Draft Environmental Assessment for Amendments to the North Atlantic Right Whale Vessel Strike Reduction Rule

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COVER SHEET

Title of Environmental Review: DRAFT ENVIRONMENTAL ASSESSMENT for Amendments to the North Atlantic Right Whale Vessel Strike Reduction Rule

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Location of Proposed Action: U.S. Atlantic coastal and offshore waters

Cover photo credit: Right whale #4540 with fresh propeller cuts as a calf off Georgia, 2013. Photos by Clearwater Marine Aquarium Research Institute, taken under NOAA permit #15488.

NMFS is proposing regulations pursuant to its rulemaking authority under MMPA section 112(a) (16U.S.C. 1382(a)), and ESA section 11(f) (U.S.C. 1540(f)) that would modify the North Atlantic right whale vessel speed rule (50 CFR § 224.105). This Draft Environmental Assessment considers a combination of one or more of the following changes to the existing speed rule: 1) adding most vessels greater than or equal to 35 ft (10.7 m) in length and less than 65 ft (19.8 m) in length to the class of vessels subject to speed regulation, 2) modifying Seasonal Management Area boundaries and timing to create proposed Seasonal Speed Zones (SSZs); and 3) implementing a new mandatory Dynamic Speed Zone (DSZ) program.

LIST OF ACRONYMS AND ABBREVIATIONS

AIS	Automated Information System
BOEM	Bureau of Ocean Energy Management
CII	Carbon Intensity Indicator
CVI	Clean Vessel Incentive
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COLREGS	Convention on the International Regulations for Preventing Collisions at Sea
CV	Coefficient of Variation
COVID-19	Coronavirus Disease
DMA	Dynamic Management Area
DSZ	Dynamic Speed Zone
EA	Environmental Assessment
ECA	Emission Control Areas
EEDI	Energy Efficiency Design Index
EEXI	Energy Efficiency Existing Ship Index
e.g.	for example
ESA	Endangered Species Act
EEZ	Exclusive Economic Zone
etc.	and so on
ft	feet
GHG	Greenhouse Gas
i.e.	that is
IMO	International Maritime Organization
IRFA	Initial Regulatory Flexibility Analysis
m	meter
m/s	meters per second

MARPOL	International Convention for the Prevention of Pollution from Ships
MEPC	(IMO's) Marine Environment Protection Committee
NMMA	National Marine Manufacturers Association
MMPA	Marine Mammal Protection Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OGV	ocean-going vessel
OCS	Outer Continental Shelf
PBR	Potential Biological Removal
RIR	Regulatory Impact Review
SMA	Seasonal Management Area
SSZ	Seasonal Speed Zone
SL	Source Level
sq km	square kilometers
sq nm	square nautical miles
UME	Unusual Mortality Event
U.S.	United States
USCG	United States Coast Guard
VOC	Volatile Organic Compound

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The National Oceanic and Atmospheric Administration's National Marine Fisheries Service has prepared this Draft Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA; 42 USC 4321 et seq.) and regulations issued by the Council on Environmental Quality (CEQ; 40 CFR 1500-1508) using the 2020 CEQ NEPA Regulations.

NMFS is proposing regulations to modify the North Atlantic right whale vessel speed rule (50 CFR § 224.105) pursuant to its authority under the Endangered Species Act and Marine Mammal Protection Act. The purpose of the proposed action is to further protect endangered North Atlantic right whales (*Eubalaena glacialis*) from deaths and serious injuries that result from collisions with vessels in U.S. waters. This action is needed to stop the ongoing right whale population decline in combination with additional separate actions aimed at addressing lethal right whale entanglement in fishing gear.

Alternatives considered in this Draft EA include combinations of the follow actions:

(1) Requiring most vessels greater than or equal to 35 ft (10.7 m) in length and less than 65 ft (19.8 m) in length to transit at 10 knots (5.1 m/s) or less within active Seasonal Management Areas (SMAs) to address unregulated lethal strike risk from vessels within this size class;
(2) Expanding SMA (newly named Seasonal Speed Zone) boundaries and timing to better capture areas and times with elevated vessel strike risk; and
(3) Implementing a new Dynamic Speed Zone framework to provide mandatory vessel speed reductions where and when they are needed.

NMFS has determined that all three changes, along with additional administrative updates (the Preferred Alternative), are necessary to help stabilize the ongoing right whale population decline and promote long-term recovery of the species and has issued a proposed rule to implement those changes. Adoption of these combined changes is anticipated to result in the greatest decrease in the likelihood of lethal vessel strike events involving right whales in U.S. waters compared to any of these changes alone. Furthermore, the proposed changes are expected to provide ancillary benefits including a reduction in vessel strikes involving other protected large whales species, reductions in ocean noise from vessel traffic, and a decrease in vessel emissions with resultant decreases in air pollution and greenhouse gases.

NMFS estimates that approximately 15,899 vessels would potentially be affected by the proposed action along the U.S. Atlantic coast from Maine to Florida, resulting in an expected 121,061 additional transit hours annually across all vessel types, size classes, and regions due to mandatory 10 knot speed limits. The commercial shipping sector is expected to bear the largest proportion (35%) of costs resulting from the proposed changes, with a total estimated annual cost to the maritime community of $46,216,122 (see the associated Draft Regulatory Impact Review). Due to data limitations, these figures likely overestimate the impacts to vessels less than 65 ft in length, especially recreational boats.

Without immediate intervention, the right whale population will continue to decline and approach extinction. The Preferred Alternative is anticipated to provide substantial conservation benefits to right whales and is an essential component of a broader suite of efforts to reduce lethal threats to right whales from anthropogenic sources.

1.0 Purpose and Need for Action

The National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NMFS) proposes to amend the North Atlantic right whale vessel speed rule (50 CFR § 224.105; hereafter "speed rule") pursuant to its authority under the Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA), to address the ongoing decline of the endangered North Atlantic right whale (*Eubalaena glacialis*; hereafter "right whale"), due in part to deaths and serious injuries from collisions with vessels along the U.S. East Coast. In 2008, NMFS implemented the speed rule, requiring most vessels 65 ft (19.8 m) or greater in length to transit designated Seasonal Management Areas (SMAs) at 10 knots (5.1 m/s) or less to reduce the likelihood of right whale mortalities and serious injuries from vessel strikes[1]. NMFS interprets the regulatory definition of serious injury as any injury that is "more likely than not" to result in mortality, or any injury that presents a greater than 50 percent chance of death to a marine mammal (NMFS 2014). Thus, lethal strike events are those that have or are likely to result in a mortality.)

Since 2008, the distribution of right whales has shifted, resulting in a misalignment between areas of elevated vessel strike risk and current SMA spatial and temporal bounds. Improved data on vessel traffic and right whale distribution/habitat use further highlight this misalignment and the need to adjust SMA boundaries and timing to better address the risk of lethal collisions. Data on vessel strike events also demonstrate that collisions with vessels less than 65 ft in length are also lethal to right whales, but are currently unregulated. Operators of vessels less than 65 ft in length have reported eight vessel strikes involving right whales in U.S. waters resulting in injuries, serious injuries, or mortalities, and an additional six vessel strikes (including five serious injuries) with undetermined large whale species that may have involved right whales based on the location and timing of the events. Since January 2020, four right whale vessel strikes have occurred in U.S. waters (including three involving vessels less than 65 ft in length transiting in excess of 20 knots (10.3 m/s)).

Concurrent with implementation of the speed rule in 2008, NMFS created a voluntary Dynamic Management Area (DMA) program which was intended to address more temporary strike risk in areas outside active SMAs. Temporary DMAs are designated in areas where right whale aggregations of three or more individuals are sighted in proximity outside SMAs. Beginning in 2020, the NMFS Greater Atlantic Region (Maine to Virginia) modified the DMA program to include Slow Zones, triggered by right whale acoustic detections. Once the sighting or acoustic detection trigger is met, NMFS establishes a boundary around the whales for 15 days and encourages all vessels to either avoid the area or transit through at speeds less than 10 knots. However, despite best efforts, cooperation levels remain low, rendering the program unable to provide sufficient levels of protection to right whales outside active SMAs.

In January 2021, NMFS released an assessment evaluating the effectiveness of the speed rule and associated voluntary DMA program (NMFS 2020) and solicited public comment. The review found that the speed rule had made progress in reducing vessel strike risk to right whales but that additional action is warranted to further reduce the threat of lethal vessel collisions (i.e., those

[1] NMFS later removed the five-year "sunset" provision from the 2008 speed rule (78 FR 73726, December 9, 2013; 79 FR 34245, June 16, 2014).

resulting in right whale mortalities or serious injuries). While it is not possible to establish a direct causal link between speed reduction efforts and the relative decline in observed right whale serious injury and mortality events following implementation of the speed rule, the preponderance of evidence suggests speed reductions, as implemented, have contributed to the relative decline in lethal incidents.

Since the speed rule first went into effect, NMFS has documented 12 right whale serious injury and mortality events involving vessel collisions in U.S. waters involving vessels of all sizes. This figure likely underestimates the total number of lethal right whale vessel strikes in U.S. waters since 2008. Strikes occurring farther offshore and/or involving large ocean-going vessels (OGVs) are underreported in the data because many large ships are unable to detect interactions with large whales, and whales that die well offshore are less likely to be detected overall. Based on estimates of total right whale deaths, documented mortalities from all sources represent approximately one-third of actual annual right whale mortality range-wide (Pace et al. 2021). Thus, in addition to the observed events, NMFS recognizes that additional lethal vessel strike events likely went undetected in U.S. waters.

A detailed examination of documented right whale vessel strike events in U.S. waters (Appendix A, Table 1) further reveals the following:

1) Vessels less than 65 ft in length accounted for 5 of the 12 documented lethal strike events in U.S. waters since the existing speed rule went into effect in 2008, demonstrating the significant risk this unregulated vessel size class can present to right whales.

2) Vessel strikes continue to occur all along the U.S. East Coast from the Gulf of Maine to the Florida coast. There is no indication that strike events only occur in "hot spots" or limited spatial/seasonal areas.

3) Strikes occur both inside and outside active SMAs, but in many cases, the location of the strike event remains unknown. Four of the five collision events involving vessels less than 65 ft in length occurred inside active SMAs, although the vessels involved were not subject to mandatory speed restrictions due to their size.

4) Of the six lethal vessel strike cases documented in U.S. waters and involving right whales since 1999 where vessel speed is known, only one involved a vessel transiting under 10 knots (~9 knots (4.6 m/s)), although in most cases, NMFS lacks vessel speed data associated with collision events. In one case the vessel was transiting at approximately 9 knots, in another 12-13 knots (6.2-6.7 m/s), and in four cases the vessels were transiting at or in excess of 20 knots (10.29 m/s).

5) Females, calves, and juveniles are disproportionately represented in the vessel strike data. This is concerning given the paucity of reproductively active females remaining in the population and their critical role in stabilizing the population decline.

6) Non-lethal vessel collisions with right whales continue to occur. NMFS' best estimates indicate that vessel strikes (in U.S. waters or first seen in U.S. waters) have resulted in at least 26 non-serious right whale injuries since 2008, although these data do not account

for the possibility of blunt force trauma injuries, which are not usually visibly detectable and make accurate assessments of strike injuries challenging.

Based on the available data, the current speed rule and associated vessel strike mitigation efforts are insufficient to significantly reduce the level of lethal right whale vessel strikes in U.S. waters. NMFS has determined that additional action is needed to address gaps in current management programs and better tailor mitigation efforts. In evaluating potential changes to the current speed rule NMFS considered up-to-date vessel strike risk modeling, data on right whale vessel strike events, species distribution, vessel traffic characteristics in right whale habitat, as well as the extensive and informative comments received in response to the speed rule assessment.

Lethal vessel strikes in U.S. waters are impeding recovery of the endangered right whale. NMFS' purpose for the proposed action is to substantially reduce the risk of mortality and serious injury to endangered right whales from vessel strikes in U.S. waters. The right whale population continues to decline and the species is approaching extinction, in part, due to continued lethal encounters with vessels. To address this crisis, the proposed action is needed to reduce lethal vessel strike risk to right whales in areas and times where it remains elevated. The ESA and MMPA authorize NMFS to take action when warranted to provide necessary protections for covered species, to prevent extinction and achieve recovery of listed species.

1.1 Background

The Northern right whale was originally listed as endangered in 1970 under the Endangered Species Conservation Act of 1969, the precursor to the ESA of 1973 (16 U.S.C. 1531 *et seq.*; 35 FR 18319, December 2, 1970). Following a status review for Northern right whales, NMFS concluded in 2008 that the North Pacific right whale (*Eubalaena japonica*) and North Atlantic right whale should be listed separately as endangered species (73 FR 12024, March 6, 2008) under the ESA.

The right whale was severely depleted by commercial whaling and, despite protection from commercial harvest since 1935, has not recovered. Following two decades of growth between 1990 and 2010, the species entered a state of decline over the past decade (Pace et al. 2017; Pace 2021), with a recent preliminary population estimate of fewer than 350 individuals remaining. Right whale abundance began to decline in 2010 due to a combination of increased human-caused mortality and decreased reproductive output (Pace et al. 2017). The decline coincided with changes in habitat use patterns, characterized by the whales' increasing use of areas with few protections from anthropogenic harm (Davis et al. 2017; Meyer-Gutbrod and Greene 2018; Record et al. 2019). The species' decline has been exacerbated by an ongoing Unusual Mortality Event (UME) that NMFS declared in 2017, pursuant to section 404 of the MMPA, and includes an unprecedented 51 known mortalities and serious injuries to date, impeding the species' recovery. Of the 51 mortalities and serious injuries included in the UME, 13 are attributed to unknown causes (mostly due to an inability to examine carcasses), 13 to vessel strikes, 24 to entanglements, and 1 from natural causes.

