Draft

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

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3.4 Vegetation

VEGETATION SYNOPSIS

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

- Acoustics: There is no evidence that underwater acoustic stressors impact marine vegetation. Acoustic stressors, therefore, are not analyzed for vegetation.
- Explosives: Explosives could affect vegetation by destroying individual plants or damaging parts of plants; however, there would be no persistent or large-scale effects on the growth, survival, distribution or structure of vegetation due primarily to the avoidance of sensitive habitats (e.g., hard bottom/seaweed habitat, seagrass beds, floating *Sargassum*) and recovery of relatively small areas of disturbed vegetation.
- Energy: Energy stressors are not applicable to vegetation because vegetation has a limited sensitivity to energy stressors and therefore will not be analyzed further in this section.
- Physical disturbance and strike: Physical disturbance and strike could affect vegetation by destroying individual plants or damaging parts of plants; however, there would be no persistent or large-scale effects on the growth, survival, distribution or structure of vegetation due to relatively fast growth, resilience, abundance of the most affected species (e.g., microalgae, seaweed), and vessel clearance over sensitive habitats per mitigation area requirements.
- Entanglement: Entanglement stressors are not applicable to vegetation due to the non-mobile nature of plant-life and are not analyzed further in this section.
- Ingestion: Ingestion stressors are not applicable to vegetation that uses photosynthesis to obtain necessary nutrients. The many species of microscopic algae that ingest other algae (i.e., mixotrophic phytoplankton) would be unaffected due to their vast populations, fast growth, and resilience. Therefore, the ingestion stressors are not analyzed further in this section.

3.4.1 Introduction

The following sections describe the vegetation found in the Study Area and evaluate the potential impacts of the proposed military readiness activities on them. Impacts to vegetation from the Proposed Action were analyzed in the 2018 Final EIS/OEIS. The primary changes from the analysis are provided where they apply in subsequent sections.

3.4.2 Affected Environment

The affected environment provides the context for evaluating the effects of the Action Proponents' military readiness activities on marine vegetation. With noted exceptions, the general background for vegetation in the Study Area is not meaningfully different from what is described 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) (Section 3.4.2.1, General Background). See Appendix F (Biological Resources Supplemental Information) for detailed information on the affected environment of vegetation.

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.

3.4.2.1 General Background

Vegetation in the Study Area comprises many thousands of species of plants spanning many taxonomic groups (taxonomy is a method of classifying and naming organisms).

There is updated information regarding the number and population status of species in the Study Area. However, a change in the number of species does not directly affect the analysis and conclusions.

3.4.2.1.1 Habitat Use

Habitat use varies by taxonomic groups and is described in terms of water column (e.g., phytoplankton, floating *Sargassum*), bottom (e.g., benthic macroalgae, seagrasses), or shores (e.g., coastal wetlands). A more detailed description of taxonomic groups and their location/habitat use in the Study Area is provided in Section 3.4.2.3 (Species Not Listed under the Endangered Species Act). Updated information includes the following:

- A refinement of the depth limits of vegetation in the Study Area; depth limits of benthic macroalgae and seagrass have been reduced from 200 and 90 meters (m) to 95 and 30 m, respectively (Clark et al., 2014; Duarte et al., 2007; Reed et al., 2019; Smith Jr., 1981; Vadas & Steneck, 1988).
- Inclusion of some additional data sources regarding the distribution of vegetated habitat types in the Study Area. Comprehensive mapping is provided in Section 3.3 (Habitats), Figure 3.3-1 through Figure 3.3-5 (showing seafloor habitats) or Figure 3.3-6 through Figure 3.3-10 (showing water column habitats).

3.4.2.1.2 General Threats

The general threats to marine vegetation include human activities (industrial, residential, and recreational activities) and natural occurrences (e.g., storms, surf, and tides). Human-caused stressors that act on marine vegetation include excessive nutrient input (such as fertilizers), siltation (the addition of fine particles to the ocean), pollution (oil, sewage, trash), climate change, fishing practices, shading from structures, habitat degradation from construction and dredging, and introduced or invasive species. Updated information includes the following:

- Verification of numerous potential effects from the listed threats.
- The status of the listed threats, as well as emerging threats.

3.4.2.2 Endangered Species Act-Listed Species

There are no vegetation species occurring in the Study Area that are listed under the Endangered Species Act (ESA) or officially proposed for listing. Previously listed Johnson's seagrass, *Halophila johnsonii*, was removed from listing under the ESA by the National Marine Fisheries Service (87 *Federal Register* 22137, May 16, 2022).

3.4.2.3 Species Not Listed under the Endangered Species Act

Table 3.4-1 provides general descriptions of major vegetation groups and their location/habitat use in the Study Area. Updated information on vegetation is provided in Appendix F (Biological Resources Supplemental Information). None of the updated information affects the analysis directly.

