turtles. *The Journal of Experimental Biology, 218*(7), 1044–1050.

Raytheon Company. (2015). *Airborne Mine Neutralization System (AMNS): Alternative Optical Fiber Engineering Study Final Report*. Portsmouth, RI: Integrated Defense Systems.

Renaud, M. L. and J. A. Carpenter. (1994). Movements and submergence patterns of loggerhead turtles (*Caretta caretta*) in the Gulf of Mexico determined through satellite telemetry. *Bulletin of Marine Science, 55*(1), 1–15.

Roberts, K. E., L. P. Garrison, J. Ortega-Ortiz, C. Hu, Y. Zhang, C. R. Sasso, M. Lamont, and K. M. Hart. (2022). The Influence of Satellite-Derived Environmental and Oceanographic Parameters on Marine Turtle Time at Surface in the Gulf of Mexico. *Remote Sensing, 14*(4534), 1-17. DOI:10.3390/rs14184534

Sasso, C. R. and W. N. Witzell. (2006). Diving behaviour of an immature Kemp's ridley turtle (*Lepidochelys kempii*) from Gullivan Bay, Ten Thousand Islands, southwest Florida. *Journal of the Marine Biological Association of the United Kingdom, 86*, 919–925.

Schuyler, Q., B. D. Hardesty, C. Wilcox, and K. Townsend. (2014). Global analysis of anthropogenic debris ingestion by sea turtles. *Conservation Biology, 28*(1), 129–139.

Seney, E. E. (2016). Diet of Kemp's ridley sea turtles incidentally caught on recreational fishing gear in the northwestern Gulf of Mexico. *Chelonian Conservation and Biology, 15*(1), 132–137.

Servis, J. A., G. Lovewell, and A. D. Tucker. (2015). Diet analysis of subadult Kemp's ridley (*Lepidochelys kempii*) turtles from west-central Florida. *Chelonian Conservation and Biology, 14*(2), 173–181.

Sheridan, C. M., J. R. Spotila, W. F. Bien, and H. W. Avery. (2010). Sex-biased dispersal and natal philopatry in the diamondback terrapin, *Malaclemys terrapin*. *Molecular Ecology, 19*(24), 5497–5510.

U.S. Department of the Air Force. (1997). *Environmental Effects of Self-Protection Chaff and Flares*. Langley Air Force Base, VA: U.S. Air Force, Headquarters Air Combat Command.

U.S. Department of the Navy. (2005). *Final Environmental Assessment and Overseas Environmental Assessment for Organic Airborne and Surface Influence Sweep Mission Tests*. Washington, DC: Airborne Mine Defense Program Office, Program Executive Office: Littoral and Mine Warfare.

U.S. Department of the Navy. (2024a). *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (Technical Report prepared by Naval Information Warfare Center Pacific). San Diego, CA: Naval Undersea Warfare Center.

U.S. Department of the Navy. (2024b). *U.S. Navy Marine Species Density Database Phase IV for the Atlantic Fleet Training and Testing Study Area* (Naval Facilities Engineering Command Atlantic Technical Report). Norfolk, VA: Naval Facilities Engineering Command Atlantic.

U.S. Fish and Wildlife Service. (2022). *American crocodile (Crocodylus acutus) 5-Year Review: Summary and Evaluation*. Vero Beach, FL: U.S. Fish and Wildlife Service, South Atlantic–Gulf and Mississippi Basin Regions, Florida Ecological Services Office.

University of Georgia. (2023). *Diamondback Terrapin (Malaclemys terrapin)*. Retrieved January 27, 2023, from https://srelherp.uga.edu/turtles/malter.htm.

Velez-Rubio, G. M., N. Teryda, P. E. Asaroff, A. Estrades, D. Rodriguez, and J. Tomas. (2017). Differential impact of marine debris ingestion during ontogenetic dietary shift of green turtles in Uruguayan waters. *Marine Pollution Bulletin, 127*, 603–611. DOI:10.1016/j.marpolbul.2017.12.053

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