NMFS has determined that the Potential Biological Removal (PBR) for the species— defined by the MMPA as "the maximum number of individuals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population"— is 0.7 whales (Hayes et al. 2021). This means that for the species to recover, the population cannot sustain, on average over the course of a year, the death or serious injury of a single individual due to human causes. Observed human-caused mortality far exceeds this level and a recent assessment of total right whale mortality estimates range-wide indicates that observed deaths likely captured only about 36 percent of the actual total deaths between 1990-2017 (Pace et al. 2021). Right whale abundance will continue to decline, imperiling species recovery, unless human-caused mortality is substantially reduced in the near term.

Entanglement in fishing gear and vessel strikes are the two primary causes of right whale mortality and serious injury, and human-caused mortality to adult females, in particular, is limiting recovery of the species (Moore et al. 2005, 2021; Corkeron et al. 2018; Hayes et al. 2021; Sharp et al. 2019). Anthropogenic trauma was the sole source of mortality for right whale adults and juveniles for which a cause of death could be determined between 2003 and 2018 (Sharp et al. 2019). This means that outside their first year of life, no right whales are observed with a natural cause of death because they succumb to anthropogenic lethalities before they can die of old age or other natural maladies.

NMFS also documented a decline in right whale calving rates which dropped from 2017 to 2020, with zero births recorded during the 2017-2018 season. The 2020-2021 calving season had the first substantial calving increase in 5 years, with 20 calves born, and the 2021-2022 calving season saw 15 births. However, estimated mortalities continue to outpace births, and best estimates indicate fewer than 100 reproductively active females remain in the population. Given the ongoing rate of human-caused mortality and serious injury, approximately 50 or more calves would need to be born per year over many years to stabilize the population decline and allow for recovery.

A recent study found that right whale body length is correlated to birth interval and calves produced per potential reproductive year, with larger females exhibiting shorter inter-birth intervals and more calves produced per potential reproductive year (Stewart et al. 2022). Researchers have also identified declines in right whale body length and condition which may be driven by rapidly changing ocean conditions due to climate change, repeated and worsening entanglements, and increasing vessel traffic and vessel strikes (Knowlton et al. 2012; van der Hoop et al. 2017; Corkeron et al. 2018; Christiansen et al. 2020; Stewart et al. 2021). These impacts may have cumulatively contributed to lower birth rates in the past decade. Efforts to reduce both entanglements and vessel strikes may increase fecundity and improve resiliency of the right whale population, thereby helping to maintain right whale population viability (Stewart et al. 2022).

Right whales inhabit U.S. waters year-round but predominate during late fall through early summer. Within U.S. waters, the whales primarily forage in the greater Gulf of Maine region (NY to ME) (Pershing et al. 2009; Davies et al. 2014). The species' only known winter calving area lies off the U.S. Southeast Coast within the South Atlantic Bight between northern Florida and North Carolina (Keller et al. 2012; Gowan and Ortega-Ortiz 2014). The Mid-Atlantic (New York to North Carolina) serves both as a migratory habitat for right whales moving between calving areas and northern foraging grounds, as well as a foraging habitat. The whales' primary distribution includes seasonal coastal habitats characterized by extensive commercial and recreational vessel traffic.

Right whales are vulnerable to vessel strike due to their coastal distribution and frequent occurrence at near-surface depths, and this is particularly true for females with calves. The proportion of known vessel strike events involving females, calves, and juveniles is higher than their representation in the population (NMFS 2020). Mother/calf pairs are at high risk of vessel strike because they frequently rest and nurse in nearshore habitats at or near the water surface, particularly in the Southeast calving area (Cusano et al. 2018; Dombroski et al. 2021). Calving females have the longest residence time of any demographic group on the Southeast calving ground, staying on average about three months in the region before traveling with their nursing calves to northern foraging areas (Krzystan et al. 2018). Right whales nurse their calves for up to a year. This promotes rapid calf growth (Fortune et al. 2012) but also places mother/calf pairs at increased risk of vessel interactions within the Southeast calving grounds and along the Mid-Atlantic and New England coasts, which are important migratory and foraging areas for right whales.

Two primary management tools are available to address vessel strike risk: 1) separating vessel traffic and whales via vessel routing measures to minimize their co-occurrence, and 2) reducing vessel transit speeds. Between 2002 and 2009, the International Maritime Organization (IMO) adopted five measures that relocated vessel traffic off the U.S. East Coast to minimize the overlap of right whales and vessels (Silber et al. 2012). Numerous studies have indicated that slowing the speed of vessels reduces the risk of lethal vessel collisions, particularly in areas where right whales are abundant and vessel traffic is common and otherwise traveling at high speeds (Vanderlaan and Taggart 2007; Conn and Silber 2013; Van der Hoop et al. 2014; Martin et al. 2015; Crum et al. 2019; Kelley et al. 2021). Reducing vessel speed is one of the most effective, feasible options available to reduce the likelihood of lethal outcomes from vessel collisions with right whales. Previous investigations indicate that NMFS' speed regulations reduced the risk of lethal vessel strikes to right whales (Conn and Silber 2013; Laist et al. 2014). NMFS' speed rule assessment documented a reduction in observed right whale serious injuries and mortalities resulting from vessel strikes since implementation of the speed rule, but highlighted the need for additional action to more effectively address the risk of vessel strikes to right whales (NMFS 2020). Other than separating whales and vessels in time and space, vessel speed reduction remains the single most effective tool available to provide broadscale reductions in lethal vessel strike risk.

2.0 Environmental Review Process

2.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires federal agencies to examine the environmental impacts of major federal actions within the U.S. and its territories. The purpose of developing an EA is to determine if the impacts of the proposed action are likely to be significant. The proposed regulations restricting the transit speed of certain vessel sizes to 10 knots or less within certain areas and seasons are expected to affect thousands of mariners along the U.S. East Coast, and thus NMFS considers this action to be a major federal action subject to NEPA. Therefore, NMFS is assessing the environmental effects associated with this proposed action to determine if the impacts of this action are likely to be significant. This Draft EA analyzes the potential environmental impacts of implementing four alternative sets of vessel speed restriction measures, including the Preferred Alternative, and the No Action Alternative.

This Draft EA is being prepared using the 2020 CEQ NEPA Regulations. The effective date of the 2020 CEQ NEPA Regulations was September 14, 2020 and reviews begun after these dates are required to apply the 2020 regulations unless there is a clear and fundamental conflict with an applicable statute. 85 Fed. Reg. at 43372-73 (§§ 1506.13, 1507.3(a)). This Draft EA began on December 6, 2021 and accordingly proceeds under the 2020 regulations.

2.2 Scope of Environmental Analysis

The Draft EA examines impacts related to restricting the speed of most vessels greater than or equal to 35 ft (10.7 m) in length and less than 65 ft (19.8 m) in length in current SMAs, modifying current spatial and temporal SMA boundaries to create proposed Seasonal Speed Zones (SSZs), and implementing a new, mandatory Dynamic Speed Zone (DSZ) program. Finally, the Draft EA examines the impacts of combining actions from all alternatives (except the No Action Alternative). The Draft EA addresses potential impacts to right whales, other marine species, ocean noise, air quality and climate change, and socioeconomic resources resulting from NMFS' proposed action and alternatives. The intent of this Draft EA is to provide focused information on the primary issues and impacts of environmental concern. For these reasons, the Draft EA does not provide a detailed evaluation of the effects to the elements of the human environment; instead, it provides a qualitative analysis of impacts using best available data. For further information on potential socioeconomic impacts to the human environment, see the associated Draft Regulatory Impact Review (RIR) and Initial Regulatory Flexibility Analysis (IRFA).

2.3 Best Available Information

In accordance with NEPA, NMFS used the best scientific information available to compile and assess the environmental baseline and impacts evaluated in this document. NMFS relied on available, existing information and data regarding impacts related to reducing vessel speed for most vessels greater than or equal to 35 ft in length and less than 65 ft in length, modifying spatial and temporal SMA boundaries to create proposed SSZs, and implementing a mandatory DSZ program. This proposed action was developed using scientific, management, and stakeholder input, and policy guidance.

3.0 Description of the Proposed Action and Alternatives

3.1 Criteria for Alternative Selection

The main criteria for selection of alternatives is the need to reduce right whale mortalities and serious injuries from vessel strikes. NMFS' speed rule assessment found two key components of the speed rule are failing to meet vessel strike conservation needs for right whales: 1) the scope of vessel sizes subject to regulation; and 2) the spatial and temporal misalignment of vessel strike risk relative to the current spatial boundaries and timing of SMAs (NMFS 2020). NMFS evaluated the extent to which each potential modification to the current speed rule would meet the selection criteria as a reasonable alternative and employed two tiers of criteria: 1) criteria that must be met by the proposed alternative, and 2) criteria that should, if possible, be met by the proposed alternative. The following criteria for evaluating proposed changes to the 2008 speed rule were considered.

Alternative Selection Criteria
Regulations must:

1) Meet the "purpose and need" as described above - to substantially reduce the likelihood of lethal vessel collisions involving right whales by providing necessary protections to stabilize the population decline and forestall extinction.
2) Provide robust, effective vessel strike risk reduction over a 10 to 15-year time horizon.
3) Focus on addressing the aspect of vessel strike risk attributable to vessel speed; namely, reducing vessel speeds that are in excess of 10 knots.
4) Be resilient to shifts in right whale distribution and habitat use by including built-in adaptivity to changes over time.
5) Be consistent with right whale recovery needs and goals, as well as with existing statutes and regulations.
6) Be administratively feasible and enforceable.
7) Have scientific support.

Regulations should if possible:

8) Use the smallest footprint and timeframe necessary for SSZs and DSZs to achieve conservation goals.
9) Be easily understood and carried out by those being regulated.
10) Provide opportunities to evaluate their effectiveness.
11) Minimize impacts to resources (economic, transportation) and small entities.
12) Be compatible with regulations across the U.S./Canadian border.

From these selection criteria, the following three modifications were considered:

1) **Expansion of regulated vessel size classes to include vessels greater than or equal to 35 ft in length and less than 65 ft in length.** Collisions with vessels less than 65 ft in length can be lethal to right whales and this vessel size class is not currently subject to speed restrictions under the current speed rule.
2) **Modification of SMA spatial and temporal boundaries.** Existing SMAs do not reflect shifting right whale distribution and habitat use along the U.S. East Coast, and risk modeling reveals areas/times of elevated vessel strike risk are not currently covered by SMAs.
3) **Introduction of a mandatory DSZ program.** A mandatory DSZ program provides a mechanism for nimble, "on demand" vessel strike protection for right whales in areas/times with more unpredictable or variable vessel strike risk characteristics that are not subject to seasonal speed restricted areas.

3.2 Proposed Action

NMFS is proposing to modify the current right whale vessel speed regulations to further reduce the risk of serious injury and mortality from vessel strike events in U.S. waters. NMFS examined and refined three essential components of risk reduction which make up the alternatives considered in the Draft EA. These include:

(1) Inclusion of most vessels greater than or equal to 35 ft in length and less than 65 ft in length in the vessel size class subject to the speed restrictions;

(2) Changes to the spatial boundaries and timing of existing SMAs (to be referred to as SSZs going forward) to better address areas and times where vessel strike risk is high; and

(3) Implementation of a mandatory DSZ framework (to replace the current voluntary DMA/Slow Zone program) to enforce speed restrictions when right whales are known to be present and certain conditions are met outside active SSZs.

Each of the Draft EA's alternatives consider different combinations of these proposed modifications, with Alternative 5 (Preferred Alternative) including all three modifications.

3.2.1 Refinement of Proposed Risk Reduction Measures

3.2.1.1. Addressing Strike Risk from Vessels Less than 65 ft in Length

To best target vessel strike risk mitigation for vessels less than 65 ft in length, NMFS evaluated which vessel sizes within this broad group presented a lethal threat to right whales. NMFS identified 35 ft as the appropriate minimum vessel length cutoff based on available data on known right whale vessel strike mortality and serious injury events, and considering the particular vulnerability of young right whale calves along the U.S. East Coast.

Since 2005, NMFS has documented six confirmed right whale mortalities and serious injuries involving vessels less than 65 ft in length in U.S. waters. The vessels involved ranged in length from 42 to 54 ft. NMFS has documented an additional five lethal vessel collisions in U.S. waters involving vessels less than 65 ft and large whales of undetermined species (possibly right whales) - of which two were the result of collisions with a 33-ft and 30-ft vessel. Furthermore, records from two Southern right whale (*Eubalaena australis*) vessel strike mortality events in South Africa and Australia involved 44-ft and 34-ft vessels, respectively.

Additionally, the particular vulnerability of young (< 4 months of age) calves in U.S. waters is an important consideration. Right whale calves, which are approximately 13.8 ft (4.2 m) in length at birth (Fortune et al. 2012), are disproportionately represented in the vessel strike data relative to their demographic proportion in the population. Over the past 2.5 years, three of the four right whale vessel strike mortalities and serious injuries in U.S. waters involved calves. Calves (and their mothers) are vulnerable to vessel strikes because they tend to be found close to shore and spend most of their time at or near the water surface (Cusano et al. 2018; Dombroski et al. 2021). This is especially true during the calves' first months of life when they must surface frequently to breathe, and spend a considerable amount of time nursing near the water surface. Sightings data indicate that mothers with young calves are more likely than other demographic groups to remain in proximity to shore, which increases overlap with traffic from vessels 35 to 65 ft in length. Finally, the only known right whale calving ground in the Northwest Atlantic is located in coastal waters along the South Atlantic Bight between Florida and North Carolina, meaning that the U.S. bears sole stewardship responsibility for young right whale calves during this vulnerable life stage.