Table 3.4-1: Major Groups of Vegetation in the Study Area

Marine Vegetation Groups		***Habitats: Locations in the Study Area***		
Common Name[1] (Taxonomic Group)	***Description***	***Range Complex/Testing Range***	***Range Complex Inshore***	***Ports/Piers/ Coast Guard Stations***
Coccolithophores (phylum Haptophyta [Chrysophyta, Prymnesiophyceae])	Microalgae; single-celled marine phytoplankton	Water column < 200 meters: All locations	Water column: All locations	
Diatoms (phylum Ochrophyta [Heterokonta, Chrysophyta, Bacillariophyceae])			Water column and seafloor: All locations	
Blue-green algae (phylum Cyanobacteria)				
Dinoflagellates (phylum Dinophyta [Pyrrophyta])				
Red algae (phylum Rhodophyta)	Red microalgae	Water column < 200 meters: All locations	Water column and seafloor: All locations	
	Benthic macroalgae[2]; multi-celled large algae with leafy (i.e., seaweed) and layered growth forms	Hard bottom/Artificial structures < 95 meters: All locations	Hard bottom/Artificial structures: All locations	Artificial structures: All locations
Green algae (phylum Chlorophyta)	Green microalgae	Water column < 200 meters: All locations	Water column and seafloor: All locations	
	Benthic macroalgae[2] that form sheets or branching structures	Hard bottom/Artificial structures < 95 meters: All locations	Hard bottom/Artificial structures: All locations	Artificial structures: All locations
Brown algae (phylum Phaeophyta [Ochrophyta])	Floating macroalgae with only leafy growth forms (e.g., *Sargassum*)[2]	Water column Surface: All locations	Not present: All locations	
	Benthic macroalgae with only leafy or	Hard bottom/Artificial structures	Hard bottom/Artificial structures:	Artificial structures: Groton, CT

Table 3.4-1: Major Groups of Vegetation in the Study Area (continued)

Marine Vegetation Groups		*Habitats: Locations in the Study Area*		
Common Name[1] (Taxonomic Group)	***Description***	***Range Complex/Testing Range***	***Range Complex Inshore***	***Ports/Piers/ Coast Guard Stations***
	stringy growth forms (e.g., kelp)[2]	< 40 meters: Northeast RC NUWC Newport Testing Range	Northeast RC Inshore	Newport, RI Boston, MA Bath, ME
Vascular plants (phylum Tracheophyta)	Seagrasses[2]; grasses that grow fully submerged in sheltered waters of the Study Area	Soft seafloor < 30 meters: Key West RC	Soft seafloor < 5 meters: All Locations	Not present: All locations
	Coastal wetlands[2]; marsh grasses or mangroves bordering sheltered, inshore waters of the Study Area	Not present: All locations	Soft shores: all locations (mostly marsh grasses)	Not present: All locations

[1] Taxonomic groups are based on Roskov et al. (2015) and Ruggiero & Gordon (2015). Alternative classifications are in brackets. Phylum and division may be used interchangeably.
[2] Taxonomic group contains species forming Essential Fish Habitats.
Notes: < = less than; CT = Connecticut; GOMEX = Gulf of Mexico; MA = Massachusetts; ME = Maine; NUWC = Naval Undersea Warfare Center; RC = Range Complex; RI = Rhode Island; VACAPES = Virginia Capes

3.4.3 Environmental Consequences

Under the No Action Alternative, none of the proposed military readiness activities would be conducted. Therefore, baseline conditions of the existing environment for vegetation 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 in this section.

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

The focus of the subsequent analysis will be on large, multicellular plants; the impact of the Proposed Action Alternatives on unicellular or multicellular microalgae was considered negligible due to their vast population, growth rate, resilience, and movement with the flows of water and sediment.

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). The stressors and substressors presented for analysis include the following:

- **explosives** (explosions in water)
- **physical disturbance and strikes** (vessels and in-water devices; military expended materials; seafloor devices; pile driving)

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

The stressors that are not analyzed further in this Supplemental EIS/OEIS include acoustic, energy, entanglement, and ingestion. The reasoning for not analyzing these stressors is summarized in the vegetation synopsis with supporting details provided in the 2018 Final EIS/OEIS. There is also some updated information regarding the operation of high-energy lasers in Section 3.0.3.3.3 (Identifying Stressors for Analysis, Energy Stressors) as well as acoustic and ingestion stressor effects on vegetation that is reviewed and discounted in Appendix D (Acoustic and Explosive Impacts Supporting Information) and Appendix G (Non-Acoustic Impacts Supporting Information), respectively.

The analysis of potential impacts to vegetation considers the standard operating procedures and mitigation measures that would potentially provide protection to vegetation. Standard operating procedures relevant to vegetation (e.g., using explosives, operating vessels safely, placing seafloor devices for retrieval) are detailed in Appendix A (Section A.2.7, Standard Operating Procedures). Details on mitigation measures relevant to vegetation are referenced in Table 3.3-3 (Mitigation Requirements Summary by Stressor for Habitats) of Section 3.3 (Habitats). Details on all mitigation measures are provided in Chapter 5 (Mitigation).