3.2.1.2 Identifying Effective Boundaries for Seasonal Speed Zones

NMFS developed proposed modifications to the current SMAs using a coast-wide vessel strike mortality risk model and considering right whale visual sighting (NARWC 2021) and acoustic detection (NEFSC 2022) data, recent vessel traffic Automated Information System (AIS) data, and information on other relevant planned ocean activities, including offshore wind development. The goal of this effort was to develop seasonal boundaries that best capture areas with elevated risk of lethal right whale vessel strikes.

NMFS evaluated the risk of right whales being struck and killed by vessels in U.S. waters along the U.S. East Coast using an encounter risk model (Garrison et al. 2022), incorporated herein by reference. This model simulates the likelihood of a fatal vessel strike based on six sources of information: 1) the spatial distribution and density of right whales; 2) the spatial distribution and amount of vessel traffic; 3) the likelihood that a whale and a particular vessel will be in close proximity; 4) the likelihood that a whale will be near the surface during the interaction; 5) the likelihood that a whale will successfully move to avoid the interaction; and 6) the likelihood of mortality if a collision occurs. A similar approach was previously applied to large whales on the U.S. West Coast (Rockwood et al. 2017, 2020) and right whales occurring off the coast of Florida (Crum et al. 2019).

The spatial distribution of right whales was modeled using a compilation of aerial survey data collected by NMFS and many different external research groups. The model and approaches are similar to those described in Roberts et al. (2016) and Gowan and Ortega-Ortiz (2014) and reflect the distribution of right whales since 2010 (Roberts et al. 2021). Environmental variables were used to predict the monthly changes in right whale distribution between Florida and the Nova Scotian shelf.

Vessel traffic was characterized using data collected via satellite and terrestrial-based AIS that transmit information on vessel movements, speed, and characteristics for those vessels that carry AIS units. For each spatial cell in the right whale distribution model, the length of transit, time of transit, and average speed of each vessel was summarized from the available AIS data. These data were summarized monthly for 2017 through 2019. Generally, most vessels greater than or equal to 65 ft (19.8 m) in length are required to carry AIS transceivers. While many vessels less than 65 ft (19.8 m) in length are AIS-equipped, they are likely to be substantially under-represented in these data, and therefore, the risk of interactions with right whales is under-represented in the model.

The likelihood of a whale-vessel encounter was modeled using the approach described in Martin et al. (2015), where the probability of close encounter between a whale and a vessel within a given spatial cell is a function of vessel size, whale swimming speed, and vessel speed. Given a close encounter, the probability that a whale will be near the surface (in the upper 32.8 ft (10 m) of the water column) where it would be susceptible to a vessel strike, was estimated based on available data on dive-surface behavior from animal-borne tags from different regions where whales occur (Baumgartner and Mate 2003; McGregor and Elizabeth 2010; Parks et al. 2011; Baumgartner et al. 2017; Dombroski et al. 2021).

It remains unclear how right whales respond to close approaches by vessels and the extent to which this allows them to avoid being struck. Rockwood et al. (2017) and Crum et al. (2019) examined different ways of accounting for avoidance behaviors within encounter risk models. Conn and Silber (2013) indicated that encounter rates were higher with fast-moving vessels than expected, which may be consistent with successful avoidance of slower vessels by whales. In this model, NMFS included a potential avoidance behavior accounting for random effects of the distance at which a whale reacts, the speed the whale swims to escape, and the direction the whale chooses to swim. This approach accounts for the increased likelihood that a whale will escape a slower moving vessel and includes the large amount of uncertainty in whale behavioral response to approaching vessels.

In this framework, if a collision between a whale and a vessel occurs, the likelihood that the collision will be fatal is a function of vessel speed. We applied the model of Conn and Silber (2013) to evaluate this probability. It should be noted that the data in this model are primarily from vessels greater than or equal to 65 ft in length, so it may be less appropriate for some of the vessels less than 65 ft in length included in the current analysis.

Areas of highest risk are primarily associated with places where there is both a high density of vessel traffic and high density of right whales. In U.S. waters, these areas correspond generally to the Atlantic East Coast region, particularly between late fall and early spring (November through April). The highest risk areas occur in the Mid-Atlantic between Cape Hatteras, North Carolina, and Massachusetts, and in relatively shallow waters over the continental shelf. High-density vessel traffic areas in approaches to major commercial ports pose the greatest risk of vessel strike mortalities. While vessels less than 65 ft in length are under-represented in the AIS data, the spatial distribution of the risk of interactions with these vessels was also examined. In general, the risk of interactions with vessels less than 65 ft in length was higher closer to shore. The monthly spatial distribution of vessel strike risk was examined to identify regions and times where slowing vessel traffic to speeds less than 10 knots would have the greatest impact on reducing the overall risk of vessel strike mortalities for right whales.

Once these spatio-temporal areas were identified, they were compared with additional opportunistic and survey-based right whale sightings information, including demographics, acoustic detections of right whale presence, and additional information, where available, on possible future activities that might impact vessel traffic, including proposed and leased wind energy sites and U.S. Coast Guard (USCG)-proposed vessel safety fairways (85 FR 37034, June 19, 2020). Comparing these additional data with areas identified by the risk model informed development of proposed SSZ boundaries based on the totality of information available.

It is important to note that the risk model is not informed by right whale sightings prior to 2010, opportunistic sightings, or acoustic detections. Additionally, vessel traffic from boats less than 65 ft in length are under-represented in the model. The model showed that the greatest risk of lethal vessel strikes occurred throughout waters of the mid-Atlantic and southern New England, particularly during November - May when the majority of North Atlantic right whales are in U.S. waters. Model simulations (using the Garrison et al. 2022 risk model) indicate that the proposed expansion of seasonal vessel speed restrictions (proposed SSZs) would address 89% of the total risk that can be reduced by restricting vessel speeds to 10 knots. This corresponds to a realized average reduction in vessel strike mortality of North Atlantic right whales of 27.5%. While the risk model underestimates the strike risk associated with traffic from vessels greater than 35 ft to less than 65 ft in length, given the expected coastal distribution of this traffic, based on available AIS data, NMFS anticipates this component of strike risk would be substantially accounted for by the revised SMA boundaries/timing.

3.2.1.3 Use of Dynamic Speed Zones to Provide Efficient and Flexible Protection

Static seasonal speed restrictions best serve areas with reliable right whale presence and elevated vessel strike risk. For example, right whales reliably occur within the South Atlantic Bight calving ground each and every season (November through April). The total number of individuals present will vary from year to year (Krzystan et al. 2018), but this calving, and likely mating, habitat is an essential area for right whale reproduction and is designated (81 FR 4837, January 27, 2016) as critical habitat under the ESA. The consistency of right whale presence (especially vulnerable mother/calf pairs) combined with high levels of vessel traffic along the U.S. Southeast Coast are the primary reasons lethal vessel strike risk in this region is best managed via seasonal static speed restriction.

In other times/areas however, right whale presence is less predictable and vessel strike risk (based on risk modeling) generally is more moderate. For example, during late fall and winter, right whales have been documented visually or acoustically over many years in the central Gulf of Maine, frequently engaged in foraging. However, this is not the case every fall/winter season, and vessel strike risk is relatively lower in this area due to lower levels of vessel traffic transiting at high speeds. Vessel strike risk modeling indicates a benefit to right whales from vessel speed restriction in this area, but to a lesser degree than other times/areas. With adequate seasonal monitoring for right whale presence, a dynamic area speed restriction is ideally positioned to provide vessel strike protection in this area when and where it will be most beneficial to right whale conservation.

NMFS proposes a process for determining and implementing DSZs that would follow an objective, rigorous and replicable protocol, informed by inputs such as the number of right whales detected, the dispersion of the aggregation, and whale behavior (if known). The proposed measure would build upon current criteria for designating DMAs and Slow Zones by making these existing protocols a minimum trigger threshold to to designate DSZs. NMFS proposes a more rigorous standard for designating DSZs under this new mandatory DSZ program compared to current trigger thresholds under the voluntary DMA and Slow Zone program.

Under these protocols, NMFS would establish DSZs lasting at least 10 days when three or more right whales are sighted within close proximity of one another, or a right whale acoustic detection is confirmed, and NMFS has determined there is a greater than 50 percent likelihood that right whales would continue to be present within the potential DSZ zone. The DSZ zone would not to exceed (1) 2500 sq nm (8575 sq km), commensurate with the size of the right whale aggregation, for visual detections, or (2) 400 sq nm (1372 sq km) for acoustic detections. As with the current voluntary DMA/Slow Zone program, DSZs may be extended temporally if additional sightings or acoustic detections meeting the minimum DSZ thresholds occur within the effective period. This more rigorous standard will ensure that dynamic speed regulations are targeted and effective, while avoiding unnecessary mandatory vessel speed restrictions in areas/times with minimal benefit to the whales. Recognizing this is a new standard, NMFS will complete a formal, detailed DSZ framework protocol, in line with the standards outlined in the preamble to the regulatory text and informed by extensive acoustic and visual right whale monitoring data and public input.

Based on simulations of the benefits that would occur if the proposed SSZ boundaries were implemented (Garrison et al. 2022) and the additional risk reduction expected to accrue from the use of mandatory DSZs, NMFS anticipates that the revised SSZs and new DSZs together would address over 90% percent of the risk reduction that can be achieved by reducing vessel speeds to 10 knots , relative to the status quo. Further, as discussed above, strike risk associated with traffic from vessels greater than 35 ft to less than 65 ft in length is underestimated in the risk modeling.

3.2.2 Administrative Modifications

NMFS considered several administrative changes to the speed rule intended to enhance the effectiveness of the rule, provide clarity to the mariner community, allow for better monitoring, and improve enforcement.

NMFS considered the following administrative changes:

1. Expansion of the safety deviation provision to include emergency circumstances that present a threat to the health, safety, or life of a person;
2. Modification of the safety deviation reporting protocols to eliminate the vessel logbook entry requirement in favor of a new requirement for vessel operators to complete and electronically submit an accurate and complete Safety Deviation Report online to NMFS within 48 hours of employing a safety deviation detailing the circumstances surrounding the deviation and need for the deviation. The vessel operator and, if the vessel is under pilotage at the time of the deviation, the pilot on board, shall attest to the accuracy of the information in the Safety Deviation Report before it is submitted. The proposed regulations would require a vessel operator to submit, via a NMFS website, the same information currently in the logbook entry requirement, along with new information relevant to the deviation event;
3. Inclusion of a new provision, applicable only to vessels 35 - 65 ft in length, which allows such vessels to transit at speeds greater than 10 knots within areas where a National Weather Service Gale Warning, or other National Weather Service Warning (e.g., Storm Warning, Hurricane Warning) for wind speeds exceeding those that trigger a Gale Warning is in effect. No reporting of these speed deviations would be required;
4. Clarification that nothing in the speed rule negates the duty to consult under ESA section 7(2)(a);
5. Addition of the U.S. Coast Guard to the current exemption extending to foreign sovereign vessels when they are engaging in joint exercises with the U.S. Department of the Navy; and
6. Modifications would describe conduct that the rule prohibits and clarify that the person invoking an exemption has the burden of proving that the exemption applies.

These proposed changes to the speed rule are administrative in nature, and are not expected to have an effect on the environment. Therefore, they will not be further analyzed or discussed in this Draft EA, but are included as part of the preferred alternative.

3.3 Geographic Scope of the Alternatives

The geographic scope of the alternatives encompasses marine waters from the U.S. East Coast shoreline out to the extent of the Atlantic Exclusive Economic Zone (EEZ) (hereafter referred to as the "action area"). Certain alternatives would apply to most vessels greater than or equal to 35 ft in length and less than 65 ft in length or most vessels greater than or equal to 65 ft in length transiting within current SMAs, proposed SSZs, and/or new mandatory DSZs. See Appendix B, Figure 1 for a map of the proposed SSZs and Figure 2 for a map of 2021 DMAs/Slow Zones, which provides guidance regarding the location of potential DSZs under the newly proposed protocol. The geographic coordinates and active period for each of the proposed SSZs are also provided in Appendix C.

A DSZ may be declared anywhere within U.S. waters, outside an active seasonal area (SMA or SSZ depending on the alternative), where and when right whales are detected and certain conditions are met. While it is not possible to know where DSZs would be triggered in the future, the past locations of voluntary DMAs/Slow Zones offer an indication of where future DSZs (using a different protocol) might occur. Figure 2 (Appendix B) shows all voluntary DMAs/Slow Zones triggered in 2021 with the current SMA boundaries and the subset of DMAs/Slow Zones that would have been triggered had the proposed SSZs been in place.

3.4 Alternatives Considered

This section describes alternatives NMFS is considering to implement proposed modifications to the current speed rule. To select alternatives for analysis, NMFS developed the criteria in Section 3.1 from internal scoping, public comments on the speed rule assessment, and best available scientific information. The components selected for analysis are those that meet all or most of the selection criteria discussed in Section 3.1. Five alternatives are analyzed in the Draft EA, including taking no action. With the exception of Alternative 1 (No Action Alternative), the alternatives consist of subsets or combinations of the modifications described above. Some alternatives include one type of modification only (Alternatives 2 and 3), while others include a combination of measures (Alternatives 4 and 5). Alternative 5 is NMFS' preferred alternative.

3.4.1 Alternative 1 (No Action Alternative): No modifications to the North Atlantic right whale vessel speed rule

Alternative 1 (No Action Alternative) would not change the status quo. No modifications to the speed rule would be made.

3.4.2 Alternative 2: Restrict the speed of most vessels greater than or equal to 35 ft in length and less than 65 ft in length to 10 knots or less within current Seasonal Management Areas

Alternative 2 would add most vessels greater than or equal to 35 ft and less than 65 ft in length to the vessel size class subject to 10-knot speed restrictions within current SMAs. This alternative would continue to exempt the same categories of vessels as the current speed rule (50 CFR § 224.105), including military vessels, vessels that are owned, operated by, or under contract to the Federal Government, and law enforcement vessels, when engaged in law enforcement or search and rescue duties.

Alternative 2 would also include the new weather-related safety deviation provision described in Section 3.2.2, Administrative Details. This new provision would be applicable only to vessels less than 65 ft in length, and would allow such vessels to transit at speeds greater than 10 knots within areas where a National Weather Service Gale Warning, or other National Weather Service Warning is in effect, without having to report the speed deviation.

3.4.3 Alternative 3: Spatial and temporal modification of existing Seasonal Management Areas (to be referred to as Seasonal Speed Zones)

Alternative 3 would modify the boundaries and timing of existing SMAs to create proposed SSZs that better capture areas and times with elevated risk of lethal vessel strikes. See Section 3.2.1 above for more details on how the proposed SSZs were created. See Figure 1 in Appendix B for geographic boundaries and timing of the proposed SSZs. See Appendix C for geographic coordinates and active periods for each of the proposed SSZs.

3.4.4 Alternative 4: Combination of Alternative 2 and mandatory Dynamic Speed Zone program

Alternative 4 would implement changes as detailed in Alternative 2 (add most vessels greater than or equal to 35 ft and less than 65 ft in length to the vessel size class subject to 10-knot speed restrictions in current SMAs) as well as establish a mandatory DSZ program for most vessels greater than or equal to 35 ft. See Section 3.4.2 above for a description of Alternative 2, and Section 3.2.1 above for details on the proposed mandatory DSZ program.

Alternative 4 would also include the weather-related safety deviation provision included as part of Alternative 2 and described in Section 3.2.2, Administrative Details.

3.4.5 Alternative 5 (Preferred Alternative): Combination of Alternatives 3 and 4

Alternative 5 (Preferred Alternative) would add most vessels greater than or equal to 35 ft and less than 65 ft in length to the vessel size class subject to 10-knot speed restrictions, modify the existing SMAs to create proposed SSZs, and establish a mandatory DSZ program. See Section 3.2.1, Refinement of Proposed Risk Reduction Measures, for more details on each proposed modification included in Alternative 5 (Preferred Alternative).

Alternative 5 (Preferred Alternative) would also include all the administrative changes to the speed rule as described in Section 3.2.2, Administrative Modifications.

Following examination of best available information to achieve the purpose and need described above, NMFS determined that Alternative 5 (Preferred Alternative), combining all other alternative actions (except the No Action Alternative) is the best option to ensure a substantial reduction in lethal right whale vessel strikes along the U.S. East Coast. NMFS has identified this alternative as the Preferred Alternative because it would best achieve the purpose and need for action, to help stabilize the right whale population decline, and promote species recovery.

3.5 Alternatives Considered but not Analyzed in Detail

Modifications considered by NMFS, but dismissed from further consideration early in the planning process, are discussed below. These alternatives were considered but not further analyzed because they lacked sufficient conservation benefit to right whales based on available data, or were not practically feasible or efficient to implement.

Restricting the speed of most vessels greater than or equal to 50 ft (15.2 m) in length and less than 65 ft in length to 10 knots or less within the proposed SSZs was evaluated and dismissed because this alternative fails to address the risk of mortalities and serious injuries involving vessels smaller than 50 ft in length. Evidence from confirmed collision events, reported by vessel operators, demonstrate that vessels smaller than 50 ft in length have caused right whale mortalities and serious injuries within U.S. waters. As a result, no further consideration of this alternative was pursued.

NMFS considered restricting the speed of most vessels greater than or equal to 25 ft (7.6 m) in length and less than 35 ft in length to 10 knots or less within the proposed SSZs but dismissed this alternative because insufficient evidence exists suggesting this vessel size class (25 - 35 ft) is responsible for a significant portion of lethal vessel strikes in U.S. waters. Many vessel types in this size class are designed for high speed transit which is of concern. However, including vessels in this size range would likely impact substantially more vessel operators along the coast based on vessel registration data, and we lack information regarding vessel traffic patterns of this vessel size class to determine if significant overlap with right whale habitats is occurring. Vessels less than 35 ft in length tend to operate closer to shore and in some areas may operate exclusively in inshore/nearshore waters (e.g. Chesapeake Bay, Albemarle Sound, the intercoastal waterway) and be unlikely to enter current SMAs or proposed SSZs.

4.0 Affected Environment

The geographic area considered in this chapter spans the East Coast of the U.S. from Maine to Florida, and includes state waters (seaward from the shore to 3 nm [5.6 km]); U.S. territorial waters (seaward from the shore to 12 nm [22.2 km]); and the U.S. Atlantic EEZ (out to 200 nm [370.4 km]). The geographic scope of SSZs and potential mandatory DSZs under the proposed action and its alternatives is discussed above in Section 3.3, Geographic Scope of the Alternatives. The U.S. eastern seaboard is the most populous coastal area in the country which is reflected in the dense vessel traffic characterizing many areas along the coast. Commercial vessel activity predominates, with some of the largest ports in the U.S. found just inshore of right whale habitat. This urbanized coastal environment also hosts extensive recreational and government vessel activity.

This chapter describes the resources that may be affected by implementation of the proposed action, to the extent necessary to understand potential impacts. The following resources have been identified to be potentially affected by the proposed action: North Atlantic right whales, other marine species (biological resources); air quality, climate change, noise (physical resources); and socioeconomic resources. Relevant biological resources to this analysis include the status and distribution of right whales and other marine species, and life history information. Relevant physical resources include climatic and noise factors. Relevant socioeconomic resources include the potentially affected maritime community.

The following sections include a description for each resource and provide context for understanding potential effects of each alternative, which are analyzed in corresponding sections in Chapter 5.0, Environmental Consequences.

4.1 Biological Resources

This section provides information on North Atlantic right whales and other relevant marine species (see Table 2 in Appendix A) whose ranges coincide with that of the action area and which are known or suspected to be affected by vessel interactions or impacts. The evaluation focuses on impacts to right whales, since the proposed action was specifically designed to reduce the risk of lethal vessel strikes to this species. However, because other marine species may be incidentally affected by the alternatives, they are addressed below, although not to the same level of detail.

4.1.1 Large Whales

Several species of large whales occur within the action area including North Atlantic right whales, humpback whales (*Megaptera novaeangliae*), minke whales (*Balaenoptera acutorostrata*), fin whales (*Balaenoptera physalus*), sei whales (*Balaenoptera borealis*) and sperm whales (*Physeter macrocephalus*) (Hayes et al. 2021). Blue whales (*Balaenoptera musculus*) have been detected occasionally, but infrequently, offshore in the Mid-Atlantic and New England regions (Hayes et al. 2021). For this reason they will not be further included in this evaluation. All large whale species are subject to potential harm from vessel interactions, with the severity and degree of interactions mostly a function of species distribution and behavior in relation to vessel traffic. This section provides relevant biological and ecological information regarding right whales and other large whale species which may be affected by the proposed alternatives.

4.1.1.1 North Atlantic Right Whales

Status

The right whale population continues to decline with the latest preliminary estimate indicating fewer than 350 right whales remaining (Pace 2021). Of the 350 whales, fewer than 100 are reproductively active females which limits potential calving rates (Corkeron et al. 2018). To date, researchers have documented 51 right whale serious injuries and mortalities since 2017 as part of an ongoing UME, with 13 attributed to unknown causes (mostly due to an inability to examine carcasses), 13 to vessel strikes, 24 to entanglements, and 1 from natural causes. See Section 1.1, for more details on the right whale population status.

Description and Natural History

Right whales are large, rotund baleen whales (also known as mysticetes) mostly black in color, with light patches of rough skin, called callosities, on their head. Right whales can grow to approximately 45 ft (13.7 m) in length, although average body size has decreased since the 1980s, in part due to sub-lethal anthropogenic stressors (Stewart et al. 2021). The whales have thick blubber and lack a dorsal fin, which suggests the species is well adapted to ice-prone environments despite its current distribution in more temperate regions. Right whales are naturally long lived predators but data on average lifespan is limited in part because every non-calf mortality in the past 20 years, for which the cause of death could be determined, resulted from interactions with fishing gear or vessel strikes (Sharp et al. 2019). Individuals do not live long enough to die of natural causes, stymieing estimation of natural longevity for the current population.

Females usually reach sexual maturity around 9-10 years of age, and give birth to a single calf after an approximately year-long pregnancy. Three years is considered a healthy calving interval, and is the norm for Southern right whales, but recent calving data demonstrates that females in the North Atlantic are only calving every 6 to 10 years. The energy demands of parturition and lactation are substantial and the additional stress caused by chronic injuries is one of the reasons females are calving less often. Females must amass sufficient lipid reserves to support a calf's nutritional needs while nursing as they rarely feed while on the calving ground.

In U.S. waters, right whales mostly forage in the greater New England region with some foraging occurring in the Mid-Atlantic and more rarely along the Southeast coast. Right whales feed primarily on copepods, in particular *Calanus finmarchicus*, where they occur in high abundance (Watkins and Schevill 1976, Wishner et al. 1988, Mayo and Marx 1990, Woodley and Gaskin 1996, Kenney 2001, Baumgartner et al. 2003, Baumgartner and Mate 2003). Right whales are ram-filter feeders, an energy intensive foraging strategy for which they are morphologically well adapted (van der Hoop et al. 2019). They forage by holding open their mouths while swimming through patches of high energy-dense prey, such as copepods, to filter out the tiny zooplankton using their long baleen.

Right whales feed at all levels of the water column, from the water's surface to the sea floor, as evidenced by tag data and whales appearing at the surface with muddy substrate on their rostrum. Foraging commonly occurs at the surface or subsurface in the spring in Cape Cod Bay (Mayo and Marx 1990) but at depth in the summer, fall, and early winter where high densities of copepods occur (Kenney et al. 1995, Baumgartner and Mate 2003, Baumgartner et al. 2017). The high lipid content of diapausing copepods that can occur in late summer and early fall at depth, from 83 fm (300 m) to 250 fm (1500 m), in the Gulf of Maine basins may be of particular importance to right whales (Baumgartner et al. 2017, Krumhansl et al. 2018). Seasonal patterns in *C. finmarchicus* aggregations and phenology have been changing (Pershing and Stamieszkin 2020), influencing right whale distribution throughout the greater Gulf of Maine region (Record et al. 2019) and challenging efforts to predict whales' presence at known foraging hotspots.

Distribution and Habitat Use

Right whales mainly inhabit coastal and continental shelf waters in the western North Atlantic Ocean, although they are known to migrate and forage offshore, over deep water. Researchers have documented individuals as far as Europe and the Gulf of Mexico, but the species' primary range extends from Florida through the U.S. Mid-Atlantic and greater Gulf of Maine region to the east coast of Canada (Bay of Fundy, Scotian Shelf and Gulf of St. Lawrence) and to a lesser extent into to the waters of Greenland and Iceland (Lien et al. 1989, Mate et al. 1997, Morano et al. 2012, Oedekoven et al. 2015, Davis et al. 2017, Krzystan et al. 2018, Davies et al. 2019). Large aggregations are most frequently observed in the species' primary foraging habitats including Cape Cod Bay, the greater Gulf of Maine region (Mate et al. 1997, Wikgren et al. 2014, Davis et al. 2017, Mayo et al. 2018) the Bay of Fundy, Scotian Shelf, and Gulf of Saint Lawrence (Davies et al. 2019, Plourde et al. 2019). Groups of right whales will actively socialize at the water's surface, in surface-active groups, in which mating and socialization occurs.

Each fall, a subset of the population travels from northern foraging grounds to the shallow, coastal waters of their only known calving grounds along the South Atlantic Bight. Right whales most frequently give birth in the coastal waters off Georgia and Florida between December and March with mother and calves generally present in the region between November and April.

On June 3, 1994, NMFS designated important nursery and calving habitat along the Georgia and northeastern Florida coasts as well as essential feeding areas off the coast of New England as critical habitat for right whales. On February 26, 2016 (81 FR 4837), NMFS replaced the 1994 critical habitat designation for right whales in the North Atlantic with two new areas of critical habitat: the Northeastern U.S. Foraging Area (Unit 1) and Southeastern U.S. Calving Area (Unit 2).

Beginning in 2010, right whale distribution patterns began to shift dramatically, with the region south of Martha's Vineyard and Nantucket becoming an important winter/spring foraging habitat and the Gulf of St. Lawrence attracting large numbers of right whales to forage in summer and early fall. Climate change has altered the abundance and distribution of the copepod *C. finmarchicus*, a critical food supply for right whales. Oceanographic changes driven by accelerated climate trends have caused a deviation in the seasonal foraging patterns of right whales (Record et al. 2019a). These distribution changes left right whales more vulnerable to vessel strikes and gear entanglements as the whales moved away from areas with protection measures in place (Meyer-Gutbrod and Greene 2018). These changes also coincided with reduced calving output, potentially reflecting a delay between declining productivity in traditional habitats and increasing productivity in newer habitats, resulting in a "climate deficit" in their fitness (Meyer-Gutbrod et al. 2021; Pershing and Pendleton 2021). If females, in particular, struggle to find sufficient food resources in these new habitats this in turn can affect their calving output in the following years. These climate change-induced distribution shifts have also resulted in elevated right whale abundance in areas identified for future wind energy development off Massachusetts and Rhode Island, with aerial surveys documenting right whales spending more time in this area (O'Brien et al. 2020).