The criteria for determining the significance of an impact on vegetation are described in Table 3.4-2. 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 3.4-2: Criteria for Determining the Significance of Proposed Action Stressors on Vegetation

Impact Descriptor	*Context and Intensity*	*Significance Conclusions*
Negligible	Impacts on vegetation would be limited to temporary (lasting up to several hours) changes in terms of spatial, nutritional, physiological, or reproductive requirements in the Study Area. Impacts on vegetation would not cause lasting damage or alteration.	Less than significant
Minor	Impacts would be temporary or short-term (lasting several days to several weeks) changes that would not be outside the natural range of variability in terms of spatial, nutritional, physiological, or reproductive requirements in the Study Area. Impacts on vegetation would be easily recoverable with no long-term or permanent impact.	Less than significant
Moderate	Impacts would be short-term or long-term (lasting several months or longer) changes that would be outside the natural range of variability in terms of spatial, nutritional, physiological, or reproductive requirements in the Study Area. Some vegetation would be damaged or altered potentially over the long term but the remainder would continue to support the species dependent on it.	Less than significant
Major	Short-term or long-term changes well outside the limits of natural variability in terms of spatial, nutritional, physiological, or reproductive requirements in the Study Area. Vegetation would be degraded over the long term or permanently such that its population in an area would no longer be sustainable.	Significant

With noted exceptions, the stressor background information and environmental consequences are not meaningfully different from what is described in the 2018 Final EIS/OEIS (Section 3.3.3, Environmental Consequences).

3.4.3.1 Explosive Stressors

Table 3.4-3 contains a brief summary of background information that is relevant to analyses of impacts from explosive stressors. Details on the updated information in general, as well as effects specific to each substressor, are provided in Appendix D (Acoustic and Explosive Impacts Supporting Information).

Table 3.4-3: Explosive Stressors Background Information Summary

Substressor	*Background Information Summary*
Explosions in the water	Explosions produce pressure waves with the potential to cause physical disturbance due to rapid changes in pressure and other physical effects. Charges detonated underwater could affect vegetation by destroying individual plants or damaging parts of plants. • The majority of underwater explosions occur on the surface and typically during the day at offshore locations outside of state coastal waters in depths greater than 100 feet (30 meters), where only floating *Sargassum* would be impacted. • Explosions on or near the seafloor occur mostly in estuarine or shallow ocean waters where much of the benthic vegetation (benthic macroalgae) grows on hard bottom areas and artificial structures. • If floating *Sargassum* or benthic vegetation is in the immediate vicinity of an explosion, the taxa most likely impacted are resilient to fragmentation and damage due to lack of vital organs, fast growth rate, and asexual reproduction.
Explosions in the air	Explosions in the air would not affect vegetation on the surface or the seafloor, due to the resilience of vegetation, lack of proximity to aquatic habitats, and transmission loss of explosive impulses across the air-water interface.

The Action Proponents will implement mitigation tailored to reducing the impact of explosives in the water on sensitive habitats that feature living organisms, including vegetation in the mitigation areas identified in Table 3.3-3 (Mitigation Requirements Summary by Stressor for Habitats) of Section 3.3 (Habitats). The mitigation areas that are not specific to vegetation are mapped and described in Section 3.3 because they primarily address impacts on the seafloor habitat of vegetation and other biological resources (e.g., live hard bottom). The mitigation that is specific to vegetation includes the following:

- Near observed concentrations of floating *Sargassum*, the Action Proponents will not use explosive ordnance due to the association of floating vegetation and some ESA-listed species (e.g., sea turtles).
- Within 350 yards of mapped submerged aquatic vegetation (includes both seagrass beds and benthic macroalgae habitat), the Action Proponents will not detonate explosive mines.

3.4.3.1.1 Impacts from Explosives in Water

Table 3.4-3 contains a summary of the background information used to analyze the potential impacts of explosives in the water on marine vegetation. For information on explosive sizes and quantities for each alternative, see Table 3.0-5 (Explosive Sources Quantitatively Analyzed that Could Be Used Underwater or at the Water Surface).

In the unlikely event that underwater explosives are used near unmapped hard bottom (seaweed habitat) or floating *Sargassum* is overlooked by mitigation Lookouts, some individual plants could be dislodged or damaged. The mitigation areas will reduce or eliminate the impact of bottom-placed explosives on vegetation associated with live hard bottom (e.g., benthic macroalgae). Mapped sensitive habitat features within the Study Area only occur within mitigation areas (e.g., shallow-water coral reefs, live hard bottom), with the exception of Key West Range Complex Inshore. In those locations, the explosive charges are very small, and either placed on the seafloor or on seafloor devices (e.g., metal plates, steel frames) with the explosive energy directed upward.

3.4.3.1.1.1 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 (greater than 14,500 – 58,000 pounds [lb.] net explosive weight [NEW]) and reduced use of bin E16 (greater than 7,250 to 14,500 lb. NEW) for ship shock trials. There is also a reduction in 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]). Very few detonations would occur at inshore locations and would involve the use of smaller charge sizes (E5 or below). Additionally, small ship shock trials could occur in Virginia Capes, Jacksonville, or the Gulf of Mexico Range Complexes.

The majority of underwater explosions occur on the surface and typically in offshore locations beyond state waters and in depths greater than 100 feet (30 m), where growth of benthic macroalgae is generally low compared to estuarine and nearshore ocean waters. Relatively few activities including explosives underwater occur within state waters. The craters created in most intermediate or soft bottom areas would disappear in less than a year (refer to Section 3.3, Habitats, for details) and mostly benthic microalgae would be affected. Neither mapped seagrass beds nor benthic macroalgae associated with mapped hard bottom would be impacted by surface or bottom-placed explosives. Improvements in mapping have also reduced the potential for impacting these habitats.