4.1.1.2 Other Large Whales

Humpback Whales

The Gulf of Maine humpback whale (formerly Western North Atlantic, *Megaptera novaeangliae*) was previously listed as endangered under the ESA. In 2016, several distinct population segments (DPSs) were removed from listing, including the West Indies DPS. The Gulf of Maine stock is largely composed of whales that reproduce in the West Indies (81 FR 62259, September 2016). The Gulf of Maine stock remains protected under the MMPA. Current data suggest that the Gulf of Maine humpback whale stock is increasing (Hayes et al. 2021). The most recent population estimate is 1,396 animals with a minimum population estimate of 1,380 (Hayes et al. 2021).

In the western North Atlantic, humpback whales occur along the east coast of North America and north and east across Greenland, Iceland, and the Norwegian Sea (Christensen et al. 1992, Palsbøll et al. 1997). Humpbacks calve and mate in the Caribbean during the winter and migrate to northern feeding areas during the summer months. Since the early 1990s, humpbacks, particularly juveniles, have been observed stranded dead with increasing frequency in the mid-Atlantic (Swingle et al. 1993, Wiley et al. 1995) and have been sighted in wintertime surveys in the Southeast and mid-Atlantic (Hayes et al. 2021) and foraging off the NY Bight in spring and summer (Lomac-McNair et al. 2022). In the Gulf of Maine, sightings are most frequent from mid-March through November, with a peak in May and August, from the Great South Channel east of Cape Cod northward to Stellwagen Bank and Jeffreys Ledge (CETAP 1982). Acoustic detections of humpbacks indicate year-round presence in New England waters, including the waters of Stellwagen Bank (Davis et al. 2020). Distribution in these waters appears to be correlated with prey species, including herring (*Clupea harengus*), sand lance (*Ammodytes* spp.), and other small fishes as well as euphausiids (Paquet et al. 1997).

Minke Whales

The minke whale (*Balaenoptera acutorostrata*) is not listed as endangered or threatened under the ESA but is protected under the MMPA. Minke whales off the eastern coast of the U.S. are considered to be part of the Canadian east coast population and are frequently observed in New England waters between spring and fall, but are largely absent by winter (Hayes et al. 2021). Acoustic detections indicate minke whale presence from September through April in deep-ocean waters in the eastern North Atlantic (Risch 2013, Risch et al. 2014). Data are insufficient for determining a population trend for this species. The best estimate of population size is 24,202 (coefficient of variation (CV=0.30)) minke whales which is substantially higher than in the 2018 stock assessment report because it now includes updated survey data from Canadian waters. The minimum population size is calculated at 17,002 (Hayes et al. 2021).

Fin Whales

The fin whale is found in all major oceans and was composed of three subspecies until recently: *Balaenoptera physalus physalus* in the Northern Hemisphere, and *B. p. quoyi* and *B. p. patachonica* (a pygmy form) in the Southern Hemisphere. New genetic data suggest that fin whales in the North Atlantic and North Pacific oceans represent two different subspecies (Archer et al. 2019). The International Whaling Commission defines a single stock of the North Atlantic fin whale off the eastern coast of the U.S., north to Nova Scotia, and east to the southeastern coast of Newfoundland (Donovan 1991). Fin whales are common year round in both inshore and offshore waters of the U.S. EEZ from Cape Hatteras northward (Hayes et al. 2021). Of the three to seven stocks thought to occur in the North Atlantic Ocean (approximately 50,000 individuals), one occurs in U.S. waters, where NMFS' best estimate of abundance is 7,418 individuals (Hayes et al. 2021).

Sei Whales

Sei whales (*Balaenoptera borealis*) are listed as endangered throughout their range under the ESA. The western North Atlantic sei whale population belongs to the Northern Hemisphere subspecies (*B. b. borealis*) and consists of two stocks, a Nova Scotian Shelf stock and a Labrador Sea stock (Baker and Clapham 2004, Mitchell and Chapman 1977). In U.S. waters, the Nova Scotian Shelf stock is found throughout the greater Gulf Of Maine region in both nearshore and offshore waters (Hayes et al. 2021). This stock is estimated at 6,292 individuals with a minimum population size of 3,098 individuals (Hayes et al. 2021). Sei whales are often found in the deeper waters that characterize the edge of the continental shelf (Hain et al. 1985) but substantial numbers of sei whales have been sighted south of Nantucket in spring and summer (Stone et al. 2017) and on Georges Bank in the spring and summer (CETAP 1982). Sei whales (like right whales) are largely planktivorous, primarily feeding on euphausiids and copepods, which results in the whales' primarily nearshore distribution at certain times of year.

Sperm Whales

In the western North Atlantic, sperm whales (*Physeter macrocephalus*) range from Greenland to the Gulf of Mexico and the Caribbean and are generally recognized as a single stock. The sperm whales that occur in the western North Atlantic are believed to represent only a portion of the total stock (Blaylock et al. 1995). Waring et al. (2014) suggests sperm whale distribution shifts north in spring to the central mid-Atlantic bight and southern end of Georges Bank and into the northern end of Georges Bank, the continental shelf, and the Northeast Channel in summer. Sperm whale presence on the continental shelf south of New England is highest in the fall. Total numbers of sperm whales off the U.S. or Canadian Atlantic coast are unknown, although estimates from selected regions of the habitat do exist for select time periods. The best recent abundance estimate for sperm whales is the sum of the 2016 surveys and is 4,349 (CV=0.28; Hayes et al. 2020). However, this is likely an underestimate given the data were not corrected for dive-time, which can be long for sperm whales (Watwood et al. 2006).

4.1.2 Other Marine Species

Marine species potentially impacted by the proposed action include marine mammals (in addition to large whales), sea turtles, and fishes. In addition to right whales, there are a variety of other marine mammal, sea turtle, and fish species commonly or occasionally found in the U.S. Atlantic EEZ (see Table 2 in Appendix A) that overlap with the action area. Some species are abundant and common, such as gray seals, whereas others are endangered or only visit the action area occasionally, such as Kemp's ridley (*Lepidochelys kempii)* sea turtles. Additional information on the use of the affected environment by other marine species is discussed in detail in Section 3.2 of the Final Environmental Impact Statement (FEIS) prepared in association with implementation of the 2008 speed rule (NMFS 2008).

4.1.2.1 Other Marine Mammals

The status and distribution of other marine mammals known to occur within the action area are discussed in detail in the 2020 U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessment Report (Hayes et al. 2021), and those sections are hereby incorporated by reference and summarized here. Four species of pinnipeds, and 28 species/stocks of cetaceans (mostly small odontocetes) occur in areas and times that overlap the action area (Table 2, Appendix B). Some species/stocks are common and ubiquitous throughout the action area while others are seasonal, transient or more infrequently detected. Hayes et al. (2021) includes information on recent vessel related lethal interactions with species listed in Table 2. In most cases we lack sufficient data to understand whether vessel strikes are an ongoing concern for certain species, but vessel strikes are documented for many species of marine mammals (Schoeman et al. 2020).

4.1.2.2 Sea Turtles and Fishes

Five species/DPSs of sea turtles including hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*, NW Atlantic DPS), and green (*Chelonia mydas*, North Atlantic DPS) occur within the proposed action area (Table 2). Eight species/DPSs of relevant fishes also occur within the proposed action area (Table 2). All of the above sea turtle and fish species are ESA listed and most, with the exception of oceanic white tip sharks, are distributed wholly or partially within nearshore habitats that overlap with extensive vessel traffic along the U.S. east coast.

Vessel strikes are known to adversely affect sea turtles, fishes, and marine mammals (Laist et al. 2001; NMFS and USFWS 2008; Work et al. 2010; Brown and Murphy 2010; Schoeman et al. 2020). In general, species with a distribution that includes nearshore habitats and behavioral characteristics that involve time spent at or near the water surface are at highest risk of vessel interactions. Vessel strike is an increasing concern for sea turtles, especially in the southeastern U.S., where development along the coasts is likely to result in increased recreational boat traffic. In the U.S., the percentage of strandings of loggerhead sea turtles that were attributed to vessel strikes increased from approximately 10 percent in the 1980s to a record high of 20.5 percent in 2004 (NMFS and USFWS 2007). A study on stranded sea turtles in Florida found that about a third of stranded loggerheads, green turtles, and leatherbacks had a vessel strike injury (Foley et al. 2019). The frequency of vessel strike injuries in stranded Kemp's ridleys (26.1 percent) and hawksbills (14.8 percent) was lower, but still substantial.

4.2 Physical Resources

The following section provides information on resources of the physical environment that may be affected by the alternatives, including ocean noise and air quality.

4.2.1 Ocean Noise

The dramatic increase in global ocean noise over the past century is largely associated with an increase in commercial vessel activity (Frisk 2012; Matthews and Parks 2021). In the North Atlantic Ocean, increasing noise levels since the mid-1950s are linked to the increasing size and speed of ships (Ross 2005; Širović et al. 2016). Large merchant ships in particular are louder than many other vessel types and the global fleet continues to grow in size and power (Frisk, 2012; UNCTAD 2021). Globally, humans are affecting marine animal behavior and physiology as oceans become noisier due to anthropogenic generated sound (Duarte et al. 2021).

The following section provides information on underwater noise in the proposed action area, and from studies conducted globally with direct relevance to the action area. Additional information on ocean noise is discussed in detail in Section 3.3.4 of the 2008 FEIS (NMFS 2008).

Numerous studies have concluded that vessels of all sizes contribute substantially to ocean noise and the impact of this contribution remains an issue of global concern due to the effects of elevated anthropogenic noise on marine ecosystems (Hildebrand 2009; Farcas et al. 2020; Duarte et al. 2021). In general, anthropogenic sound sources in the ocean (e.g. vessel propellers, energy extraction, and seismic air guns) have been growing steadily, and very low-frequency sounds between 1 and 100 Hz reach large distances in the ocean (Wilcock et al. 2014). Low-frequency underwater noises are emitted from a variety of vessel types including commercial shipping vessels, industrial transport vessels (e.g., ferries), fishing, and recreational activities (Slabbekoorn et al. 2010). Commercial shipping is the dominant source of low-frequency noise (5 to 400 Hz) in the ocean (Wenz 1962; Hildebrand 2009). Studies have highlighted shipping's substantial contribution to underwater noise levels (Frisk 2012). Over the last 50 years, increased shipping has contributed an estimated 32-fold increase in the level of low frequency noise along major shipping routes (Malakoff 2010; Duarte et al. 2021). Even away from major shipping routes, vessel noise is still prominent in many ocean regions due to long-range sound propagation at low frequencies (Miksis-Olds and Nichols 2016; Duarte et al. 2021). Vessel traffic in general is a significant contributor to underwater noise and ships are now the most common and pervasive source of anthropogenic noise in the oceans. Vessel traffic of all sizes is increasing globally, ranging from small recreational boats to large commercial ships. Commercial ships are increasing not only in number but also in size, with ship noise rising simultaneously (Erbe et al. 2019).

Underwater noise generated by human activities (e.g., shipping, resource exploration, infrastructure development) affect marine animals at multiple levels, impacting their behavior, physiology, and survival (Duarte et al. 2021). Vessel noise (offshore and nearshore - commercial and recreational vessels), active sonar (military and research activities), seismic airguns (for oil and gas exploration and research), underwater explosives (military operations, harbor deepening, fishing deterrents, and rig removal), pile driving (impact and vibratory), renewable energy sources (e.g., wind, wave, and tidal farms), acoustic deterrents, dredging, icebreaking, drilling, and rocket launches are all examples of human-made sound that have the potential to adversely impact marine fauna acutely and/or chronically (Slabbekoorn et al. 2010; Gedamke et al. 2016). Vessels represent the primary source of chronic noise exposure on marine mammals. A study in Southern California found that region-wide exposure to shipping noise likely degrades the acoustic environment for baleen whales in certain areas (Redfern et al. 2017).

A study of ambient noise levels in Stellwagen Bank National Marine Sanctuary (NMS), a right whale habitat, measured the contribution of vessels to increases in low-frequency noise (Hatch et al. 2008). Another study in Stellwagen Bank NMS sought to quantify levels of masking of biologically important foraging calls made by right whales (Hatch et al. 2012). Due to concern that increased low-frequency noise from vessels may cause masking of important communication signals for right whales, another study characterized the ambient noise levels, including both natural and anthropogenic sources, and right whale upcall parameters in three right whale habitat areas, two of which were in U.S. waters (Cape Cod Bay and off the coast of Georgia). The results of the study suggest that right whales may be responding to the peak frequency of noise, rather than the absolute noise level in their environment (Parks et al. 2009). The findings in Hatch et al. (2012) support the claim made by Clark et al. (2009) that compared with other vocally active baleen whales, the lower source levels produced by calling right whales make them particularly vulnerable to communication masking as a result of chronic noise from vessel traffic. Vessels may cause auditory disturbances to right whales and other marine species that spend time near the surface. Right whales showed lower baseline levels of stress-related hormones in fecal samples following a 6 dB reduction in ambient noise from reduced vessel activity after the 9/11 terrorist attacks in the U.S. (Rolland et al. 2012). This unique study provides preliminary evidence that exposure to low frequency noise due to vessel traffic may be associated with chronic stress in right whales (Hatch et al. 2012). The early reduction in vessel activity due to the Coronavirus Disease (COVID-19) pandemic has also provided evidence of an unusual expansion in the movements of marine mammals and sharks to what were busy, noisy waterways pre-pandemic, such as harbors and coastal urban areas, where these marine animals are not regularly observed (Bates et al. 2020; Duarte et al. 2021). This abnormal behavior has been linked to reduced anthropogenic noise during confinement of humans due to COVID-19 containment strategies (Thomson and Barclay 2020; Rutz et al. 2020; Duarte et al. 2021).

Most studies of vessel based underwater noise have focused on large merchant and cruise ships (Erbe et al. 2019), but vessels < 65 ft in length operating in nearshore waters are capable of producing sound levels that may impact protected species across broad coastal areas (Pine et al. 2016, 2021; Hermannsen et al. 2019; Cope et al. 2021). Researchers collected ocean acoustic data during the COVID-19 pandemic in New Zealand when almost all recreational and non-essential commercial vessel traffic was halted in the Hauraki Gulf Marine Park due to strict health "lockdown" measures. Five days after the pandemic lockdown, researchers identified vessel noise within the Rangitoto Channel (the primary entrance into Auckland) only 8 percent of the time, compared to 63 percent the day before lockdown (Pine et al. 2021). Pine et al. 2021 noted that this sudden drop in ambient sound levels led fish and dolphins to experience a significant increase in their communication ranges by up to an estimated 65 percent (hundreds of meters to several kilometers for dolphins and tens of meters to hundreds of meters for fish). These new data provide evidence that vessels < 65 ft in length, when in sufficient numbers/presence, directly influence ambient sound levels and demonstrate how vessels < 65 ft in length are already contributing to ambient sound levels in ecologically important areas near busy metropolitan areas (Pine et al. 2021).

In 2014, the IMO approved voluntary guidelines for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life (IMO 2019c). These guidelines focused on design features that reduce the main sources of underwater noise, which are the propellers, hull form, and on-board machinery (Duarte et al. 2021). Underwater noise produced by an individual vessel is positively correlated with the vessel's speed, suggesting underwater noise levels can be reduced by slowing vessels down (McKenna et al. 2012, 2013; Gassmann et al. 2017; MacGillivray et al. 2019). One study found that reducing speeds for noisy vessels in the major shipping routes in the eastern Mediterranean from 15.6 to 13.8 knots led to an estimated 50 percent reduction in the noise levels from these vessels between 2007 and 2013 (Leaper et al. 2014; Duarte et al. 2021).

The NOAA Ocean Noise Strategy Roadmap outlines the status of science regarding sound use by, and noise impacts to, four broad taxonomic groups for which NOAA has management responsibilities: marine mammals, fish, invertebrates, and sea turtles. To date, much of the management of noise effects on these taxonomic groups has occurred primarily through project-specific consultations and permitting pursuant to the MMPA, ESA, National Marine Sanctuary Act, and Magnuson‑Stevens Fishery Conservation and Management Act (Gedamke et al. 2016). A case study from NOAA's Ocean Noise Strategy Roadmap highlighted the importance of developing technology to reduce underwater noise from vessels (Gedamke et al. 2016; Redfern et al. 2017).

4.2.2 Air Quality and Climate Change

Information on air quality in the U.S. is discussed in detail in Section 3.3.3 of the 2008 FEIS (NMFS 2008). The following section provides updated information from the 2008 FEIS on current air quality and climate change conditions in the action area.

4.2.2.1 Air Pollutants and Marine Vessels

The Clean Air Act requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS; 40 CFR 50) for six "criteria" pollutants which can be harmful to public health and the environment: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter ($PM_{2.5}$ and PM_{10}), and sulfur dioxide (SO_2). The law also requires EPA to review the standards and update them as necessary every five years; standards for the six criteria pollutants were last reviewed/updated in 2020.

Marine vessels are a significant contributor to pollution emissions in the coastal region. Vessel engines emit air pollutants, including carbon dioxide (CO_2), nitrogen oxides (NO_x), sulfur oxides (SO_x), CO, unburned hydrocarbons (HC), $PM_{2.5}$, and PM_{10}, all of which contribute to climate change and/or air pollution. Populations living in proximity to ports have been found to be exposed to particularly high levels of air pollution from marine vessels, with associated health impacts from the NO_x and PM emissions. In communities adjacent to ports, commercial shipping is often the major source of air pollution. Global emissions from shipping are expected to more than triple between 2020 and 2050. While the share of CO_2 emissions coming from shipping (international, domestic, fishing) was at 2.89 percent of total anthropogenic CO_2 emissions in 2018, expected growth rates suggest shipping's role will be increasingly important. The IMO estimates an increase in emissions from commercial shipping vessels by 90 to 130 percent by 2050, even in a scenario that considers fuel efficiency improvements (Faber et al., 2020; Gössling et al. 2021).

Existing literature and data concerning air emissions of vessels greater than 35 ft and less than 65 ft in length is scarce. A study modeling leisure (recreational) vessel emissions in the Baltic Sea found that compared to commercial shipping emissions, the fuel consumption, NO_x, and $PM_{2.5}$ are significantly lower (1.2%, 0.4%, and 2.7%, respectively) for recreational vessels. The study also found CO emissions from recreational vessels are lower but comparable to those of commercial shipping. Non-methane volatile organic compound (VOC) emissions from the recreational vessels are estimated to be significantly higher than the emissions from large vessels with well-optimized marine diesel engines. It should also be noted that recreational vessel emissions are heavily concentrated near populated coastal areas in the summer months (Johansson et al. 2020). While recreational vessels operating in U.S. waters may have different emission standards than those operating in the Baltic Sea, this study does illuminate relatively large emission estimates for recreational vessels that may often be overlooked by a historical focus solely on commercial shipping emissions.

4.2.2.2 Marine Vessel Emissions: Regulatory Framework and Climate Change

The Marine Environment Protection Committee (MEPC) is a group of member states within the IMO that works on the prevention of marine pollution. The resulting global standards are adopted in the International Convention for the Prevention of Pollution from Ships (MARPOL). MARPOL Annex VI, which defines engine and vessel requirements related to air pollution, was amended in 2008 to set more stringent fuel sulfur limits and more stringent NO_x emission standards, especially for vessel operation in designated Emission Control Areas (ECAs). In 2010, the IMO designated an ECA along the U.S. East Coast (among many other regions) through amendments to MARPOL. Vessels operating in ECAs must not exceed 0.10 weight percent of fuel-sulfur concentrations, or else use an approved equivalent method. Vessels built (or modified) since 2000 with engines above 130 kW and operating in ECAs must also be certified to meet appropriate emission standards corresponding to the vessel's build (or modification) date. As of January 1, 2016, engines installed on new and modified vessels are subject to the MARPOL Annex VI Tier III NO_x standards while those engines are operating in ECAs. Beginning in August of 2012, new vessel emissions standards were established for ECAs which became effective in 2013 and continue to be strengthened over time. OGVs usually achieve compliance with emission standards by switching to cleaner burning fuels within ECAs, such as marine diesel oil, slowing their speed, and/or employing exhaust gas cleaning systems known as "scrubbers." Most types of OGVs see substantial fuel consumption savings when steaming at lower speeds, which in turn reduces air pollution emissions. The extent of the savings and the speeds needed to achieve them vary according to the vessel size, design, and transit draft. Numerous sectors have recently urged the IMO to set speed limits for OGVs in an attempt to further reduce greenhouse gas (GHG) emissions (US EPA 2016c; NMFS 2020). The action area falls within the North American ECA, which is designated for both fuel-sulfur standards and NO_x emission standards.

In 2011, IMO's MEPC adopted technical measures for new ships and operational reduction measures for all ships in a new Chapter 4 of MARPOL Annex VI entitled "Regulations on energy efficiency for ships," which went into effect on January 1, 2013 and apply to all ships of 400 gross tonnage and above. The Energy Efficiency Design Index (EEDI), which aims to increase the energy efficiency of ships at a global scale, requires new ships to comply with minimum mandatory energy efficiency performance levels, increasing over time through phases (IMO 2019a, 2019b). The IMO expects the EEDI for new ships to reduce specific CO_2 emissions by 19 to 26 percent in comparison to a business-as-usual scenario; however, given the shipping sector's growth, total emissions will continue to rise despite increased efficiencies (Gössling et al. 2021). The Ship Energy Efficiency Plan establishes a mechanism for shipowners to improve the energy efficiency of both new and existing ships using operational measures such as weather routing, speed optimization, just-in-time arrival in ports, etc (IMO 2019b).

In April 2018, the IMO adopted an initial strategy on the reduction of GHG emissions from ships. The target is to reduce total annual GHG emissions by at least 50 percent by 2050 compared to 2008 values, while pursuing efforts to phase them out entirely. One element of the strategy is to "consider and analyze the use of speed optimization and speed reduction as a measure, taking into account safety issues, distance traveled, distortion of the market or to trade and that such measure does not impact on shipping's capability to serve remote geographic areas" (IMO 2018). It has been suggested that speed reduction is potentially the only short-term regulatory option capable of achieving the reductions in GHG emissions needed to meet IMO targets (Leaper 2019).

In June 2021, IMO's MEPC adopted amendments to MARPOL Annex VI that will require ships to reduce their GHG emissions through technical and operational approaches to improve the energy efficiency of ships, building on IMO's previously adopted mandatory energy efficiency measures. The new measures will require all ships to calculate their Energy Efficiency Existing Ship Index (EEXI) following technical means to improve their energy efficiency and to establish their annual operational carbon intensity indicator (CII) and CII rating, which links a ship's GHG emissions to the amount of cargo carried over distance traveled. Administrations, port authorities, and other stakeholders are encouraged to provide incentives to ships with a high CII rating (A or B). A ship rated D for three consecutive years, or rated E, will be required to submit a corrective action plan to show how the required rating (C or above) would be achieved. These amendments are expected to enter into force on November 1, 2022, with the EEXI and CII certification requirements coming into effect on January 1, 2023. The IMO will be required to review the effectiveness of the implementation of CII and EEXI requirements by January 1, 2026 and if necessary, develop and adopt further amendments. These short term carbon intensity measures are in line with the Initial IMO GHG Strategy, which aims to reduce carbon intensity of international shipping by 40 percent by 2030, compared to 2008 levels (IMO 2021). A simple and easy way for ships to meet these new requirements in the short term is by slowing their speed, which doesn't require as much engine power and fuel.

International standards apply to both U.S. vessels and to foreign vessels. Engines installed on U.S. vessels are also subject to fuel standards and engine emission standards that EPA has adopted under the Clean Air Act (US EPA 2016c). EPA has adopted domestic exhaust emission standards for marine compression-ignition (diesel) engines installed in a variety of U.S. vessels, ranging from small recreational vessels to large OGVs (US EPA 2016a). Beginning in 2006, EPA began to phase in more stringent regulations to lower the amount of sulfur in diesel fuel to 15 parts per million (ppm). This fuel is known as ultra-low sulfur diesel (ULSD), and was phased in for marine diesel fuel from 2007 to 2014. After 2014, EPA required that all marine diesel fuel must be ULSD and all engines and equipment must use this fuel (US EPA 2015). In March 2008, the EPA finalized more stringent emissions standards for marine diesel engines, with the aim to dramatically reduce emissions of diesel particulate matter (PM) and NO_x (US EPA 2016b).

In 2013, the Port Authority of New York and New Jersey implemented a Clean Vessel Incentive (CVI) Program aimed at reducing air pollution from the many large vessels coming to the port (Port Authority of New York and New Jersey 2022). One component of the CVI program provides financial incentives for participating vessels which maintain speeds of 10 knots or less within a 20 nm (37 km) boundary seaward of the territorial sea line. This outer boundary overlaps with the current New York SMA for right whales. Through this component of the CVI program, the Port Authority encourages ships to expand and extend their seasonal compliance obligations under the current speed rule. As a result, vessels who transit this area under 10 knots during the active SMA period and register for the CVI program are both reducing emissions and helping to reduce the risk of vessel strike to whales, including right whales.

4.3 Socioeconomic Resources

The urban Northeast corridor between Boston, MA and Washington, DC is the most densely populated region of the U.S. and home to more than 56 million people. Ocean going trade continues to expand along the coast with the largest port, the Ports of New York/New Jersey, receiving over 70% of first port of call visits from international shipping to the east coast. Global seaborne trade has steadily increased 3% per year on average although growth slumped recently in 2020 during the COVID-19 pandemic (March et al. 2021; UNCTAD 2021). Over the past decade upgrades to port facilities, infrastructure and dredging projects have increased port access for the largest Post-Panamax size ocean going vessels, with additional growth expected in the coming years. Commercial fishing activity is also expansive along the U.S. East Coast with Massachusetts and Maine consistently listed among the top five U.S. states for commercial fishery landings by value (Fisheries of the U.S. 2019). Boating for pleasure, whether on tour boats, cruise ships, recreational fishing vessels or private vessels is a common activity, albeit more seasonal along the northeastern coast due to colder winter weather. Recreational boating activity is increasing with sales of new powerboats increasing 12% in the U.S. between 2019 and 2020 with over 300,000 vessels sold (NMMA 2021). When considering the activities mentioned above and additional industrial vessels, ferries, military and government vessels, the east coast is characterized by a wide variety of mariner activity operating a range of vessel types.

NMFS prepared a Draft RIR in accordance with Executive Order 12866 and an IRFA as required under the Regulatory Flexibility Act. These documents detail the socio-economic resources potentially impacted by the alternatives and are hereby incorporated by reference. Relevant sections are briefly summarized below with other sections summarized later in this document.