Based on the relative footprint and location of explosives use under Alternative 1 for training and testing (refer to Section 3.3, Habitats, for analysis summary), and the general description of impacts, there would be (1) an unlikely spatial coincidence between explosive impacts and the distribution of sensitive vegetated habitats (e.g., seagrass beds, benthic macroalgae); (2) a quick recovery of vegetation types that are more likely impacted (e.g., floating *Sargassum,* seafloor microalgae); and (3) only short-term impacts from most local disturbances of the surface water or seafloor, with some temporary increases in suspended sediment in mostly shallow, soft bottom habitats. The effects of this substressor on marine macroalgae and vascular plants are therefore not expected to result in detectable changes in their growth, survival, or propagation and are not expected to result in population-level impacts or affect the distribution, abundance, or productivity of vegetation species; rare species are unlikely to be affected and common species could absorb impacts on relatively few individuals.

The analysis conclusions for underwater explosives use with training and testing activities under Alternative 1 are consistent with a moderate impact on vegetation populations.

3.4.3.1.1.2 Impacts from Explosives in Water under Alternative 2

Impacts from explosives in water under Alternative 2 are no different from Alternative 1 (Table 3.0-5: Explosive Sources Quantitatively Analyzed that Could Be Used Underwater or at the Water Surface) and therefore the impact conclusions are the same for both training and testing. The explosive sizes and numbers under Alternative 2 are the same as Alternative 1.

3.4.3.2 Physical Disturbance and Strike Stressors

Table 3.4-4 contains a brief summary of background information that is relevant to analyses of impacts from physical disturbance and strike stressors (vessels and in-water devices, military expended materials, seafloor devices, and pile driving). The background information for physical disturbance and strike stressor effects on vegetation in the Study Area as described in the 2018 Final EIS/OEIS (Section 3.3.3.4) has not appreciably changed. As such, the information presented in the 2018 Final EIS/OEIS remains valid.

Table 3.4-4: Physical Disturbance and Strike Stressors Background Information Summary

Substressor	*Background Information Summary*
Vessels and in-water devices	In general, there would be a higher likelihood of vessel and in-water device disturbance or strike in coastal areas than in the open ocean portions of the Study Area because of the concentration of activities and the comparatively higher abundances of vegetation in areas closer to shore (e.g., benthic macroalgae, floating *Sargassum*). • In most cases, vessels and in-water devices would avoid contact with the bottom (and associated vegetation) per standard operating procedures unless the vessel/vehicle is designed to touch the bottom (e.g., amphibious vehicles). • Floating *Sargassum* around a passing vessel would be mostly displaced, rather than struck, as water flows around the vessel or device due to its hydrodynamic shape. For the small amount of floating *Sargassum* that is struck, the effect would be minimal; floating *Sargassum* mats can remain floating and regrow despite fragmentation from strikes (Zaitsev, 1971). • In coastal ocean areas, neither vessels nor in-water devices would normally strike benthic macroalgae because they avoid contact with the bottom. The disturbance of seaweeds and other macroalgae by propeller wash would be temporary and negligible; benthic macroalgae in coastal areas is highly resilient to natural disturbances, such as storms and extreme wave action (Mach et al., 2007). • The potential for vessels to affect vegetation on or near the bottom would occur mostly during inshore training locations. Vegetation in such areas could be affected by sediment disturbance or direct strike during vessel movement in shallow water (e.g., waterborne training, amphibious landings). • Although amphibious vehicles are designed to touch the bottom, they are generally used along ocean beaches and similar high-energy shorelines where the habitat is unsuitable for seagrass. Benthic microalgae that occur in soft bottom habitats associated with dynamic nearshore environments are also highly resilient to disturbance and recover relatively quickly. • Along more sheltered shorelines, vessel propulsion systems operating in shallow soft bottom areas can also disturb sediments and associated vegetation (e.g., seagrass) through propeller wash and actual contact with the bottom (Sargent et al., 1995); touching the bottom in shallow, soft bottom is a common practice among boaters that temporarily disturbs the sediment and associated vegetation. • Seagrass beds and coastal wetlands may be subject to recurring boat propeller- or wake-induced turbidity and erosion (Stevenson et al., 1979; Zabawa & Ostrom, 1980). For context, Navy vessels represent a small fraction of total maritime traffic (Mintz, 2016) and even less for Coast Guard vessels. For safety reasons, small vessels are not generally operated at excessive speeds close to shore, and the wakes generated would have similar impacts as naturally occurring wind waves. • Some seagrass species in the Study Area can take up to ten years to recover from propeller scarring (Dawes et al., 1997). However, neither propeller scarring nor erosion from vessel wakes is considered a significant threat to seagrass or coastal wetlands compared to other threats (e.g., nutrient enrichment, shoreline development) (Orth et al., 2010).
Aircraft and aerial targets	Impacts from aircraft and aerial targets are not applicable and will not be analyzed further in this section.

Table 3.4-4: Physical Disturbance and Strike Stressors Background Information Summary (continued)

Substressor	*Background Information Summary*
Military expended materials	Military expended materials deployed over water include a wide range of items that mostly pose a threat to vegetation located where the item settles or moves across the bottom. Before the item is buried or encrusted with marine growth, the impacts on vegetation may include crushing directly under the material, abrasion from movement of the material, temporary increases in turbidity around the material, and coverage of the underlying substrate. • Most release of military expended materials occurs in the confines of established at-sea training and testing areas far from shore, although there is some release of expended materials within inshore (e.g., marine markers in the VACAPES RC Inshore) and nearshore locations (e.g., Navy Cherry Point OPAREA). • The most heavily impacted areas are offshore where the potential for impacts to benthic macroalgae are relatively low to negligible due to the depth limits of macroalgae growth in the Study Area as well as dampening effect of water on sinking objects. • The dampening effect of water would reduce the impact of military expended materials on shallow seafloor habitats that are mostly soft or intermediate substrate vegetated primarily with benthic microalgae. Disturbance of benthic macroalgae on relatively rare hard substrate would be less likely and the plants are attached and resilient to disturbance. • Decelerators/parachutes could cover vegetated habitats and prevent photosynthesis if they landed on them in an open configuration. Prevailing currents and episodic storms would tend to dislodge the material until it is buried in soft substrate or snagged on hard substrate or artificial structures. The potential for expended decelerators/parachutes to drift into shallow, inshore habitats from at-sea training and testing areas would be low, based on the prevailing ocean currents depicted in Figure 3.3-6 through Figure 3.3-10 in Section 3.3 (Habitats). • Munitions and other military expended materials would be more likely to impact floating *Sargassum*, although the algae are resilient to fragmentation from explosives, which is far more damaging than the splash of expended materials. Strikes of floating *Sargassum* would therefore have little impact and would not likely result in the mortality of individual plants.
Seafloor devices	Seafloor devices are either stationary (e.g., mine shapes, anchors, bottom-placed instruments) or move very slowly along the bottom (e.g., bottom-crawling unmanned underwater vehicles) and mostly pose a threat to vegetation located where the device settles or moves across the bottom before being recovered. Impacts may include crushing directly under the seafloor device and temporary increases in turbidity around the device. • Although intentional placement of seafloor devices on rugged bottom features is avoided to ensure recovery, seafloor devices placed in shallow seafloor areas may inadvertently impact macroalgae attached to low-relief hard substrate (e.g., bedrock). A relatively high percentage of suitable hard substrate features macroalgae growth, although the percent coverage is variable in different regions and depths of the Study Area. • Seafloor devices are most likely to impact benthic microalgae inhabiting soft and intermediate bottom habitats that cover 91% of Study Area locations less than 95 meters deep (Table 3.3-1, Percent Coverage of Seafloor Habitats and Abiotic Substrate Types in Training and Testing Locations of the Study Area).
Pile driving	Pile driving and removal involves both impact and vibratory methods in soft substrate. Pile driving may have the potential to impact soft bottom habitats temporarily during pile driving, removal, and in the short term thereafter. There may also be some negligible loss of algae that colonizes the pilings when they are removed.

Notes: % = percent; OPAREA = operating area; RC = Range Complex; VACAPES = Virginia Capes

The Action Proponents will implement mitigation tailored to reducing the impact of physical disturbance and strike on sensitive habitats that feature vegetation, as summarized in Table 3.3-3 (Mitigation Requirements Summary by Stressor for Habitats) of Section 3.3 (Habitats). The mitigation area restrictions are mapped in Section 3.3 because they primarily address impacts on the seafloor habitat of vegetation and other biological resources.

The mitigation areas will reduce or eliminate the potential impacts by locating some physical disturbance and strike stressors away from floating *Sargassum*, seagrass beds, and benthic macroalgae habitat. The overlap of sensitive vegetation and mitigation areas varies by substressor, as described in the subsequent sections.

3.4.3.2.1 Impacts from Vessels and In-Water Devices

Table 3.4-4 contains a summary of the background information used to analyze the potential impacts of vessels and in-water devices on vegetation. For information on the number of activities including vessels and in-water devices, see Table 3.0-9 (Number and Location of Activities Including Vessels) and Table 3.0-10 (Number and Location of Activities include In-water Devices).

The mitigation areas described in Table 3.3-3 will reduce or eliminate the potential direct strike impacts in the Key West Range Complex (offshore and inshore locations) and South Florida Ocean Measurement Facility by requiring at least 1 foot of clearance over shallow-water habitats (refer to Section 3.3, Habitats, for a detailed mapping of the mitigation). In other shallow areas where vessel or in-water device use is proposed, the avoidance of features that could damage the vessel or in-water device (e.g., seafloor in general and hard substrate in particular) is part of standard operating procedures.

3.4.3.2.1.1 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 (Tables 3.0-9 and Table 3.0-10) .