Vessel types potentially affected by alternatives discussed herein include: commercial ships, cruise ships, industrial work vessels, commercial fishing vessels, passenger vessels, recreational/pleasure boats and other vessel types. Certain vessels (of all sizes) remain exempt from proposed requirements including military vessels, vessels owned, operated or contracted by the Federal government, and vessels engaged in enforcement or search and rescue activities (50 CFR § 224.105(a)). Vessels may be impacted by speed limitations to varying degrees depending upon a vessel's transit distance through proposed static and dynamic speed zones during active periods and the vessel's usual transit speed. Certain vessels may be minimally impacted by the proposed changes if they operate at moderate speeds and only rarely or occasionally exceed 10 knots. Other vessel types are designed for high-speed transit and may be more substantially impacted. Additionally, some vessel types, particularly commercial and industrial work vessels, are active year-round, while others (e.g. recreational vessels) can exhibit strong seasonality in transit patterns. For example, off the coast of New England, during winter and spring general boating activity is lower due to colder weather and rougher sea conditions.

For vessels equal to or greater than 65 ft in length, AIS was the primary source of data used to calculate the number of vessels potentially impacted by the proposed action. USCG AIS carriage requirements do not apply to most vessels less than 65 ft in length (80 FR 5281, January 30, 2015; 80 FR 2050, April 7, 2016). Because of this, available AIS data for this vessel size class are biased and not a representative sample. To supplement the available AIS data, USCG vessel registration data was used for vessels greater than or equal to 35 ft and less than 65 ft in length (USCG 2021) to approximate the full universe of vessels transiting within active SMAs, SSZs, or DSZs. Vessels within this size class with a valid registration and a designated hailing port within 50 nm (vessel transit distance) of the SSZ boundaries were included in the analyses. To estimate the number of affected vessels greater than or equal to 35 ft and less than 65 ft in length, the proportion of AIS-equipped vessels transiting in active SMAs, or proposed SSZs/DSZs (depending on the alternative) on an annual basis, was calculated relative to the total number of vessels from the USCG registration data. The Draft RIR identified up to 15,899 vessels potentially affected by the collective alternatives. This included 9200 recreational vessels, 3575 commercial shipping vessels, 1079 commercial fishing vessels, 847 passenger vessels (ferries, tour boats, head boats, etc.) and 500 industrial work vessels.

5.0 Environmental Consequences

This chapter provides an evaluation of the potential effects or impacts to the affected environment described in Chapter 4.0, resulting from modifications to the speed rule under any of the four action alternatives being considered by NMFS. The environmental impacts of the alternatives to potentially affected biological, physical, and socioeconomic resources are analyzed below. Relevant biological resource impacts include analysis of vessel strike risk and any other environmental effects from the alternatives on right whales and other marine species in the action area. Relevant physical resource impacts include analysis of any effects on air quality, climate change, and ocean noise from each alternative. Relevant socioeconomic resource impacts include analysis of economic effects on the affected maritime community from alternative regulatory actions. The analyses describe expected conditions under the various alternatives when compared to the existing conditions described in Chapter 4.

The terms “effect” and “impact” are used synonymously under NEPA; consequently, both terms may be used in the following analyses. The framework used to determine the magnitude of impacts alternative actions would have on each resource is provided in Table 3 (Appendix A). NMFS used the same framework for cumulative impacts examined in Section 5.4. A summary of the impacts to each resource by alternative are provided in Table 4 (Appendix A). Written descriptions of the impacts are provided in the sections below.

As detailed below, compared to the existing regulations, the action alternatives would not significantly adversely impact the quality of the biological environment. The effects of the action alternatives only encompass the effects of implementing a combination of the modifications described above, and not the effects of vessel traffic in general, including elements such as any remaining vessel strike risk that exists from vessels transiting at or less than 10 knots, even with implementation of any of the action alternatives. Assessment of the impacts on ocean noise is based on the assumption that engine noise levels generally decrease at reduced speeds, which is well documented (Kipple and Gabriele 2007; Pine et al. 2018; Leaper 2019; ZoBell et al. 2021). This relationship is not always linear and is dependent on vessel size class, operational characteristics and engine type. Therefore, the impacts on ocean noise reflect reasonable expectations within the context of these assumptions.

5.1 Alternative 1 (No Action Alternative): No modifications to the North Atlantic right whale vessel speed rule

The consequences of following the no action alternative (Alternative 1) considers the impact of vessel traffic transiting in excess of 10 knots that would otherwise be limited to 10 knots speed restrictions under the various alternatives.

5.1.1 Impacts on Biological Resources

5.1.1.1 Impacts on Right Whales and other Large Whales

Under Alternative 1 (No Action Alternative), no modifications to the current speed rule would be implemented. This alternative is not expected to reduce the risk of mortality or serious injury from vessel collisions to right whales or other large whale species. However, vessel traffic likely to transit at speeds in excess of 10 knots is expected to increase along the eastern seaboard. Commercial shipping, recreational activities, and traffic associated with future offshore wind energy development and operations are expected to grow. This increase in traffic will continue to elevate lethal vessel strike risk and noise exposure year after year unless action is taken. Given that a failure to act will result in a de facto increase in long-term strike risk to large whales, and right whales in particular, Alternative 1 (No Action Alternative) is anticipated to result in **long-term major adverse impacts** to right whales and other large whales.

5.1.1.2 Impacts on Other Marine Species

For the reasons discussed in section 5.1.1.1, increasing vessel traffic may elevate strike risk and noise exposure to other marine species. The extent and degree of impacts to these species remains unclear, although any effect is expected to be detrimental. Therefore, **long-term minor adverse or no impacts** on other marine species would be expected.

5.1.2 Impacts on Physical Resources

5.1.2.1 Impacts on Air Quality and Climate Change

Implementing Alternative 1 (No Action Alternative) would not improve air quality or climate change parameters as described in Section 4.2.2. Vessel emissions are expected to increase over time in line with predicted increases in commercial shipping and other vessel traffic. Without a decrease in vessel speed, it is anticipated that air quality could be impacted and emissions contributions to climate change would likely grow over the long-term. Therefore, Alternative 1 (No Action Alternative) is anticipated to have **long-term minor adverse impacts** on air quality and climate change.

5.1.2.2 Impacts on Ocean Noise

Taking no action would likely result in long-term seasonal increases in ocean noise commensurate with predicted increases in vessel traffic, given the evidence of elevated noise output from vessels transiting at higher speed. Under the No Action Alternative, beneficial improvements in ocean noise levels that may accrue from reductions in vessel speed in specified areas (as under Alternatives 2, 3, 4, and 5) would not occur. Thus, Alternative 1 (No Action Alternative) is expected to have **long-term minor adverse impacts** over time on biological resources due to anticipated increases in ocean noise.

5.1.3 Impacts on Socioeconomic Resources

Alternative 1 (No Action Alternative) is anticipated to have **no short-term or long-term impact** on socioeconomic resources, as there would be no new restrictions on vessel transit operations.

5.2 Alternative 2: Restrict the speed of most vessels greater than or equal to 35 ft in length and less than 65 ft in length to 10 knots or less within existing Seasonal Management Areas

5.2.1 Impacts on Biological Resources

5.2.1.1 Impacts on Right Whales and Other Large Whales

North Atlantic Right Whales

Alternative 2 would regulate the speed at which most vessels greater than or equal to 35 ft in length and less than 65 ft in length transit through current SMAs to reduce the risk of lethal right whale collisions. It would not regulate, permit, or otherwise alter vessel traffic. Therefore, the effects of Alternative 2 only encompass the effects of reducing speeds of most vessels greater than or equal to 35 ft in length and less than 65 ft in length in current SMAs, and not the effects of vessel traffic in general. Compared to the status quo, Alternative 2 would be expected to reduce vessel strike risk to right whales from this newly regulated vessel size class.

NMFS conducted an assessment of vessel traffic involving vessels less than 65 ft in length transiting through active SMAs, which is incorporated herein by reference (NMFS 2020). The assessment evaluated available AIS data from vessels less than 65 ft in length transiting active SMAs during 2018-2019. The proportion of AIS-equipped vessels less than 65 ft in length transiting under 10 knots varied considerably between SMAs. In the four New England SMAs, more than 83% of all small vessel traffic transited at 10 knots or less, while in the New York, Delaware Bay, and Chesapeake SMAs, less than 50% of transit distance was below 10 knots. The southern SMAs were more mixed with 55-74% of small vessel transit distance at speeds under 10 knots.

Currently, USCG AIS requirements include certain vessel types greater than 26 ft in length, but the vast majority of vessels less than 65 ft in length and pleasure vessels of all sizes are not subject to AIS carriage requirements in U.S. waters. AIS data are a valuable tool for monitoring vessel traffic, evaluating vessel-related threats to right whales, and enforcing mandatory speed regulations. Due to the lack of sufficient AIS data for most vessels less than 65 ft in length, it is challenging to quantify the level of vessel risk reduction possible under Alternative 2. However, based on available data on strikes occurring in U.S. waters involving vessels less than 65 ft in length (Table 1, Appendix A), implementing this alternative is expected to reduce lethal vessel strike risk from vessels within this vessel size class transiting in excess of 10 knots.

AIS data indicate that vessels less than or equal to 35 ft and less than 65 ft in length tend to transit relatively closer to shore than OGVs, which increases their overlap with the nearshore distribution of right whales. This alternative would slow the speed of this new size class of vessels in existing SMAs, which would measurably reduce vessel strike risk for right whales within these time/areas. However, the risk reduction in existing SMAs that would occur under Alternative 2, would not address risk from all vessel size classes outside existing SMAs, where a misalignment remains between areas of high vessel strike risk and existing time/area protections. Therefore, based on the information provided in section 3.2.1.1 and above, Alternative 2 is expected to provide **short and long-term moderate beneficial impacts** on right whales.

Other Large Whale Species

Other large whale species would benefit from implementation of Alternative 2 for the same reasons described above. Humpback whales are likely to accrue most benefit due to their nearshore distribution within certain SMAs during winter and spring, in the Mid-Atlantic and Northeast regions, and history of vessel strikes (Brown et al. 2019; Stepanuk et al. 2021; Zoidis et al. 2021). Other more offshore distributed species and those that do not overlap in time/space with current SMA are less likely to be impacted. Overall, Alternative 2 would likely have **short and long-term minor beneficial impacts** for other large whale species.

5.2.1.2 Impacts on Other Marine Species

Other marine species which occur within active SMAs may accrue direct benefits from vessels equal to 35 ft and less than 65 ft in length transiting at reduced speeds. Sea turtles are the most likely to benefit since all species of ESA-listed sea turtles are at risk of vessel strikes. As discussed in section 4.1.2.3, vessel strikes are an ongoing concern for sea turtles off the Southeast U.S. coast. Slowing vessel traffic may assist sea turtles with avoiding vessels. Hazel et al. (2007) conducted experimental vessel transits at different set speeds in sea turtle habitat off Brisbane, Australia to evaluate the turtles' flight response to approaching vessels. The researchers found that greater vessel speeds increased the probability that green turtles would fail to flee from an approaching vessel, and that the majority of turtles cannot be relied upon to avoid vessels traveling faster than approximately 2.2 knots (4 km/hr). However, the experimental transits were conducted in shallow waters (6.5-13 ft (2-4 m) in depth) that are not representative of the depth profiles of the SMAs. Some caution should be exercised when considering the study results since the shallow depth of the study design limits escape options for turtles (i.e. diving to deeper depths) that would be available to turtles in most parts of the SMAs.

Hazel et al. (2007) reported a gradient of response to the three experimental vessel speeds tested with the researchers documenting greater proportions of sea turtle flight behavior at increasingly slower vessel speeds. The researchers (for safety and feasibility reasons) did not test higher vessel speeds, but based on the gradient response it is possible that at higher speeds (in excess of 10 knots) turtle flight response may have further diminished.

NMFS anticipates that slowing the speed of vessels equal to 35 ft and less than 65 ft in length in active SMAs would only provide possible short and long-term ancillary benefits to marine mammal, sea turtle, and fish species. The agency lacks sufficient data on vessel activity within this size class, and highly resolved distribution information for many species within SMAs to quantitatively evaluate impacts. Nevertheless, the totality of available information suggests such action would result in potential reductions in vessel strikes and/or noise reduction. For these reasons, Alternative 2 is expected to have likely **short and long-term minor beneficial impacts** on other marine species.

5.2.2 Impacts on Physical Resources

5.2.2.1 Impacts on Air Quality and Climate Change

Implementing Alternative 2 may have direct, long-term, beneficial impacts on air quality and climate change but they also may be negligible. Well studied relationships between ship speed and emissions/fuel consumption exist for large OGVs. Generally, the higher a vessel's design speed, the more its fuel use and emissions can be reduced by speed reduction until certain thresholds (Psaraftis et al. 2009). This is especially true for OGV such as container ships and vehicle carriers which are designed for high speed operation. Less information is available on the impact of speed reduction on emissions and fuel use for smaller vessels. This is due in part to the enormous variety of different vessel designs and operational characteristics present within this size class.

For vessels greater than or equal to 35 ft in length and less than 65 ft in length, fuel consumption is a function of hull type (displacement, semi-displacement or planing), hull shape, vessel speed, sea/weather conditions, and other factors. In the absence of more detailed information on the types of vessels impacted by this alternative, it is challenging to characterize possible reductions in fuel use and emission as a result of speed limitation. One study found fuel consumption, NO_x, and $PM_{2.5}$ emissions from recreational vessels are significantly lower than commercial shipping vessels, CO emissions are lower but comparable to those of commercial shipping, and VOC emissions are significantly higher due to recreational vessels not having as well-optimized marine diesel engines as the larger shipping vessels (Johansson et al. 2020). Therefore, it is reasonable to qualitatively suggest a reduction in emissions is possible from this general vessel category when reducing speed. Based on the information available, Alternative 2 would likely have a **long-term, negligible impact or minor beneficial impact** on air quality and climate change.