Under Alternative 1 for training:

- Vessel activity would occur in two locations that are new or not previously analyzed (Gulfport and Pascagoula, Mississippi, respectively). 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 water-based targets) would occur in one location not previously analyzed (Northeast Range Complexes Inshore). 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 not previously analyzed (inshore locations of the Northeast, Virginia Capes, and Gulf of Mexico Range Complexes; Other AFTT Areas; Hampton Roads, Virginia). There would also be notable increases in vessel activity at the Naval Surface Warfare Center Panama City Division Testing Range, Naval Station Norfolk, and Pascagoula, Mississippi. 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 water-based targets) would occur in four locations not previously analyzed (Gulf of Mexico Range Complex Inshore; Bath, Maine; Newport, Rhode Island; Pascagoula, Mississippi). 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 3.4.2 (Affected Environment) do not alter the analysis because the general distribution of vegetation types among training and testing locations has not expanded.

For the inshore locations that are new or not previously analyzed, standard operating procedures (e.g., vessel and in-water device safety) and mitigation implemented in the seafloor resource mitigation areas help to avoid impacting shallow waters where sensitive species (e.g., seagrass) are concentrated (e.g., oysters on reefs in the Northeast Range Complexes Inshore). Furthermore, the locations not previously analyzed for testing were analyzed for training in the 2018 Final EIS/OEIS. The other new locations are port or pierside locations featuring artificial structures placed in soft bottom habitat with resilient soft bottom communities. These areas are also highly modified/disturbed due to human activity and frequent dredging and therefore lack both seagrass beds and coastal wetlands.

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, there would be (1) a relatively small area of spatial coincidence between vessel disturbance zones and the distribution of sensitive vegetation (e.g., seagrass beds, coastal wetlands); (2) a quick recovery of vegetation types in waters that are more likely impacted (e.g., floating *Sargassum,* seafloor microalgae); and (3) only short-term impacts from most vessel and in-water device movements and local disturbances of the surface water column, with some temporary increase in suspended sediment in shallow areas. The effects of this substressor on marine macroalgae and vascular plants are therefore not expected to result in detectable changes in their growth, survival, or propagation, and are not expected to result in population-level impacts or affect the distribution, abundance, or productivity of vegetation; rare species are unlikely to be affected and common species could absorb impacts on relatively few individuals.

The analysis conclusions for vessel and in-water device use with training and testing activities under Alternative 1 are consistent with a moderate (due to potential damage to vegetation) impact on vegetation populations.

3.4.3.2.1.2 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 impact conclusions 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.

3.4.3.2.2 Impacts from Military Expended Materials

Table 3.4-4 contains a summary of the background information used to analyze the potential impacts of military expended materials on marine vegetation. For information on the type, number, and location of military expended materials, see Table 3.0-11 (Number and Location of Non-explosive Practice Munitions Expended during Military Readiness Activities), Table 3.0-12 (Number and Location of Explosives that May Result in Fragments during Military Readiness Activities), Table 3.0-13 (Number of Location of Targets Expended during Military Readiness Activities), Table 3.0-14 (Number and Location of Other Military Materials Expended during Military Readiness Activities), Table 3.0-17 (Number and Location of Wires and Cables Expended during Military Readiness Activities), and Table 3.0-18 (Number and Location of Activities Including Biodegradable Polymers during Testing).

The mitigation areas described in Table 3.3-3 (Mitigation Requirements Summary by Stressor for Habitats) of Section 3.3 (Habitats) will reduce or eliminate the potential impacts by locating some military expended material releases away from reef-associated vegetation species in the Key West Range Complex (inshore and offshore locations) and South Florida Ocean Measurement Facility (refer to Section 3.3, for a detailed mapping of the mitigation). In other areas where 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, which places most impacts seaward of seagrass beds, coastal wetlands, and some benthic macroalgae beds).

3.4.3.2.2.1 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 (Table 3.0-11 through Table 3.0-14).

Under Alternative 1 for training:

- Military expended materials would occur in two locations not previously analyzed (Key West and Gulf of Mexico 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 not previously analyzed (Other AFTT Areas; Naval Submarine Base Kings Bay, and Port Canaveral, Florida) in the 2018 Final EIS/OEIS. For all other locations, there would either be a decrease or similar amount of military expended materials.

For locations without a notable increase in military expended materials, the analysis from the 2018 Final EIS/OEIS remains valid; the updates to the affected environment noted in Section 3.4.2 (Affected Environment) do not alter the analysis because the general distribution of vegetation types among 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 been updated per quantitative analysis detailed in Section 3.3 (Habitats). Qualitative aspects of the analysis include the potential for lighter expended materials (e.g., decelerators/parachutes) to drift into vascular plant beds covered earlier in this section for military readiness activities.

Based on the quantitative analysis in Section 3.3 (Habitats), the total vegetated habitat (e.g., seagrass beds and benthic macroalgae habitat) affected annually by all military expended materials in all training and testing areas would be less than 2.2 acres. However, the area of impacted seagrass beds in nearshore ocean environments is overestimated due to the majority of military expended materials settling in the offshore environment where seagrass beds do not occur. This represents less than a thousandth of one percent of available vegetated habitat in any range complex. The majority of military expended material footprints would impact soft bottom communities or the bathyal/abyssal zone where vegetation does not occur. Expended material footprints coincide with seagrass beds within all the range complex inshore locations (refer to figures in Section 3.3, Habitats, for mapping). Coastal wetland areas do not coincide with any of the expended material footprints, though some lighter materials could drift into wetlands areas.

Based on the relative amount, impact footprint, and location of military expended materials under Alternative 1 for training and testing and the general description of impacts, there would be (1) a limited spatial coincidence between impact footprints and the distribution of sensitive vegetated habitats (e.g., seagrass beds, benthic macroalgae); (2) a quick recovery of vegetation types in waters that are more likely impacted (e.g., floating *Sargassum,* seafloor microalgae); and (3) only short-term impacts from most local disturbances of the surface water or seafloor, with some temporary increase in suspended sediment in mostly soft bottom areas. The effects of this substressor on marine macroalgae and vascular plants are therefore not expected to result in detectable changes in their growth, survival, or propagation and are not expected to result in population-level impacts or affect the distribution, abundance, or productivity of vegetation; rare species are unlikely to be affected and common species could absorb impacts on relatively few individuals.

The analysis conclusions for military expended materials from training and testing activities under Alternative 1 are consistent with a moderate (due to potential damage to vegetation) impact on vegetation populations.

3.4.3.2.2.2 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 impact conclusions 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.

3.4.3.2.3 Impacts from Seafloor Devices

Table 3.4-4 contains a summary of the background information used to analyze the potential impacts of seafloor devices on marine vegetation. For information on the type, number, and location of military expended materials, see Table 3.0-15 (Number and Location of Activities that Use Seafloor Devices).

The mitigation areas described in Table 3.3-3 (Mitigation Requirements Summary by Stressor for Habitats) of Section 3.3 (Habitats) will reduce or eliminate the potential impacts by locating most seafloor devices away from vegetation covering live hard bottom. Due to the prevalence of shallow-water hard coral species in the South Florida Ocean Measurement Facility, there is additional mitigation that ensures placement of seafloor devices away from sensitive habitats.

3.4.3.2.3.1 Impacts from Seafloor Devices under Alternative 1

For both training and testing activities, the proposed use of seafloor devices increased from the 2018 Final EIS/OEIS devices (Table 3.0-15).

Under Alternative 1 for training:

- Seafloor device use would occur in five locations that are new or not previously analyzed (Northeast Range Complexes; Other AFTT Areas; Jacksonville Range Complex Inshore, Naval Station Mayport, and Gulfport, Mississippi). 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, similar amount, or cessation of seafloor device use.

Under Alternative 1 for testing:

- Seafloor device use would occur in five locations not previously analyzed (Virginia Cape Range Complex Inshore, Key West Range Complex Inshore, Naval Submarine Base New London, Naval Station Mayport, and Port Canaveral, Florida). 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 device use.

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 3.4.2 (Affected Environment) do not alter the analysis because the general distribution of vegetation types among 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 remain valid because the infrequent and localized nature of seafloor device activity remains an accurate characterization of the Proposed Action in those locations.

For the inshore locations not previously analyzed, standard operating procedures and seafloor resource mitigation measures that apply to mine shapes and other devices moored to the bottom, help to avoid impacting sensitive habitats for vegetation (e.g., live hard bottoms). In the unlikely event of a seafloor device coinciding with a seagrass or benthic macroalgae bed, the impact would be minimal and temporary (e.g., crushing/abrasion). No seafloor devices would be placed in coastal wetlands that occupy the intertidal margins of the Study Area.

The new location of Gulfport, Mississippi, is a pierside location, which feature artificial structures in soft bottom habitat with relatively resilient vegetation communities. These areas are highly modified/disturbed due to human activity and frequent dredging.

Based on the relative amount and location of seafloor device use under Alternative 1 for training and testing and the general description of impacts, there would be (1) a limited spatial coincidence between device disturbance zones and the distribution of vegetated seafloor habitats (e.g., seagrass beds, benthic macroalgae) and (2) only short-term impacts from most local disturbances of the seafloor, with some temporary increase in suspended sediment in mostly soft bottom areas. The effects of this substressor on marine macroalgae and vascular plants are therefore not expected to result in detectable changes in their growth, survival, or propagation, and are not expected to result in population-level impacts or affect the distribution, abundance, or productivity of vegetation; rare species are unlikely to be affected and common species could absorb impacts on relatively few individuals.

The analysis conclusions for use of seafloor devices with training and testing activities under Alternative 1 are consistent with a moderate (due to potential damage to vegetation) impact on vegetation populations.

3.4.3.2.3.2 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 impact conclusions 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.

3.4.3.2.4 Impacts from Pile Driving

Table 3.4-4 contains a summary of the background information used to analyze the potential impacts of pile driving on marine vegetation. Only port damage repair training includes pile driving (Table 3.0-4, Number of Piles/Sheets Quantitatively Analyzed under Pile Driving and Removal Training Activities).

3.4.3.2.4.1 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-Fort Story 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.

The effects of pile driving on vegetation would be temporary resuspension of sediment and the possible removal of relatively small amounts of colonizing vegetation during pile removal. Pile driving for pier maintenance typically occurs in soft bottom habitats with unconsolidated sediments that would allow pile installation and removal at a fairly rapid pace. In Gulfport, Mississippi, proposed pile driving would be conducted along an artificial shoreline bordering relatively deep soft bottom habitat. Such areas are not expected to support appreciable amounts of seagrass or coastal wetland plants, but micro- and macroalgae could quickly colonize the hard substrate of the pilings and would be removed when the pilings are removed. However, the impact of the losses of algae populations would be negligible for both action alternatives. Seagrass has also not been mapped in this area.

The analysis conclusions for pile driving for training under Alternative 1 are consistent with a moderate (due to removal of colonizing vegetation) impact on vegetation.

3.4.3.2.4.2 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 impact conclusions are the same.

There would be no pile driving associated with testing activities.

3.4.3.3 Secondary Stressors

This section analyzes potential impacts on vegetation exposed to stressors indirectly through impacts on their habitat (explosives and explosive byproducts, unexploded munitions, metals, chemicals) and/or prey availability. Details on updated information for secondary stressors is provided in Appendix G (Non-Acoustic Impacts Supporting Information). However, none of the updated information directly affects the analysis.

3.4.3.3.1 Impact of Secondary Stressors

3.4.3.3.1.1 Impacts from Secondary Stressors Under Alternative 1

The impacts of explosives and military expended materials in terms of abiotic substrate disturbance are described in Section 3.3 (Habitats). Most detonations would occur in waters greater than 200 ft. in depth, and greater than 3 NM from shore, although mine warfare, demolition, and some testing detonations would occur in shallow water close to shore. In deep waters, explosions would not likely damage habitat for marine vegetation because the explosion would not be on or proximate to the sea floor. These habitats include corals, seagrass beds, and other benthic habitats that are used by marine vegetation.

The assessment of potential sediment and water quality degradation on aquatic life, including representative marine vegetation, is covered in Section 3.2 (Sediment and Water Quality). Considering the literature on other marine vegetation does not suggest an elevated sensitivity to pollutants from the Proposed Action alternatives, the analysis of sediment and water quality degradation in Section 3.2 is sufficient to cover the impact on vegetation.

The analysis included in Section 3.3 (Habitats) determined that for Alternative 1, impacts to abiotic substrates from military expended materials would amount to 2.1 acres of habitat for coastal wetlands and seagrass beds that is not protected by standard operating procedures or mitigation measures. However, the area of impacted seagrass bed habitat in the nearshore ocean environment is overestimated due to the majority of military expended materials settling in the offshore environment where seagrass beds do not occur. Explosive craters would impact mostly microalgae growing in soft and intermediate substrate types, 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 the Proposed Action. 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 vegetation by military readiness activities proposed by Alternative 1.

The impacts of the Proposed Action on secondary stressors were considered negligible on vegetation populations.

3.4.3.3.1.2 Impacts from Secondary Stressors Under Alternative 2

Impacts from secondary stressors under Alternative 2 are not meaningfully different from Alternative 1 and therefore the impact conclusions are the same for both training and testing.

3.4.3.4 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 Action Proponents' 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 stressors from the Proposed Action, as described below.

There are generally two ways that marine vegetation could be exposed to multiple additive stressors. The first would be if the vegetation was exposed to multiple sources of stress from a single event or activity within a single training or testing event (e.g., a mine warfare event may include the use of a vessel, seafloor devices, and explosives). The potential for a combination of these impacts from a single activity would depend on the range to effects of each of the stressors and the response or lack of response to that stressor. Secondly, marine vegetation 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 plant would be exposed to stressors from multiple activities within a short timeframe.

3.4.3.4.1 Combined Impacts of All Stressors under Alternative 1

Activities described in this Supplemental EIS/OEIS under Alternative 1 that have potential impacts on marine vegetation are widely dispersed, and not all stressors would occur simultaneously in a given location. The stressors that have potential impacts on marine vegetation include physical disturbances or strikes (vessel and in-water devices, military expended materials, seafloor devices, and pile driving) and explosives. Unlike mobile organisms, vegetation cannot flee from stressors once exposed. Floating *Sargassum* is the type of marine vegetation most likely to be exposed to multiple stressors in combination because it occurs in large expanses and because more activities and their associated stressors occur at the surface than on the bottom. Floating *Sargassum* is also more likely to occur in offshore locations where there is a higher risk for impacts from activities. The potential for seagrasses and benthic macroalgae to be exposed to multiple stressors would be low because activities are not concentrated in nearshore and inshore waters where they are located. In the unlikely event of an impact, the combination of stressors could include bottom disturbance from a seafloor device (mine anchor) deployed from a vessel (surface disturbance) followed by the mine shape exploding. Considering the effect of explosives far exceeds that of an associated vessel or seafloor device, a combined effect on vegetation would be negligible.

Although potential impacts on vegetation from military readiness activities under Alternative 1 may include tissue damage, the combined impacts are not expected to lead to long-term consequences for plant populations. Based on the general description of impacts, the number of plants impacted is expected to be small relative to overall population sizes and would not be expected to yield any lasting effects on the survival, growth, recruitment, or reproduction of any plant species.

The combined impact of all stressors from Alternative 1 are considered moderate (due to limited potential for damage to vegetation) on vegetation populations.

3.4.3.4.2 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 impact conclusions are the same for both training and testing.

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