5.2.2.2 Impacts on Ocean Noise

Implementing Alternative 2 would likely have minor, short and long-term, beneficial impacts on ocean noise levels. Restricting the speed of most vessels greater than or equal to 35 ft and less than 65 ft in length within current SMAs would be expected to result in a reduction in vessel noise when the SMAs are active. Studies indicate reducing the speed of smaller vessels reduces source levels and associated noise impacts although for individual vessels, the relationship between noise source levels and speed varies considerably with characteristics of the vessel (Kellett et al. 2013; Putland et al. 2018; Parsons et al. 2021). Generally, slower speeds consistently produce less noise in fixed pitch propellers (Leaper 2019). Even though reduced speeds may increase the amount of transit time for this vessel size class through SMAs, the area of ocean affected by underwater noise would still likely be smaller than if speed restrictions were not enacted, because elevated noise energy radiates farther (Parsons et al. 2021). Reduced speeds would directly benefit right whales and other marine mammals, as quieter underwater conditions would result in reduced likelihood for disturbance and reduction in the potential for acoustic masking. Based on available information, Alternative 2 is expected to have **short and long-term minor beneficial impacts** on ocean noise.

5.2.3 Impacts on Socioeconomic Resources

Section 2.6.2.3 of the Draft RIR details the estimated socioeconomic impacts of Alternative 2 and is incorporated herein by reference. Alternative 2 would add most vessels greater than or equal to 35 ft and less than 65 ft in length to the size class of vessel subject to current speed regulations in current SMAs. The socioeconomic assessment estimated delayed (or additional) transit hours that would likely accrue to each vessel type, in each region, as a result of a 10-knot speed restriction within active, existing SMAs. NMFS estimated the number of vessels potentially affected, their associated delayed transit hours, and the costs of delay. For this size class, recreational vessels and commercial fishing vessels are the most common vessel types operating within active existing SMAs, with an estimated 6,525 recreational vessels (including sailing and motorized vessels), 499 commercial fishing vessels, and 7,542 vessels in total across all regions.

Based on AIS-equipped vessel data, it is estimated that on average, 36.3% of the vessels in this size class, transit at speeds in excess of 10 knots in active SMAs and would be impacted under Alternative 2. Within the Northeast and Mid-Atlantic, recreational, industrial work, and passenger vessels account for the majority of the vessels transiting in excess of 10 knots (see Table 6, Draft RIR) while in the Southeast region, recreational vessels account for the majority (NMFS 2022). Alternative 2 is expected to impact more recreational vessels in the Southeast compared to the Northeast and Mid-Atlantic regions, likely due to the more favorable weather conditions in the Southeast region during the SMA active period. Most or all SMAs are inactive June - October, which is when recreational and other tourism-based vessels (passenger vessels), are most active in the Northeast and Mid-Atlantic.

The estimated annual cost of compliance for all vessels is $9,437,888. Commercial and industrial vessels would bear most of this cost burden (93.4%) with recreational vessels accounting for $615,151 (6.6%). Recreational vessels are substantially less impacted in the Northeast ($118,791) compared to the Southeast ($496,360), likely due to the seasonal implications of the active timing of the SMAs (i.e., inclement winter weather in the Northeast discourages vessel activity). As noted in section 2.6.4 of the Draft RIR, NMFS likely overestimated the total number of vessels less than 65 ft in length that would be impacted by the proposed regulation. This conservative approach was employed to ensure that the analysis did not fail to capture potential impacts to this vessel size class, given available data limitations.

Based on the assessment of socioeconomic costs to mariners, Alternative 2 is expected to have **short and long-term moderate adverse impacts** on socioeconomic resources.

5.3 Alternative 3: Spatial and temporal modification of existing Seasonal Management Areas (renamed Seasonal Speed Zones)

5.3.1 Impacts on Biological Resources

5.3.1.1 Impacts on Large Whales

<u>North Atlantic Right Whales</u>

Alternative 3 would modify existing SMAs (renamed SSZs), to better align vessel speed restrictions with areas and times with elevated lethal strike risk for right whales. This alternative would not modify the vessels subject to speed restriction nor regulate, permit, or otherwise alter vessel traffic. Alternative 3 encompasses the effects of modifying the spatial and temporal bounds of current SMAs and not the effects of vessel traffic in general, including any remaining vessel strike risk that would exist once new SSZs are implemented.

As detailed in section 3.2.1.2, coastwide risk modeling (Garrison et al. 2022) used to simulate the potential risk reduction associated with a net expansion of current seasonal speed restrictions is expected to address 89% of the total risk that can be reduced by restricting vessel speeds to 10 knots. Although this analysis includes limited data involving vessels less than 65 ft, the vast majority of this risk reduction (as modeled) is expected to accrue from vessels equal to or greater than 65 ft that are currently subject to speed restriction. Thus, risk accruing to many vessels < 65 ft in length is not captured in the model or addressed by Alternative 3.

Compared to the status quo, Alternative 3 is expected to provide **short and long-term moderate beneficial impacts** to right whales by substantially reducing the misalignment between times/areas of elevated vessel strike risk and mandatory speed restrictions. However, this alternative fails to address strike risk from vessels less than 65 ft in length.

Other Large Whale Species

The net spatial and temporal expansion of seasonal speed restrictions, especially in areas farther offshore and along the New York Bight are anticipated to provide additional ancillary vessel strike reduction benefits to other large whales species present in these habitats. Humpback whales are likely to accrue the most benefit due to their distribution along the Mid-Atlantic coast and New York Bight during winter and spring (Brown et al. 2019; Stepanuk et al. 2021; Zoidis et al. 2021). As stated earlier, recent research surveys have further revealed the seasonal and geographic extent of other large whales (particularly fin whales) in the New York Bight during winter (Zoidis et al. 2021) and the use of this area as a large whale foraging habitat (Lomac-McNair et al. 2022). Expanded vessel speed restrictions in this region would overlap with large whale habitat, seasonally and spatially, offering increased protections in a region that may be of particular benefit. Both humpback and minke whales are experiencing ongoing UMEs. Vessel strikes are implicated as a contributor to both UMEs, particularly for humpback whales. Given the potential benefits of reduced vessel strike risk to other large whale species, Alternative 3 is expected to have **short and long-term moderate beneficial impacts** on other large whales.

5.3.1.2 Impacts on Other Marine Species

For many of the same reasons discussed in section 5.2.1.2, Alternative 3 is anticipated to provide some degree of benefit to other marine species through a reduction in vessel strike risk and/or noise reduction benefits over the long term. Areas of expansion nearest to the coast with the heaviest vessel traffic are expected to accrue the greatest potential benefits for many, but not all, of these species. The expansion of SSZs into offshore areas in the Mid-Atlantic may benefit those species, such as offshore cetaceans, that experience minimal benefits from the current spatio-temporal structure of the SMAs. Given the substantial contribution of larger vessel traffic to ocean noise, especially in offshore environments with fewer sound sources, reducing the speed of OGVs in expanded areas would be expected to reduce ocean noise and subsequent impacts on a variety of marine species. For these reasons, Alternative 3 is expected to have **short and long-term minor beneficial impacts** on other marine species.

5.3.2 Impacts on Physical Resources

5.3.2.1 Impacts on Air Quality and Climate Change

Implementing Alternative 3 would have minor, direct, short and long-term, beneficial impacts on air quality and climate change. In general, ships that travel at high speeds emit a higher quantity of emissions on a per tonne-km basis than ships that travel at slower speeds (Psaraftis et al. 2009). Reducing speeds for shipping fleets has been shown to make a substantial contribution to effective short term measures for reducing GHG emissions (Leaper 2019). Khan et al. (2012) found that OGVs traveling at slower speeds (≤ 12 knots (13.8 mph)) resulted in CO_2 and NO_x emissions reductions of approximately 61 percent and 56 percent respectively, and $PM_{2.5}$ mass emission rate reduction of 69 percent. While the spatial and temporal modification of the existing SMAs into new SSZs under this alternative would result in most vessels greater than or equal to 65 ft in length transiting larger areas for a longer period of time compared to the current speed rule, the overall impact would lead to reductions in vessel emissions. Alternative 3 is expected to have **short and long-term minor beneficial impacts** on air quality and climate change.

5.3.2.2 Impacts on Ocean Noise

Implementing Alternative 3 would have direct, short and long-term, beneficial impacts on ocean noise levels. As described in Sections 4.2.1 and 5.2.2.2, slowing vessel speed is an effective method to reduce underwater radiated noise. Results from the Enhancing Cetacean Habitat Observation Program led by the Vancouver Fraser Port Authority have provided some of the most useful data and insights into the effect of reduced vessel speeds on source levels (SLs) and ocean noise. MacGillvray et al. 2019 determined that for large ships, lower SLs were generally proportional to speed reduction (MacGillvray et al. 2019). Another study found that slower vessel speeds reduced underwater noise in a designated "slowdown region" despite longer passage times, suggesting this is an effective method to reduce underwater noise even if transit times increase (Joy et al. 2019).

A recent study quantified the reduction in SLs and sound exposure levels (SELs) for ships participating in two variations of a vessel speed reduction program and found the SLs and SELs of participating ships/fleets were statistically lower than non-participants in both variations of the program. This study highlights how slowing vessel speed to 10 knots or less is an effective method in reducing underwater noise emitted from commercial ships (ZoBell et al. 2021).

Underwater noise levels would be reduced in, and adjacent to, the new SSZs under Alternative 3, as most vessels greater than or equal to 65 ft and above in length would be required to slow down to 10 knots or less in a net larger area and for a longer time period than the current SMAs. Although reduced speeds would increase the amount of time vessels are transiting in the new SSZs, the area of ocean affected by underwater noise would likely be smaller than if speed restrictions were not enacted. For example, a vessel traveling 10 to 12 knots is expected to generate sound over a smaller area than a vessel traveling 20 knots or faster, because elevated noise energy radiates farther. Reduced speeds would directly benefit right whales (as well as other marine species in the area), because quieter conditions would result in a reduced likelihood for disturbance and a reduction in the potential for masking. Alternative 3 is expected to have **short and long-term moderate beneficial impacts** on ocean noise.

5.3.3 Impacts on Socioeconomic Resources

Section 2.6.2.4 of the Draft RIR details the estimated socioeconomic impacts of Alternative 3 and is incorporated herein by reference. Alternative 3 would modify the spatial and temporal boundaries of SMAs (into proposed SSZs) for most vessels greater than or equal to 65 ft in length, as currently regulated under 50 CFR 224.105. This analysis used the most recent year of AIS data available to identify the number of unique AIS-equipped vessels greater than or equal to 65 ft in length that transit within the proposed SSZ boundaries.

A total of 6,656 vessels, subject to regulation, transited within proposed SSZ boundaries. The most common vessels were large commercial ships (3,616), recreational vessels (1,094), and commercial fishing boats (667) (Table 9 in the Draft RIR). AIS data were used to determine the number of unique vessels that transit in excess of 10 knots in active SSZs, and thus would be affected by Alternative 3. Approximately 74.82% (4,980 of 6,656) of the vessels transited in excess of 10 knots. Across all regions, a total of 3,330 commercial ships traveled at 10 knots or greater and would experience a total of 32,730 hours of delayed transit time (Table 11 in the Draft RIR) under Alternative 3. The majority of these vessels and delays occur in the Northeast and Mid-Atlantic, likely due to the large spatial coverage of the combined SSZs and extensive transit activity of vessels in this region.

NMFS documented 89 passenger vessels transiting in excess of 10 knots, with a total estimated 8,067 delayed transit hours in the active proposed SSZs (Tables 10 and 11 in the Draft RIR). The majority of this delay is seen in the Northeast and Mid-Atlantic (7,999 hours) due to the extensive spatial and temporal coverage of these SSZs. In addition, NMFS documented 835 recreational vessels traveling in excess of 10 knots that would be expected to experience a total of 5,559 delayed transit hours (Table 10 and 11 in the Draft RIR). Commercial fishing, industrial work, cruise ships, and pilot vessels contributed to the total transit delay hours in the Mid-Atlantic and Southeast, but to a lesser degree.

The estimated annual cost of compliance for all vessels is $26,067,727. Commercial shipping (61.5%), passenger (16.6%) and other vessels (9%) would bear most of this cost burden with recreational vessels accounting for < 1% of the costs. NMFS identified very few cruise ships (12) during the 2020-2021 season, likely due to the impact of the COVID-19 pandemic. As a result, this vessel category is somewhat underrepresented in the data. Based on pre-pandemic data from the 2017-2018 Seasonal Management Areas, 38 cruise ships were detected compared to 12 during the 2020-2021 year examined in the draft RIR. Thus costs accruing to the industry during "normal" operating years may be more than triple the estimated $250,037 per year.

Fuel costs make up a substantial portion of the operating costs for many vessel types, and transiting at a slower speed can result in fuel savings (Maloni et al. 2013). Moreover, marine fuel prices can vary substantially from year to year, leading to large swings in vessel operating costs. There is no set definition for an optimal slow speed for fuel savings, rather it is usually a percentage reduction from a vessel's design or service speed. For a fast moving container vessel, this can mean 12 knots while for a slower oil tanker, it could mean 10 knots. OGVs may experience considerable fuel consumption savings by operating at slower speeds although the benefits may not extend to speeds as low as 10 knots for all vessel designs (NMFS 2020).

Based on the assessment of socioeconomic costs to mariners, Alternative 2 is expected to have **short and long-term moderate adverse impacts** on socioeconomic resources.

5.4 Alternative 4: Combination of Alternative 2 and mandatory Dynamic Speed Zone program

5.4.1 Impacts on Biological Resources

5.4.1.1 Impacts on Large Whales

<u>North Atlantic Right Whales</u>

Alternative 4 would (1) restrict the speed of most vessels greater than or equal to 35 ft in length and less than 65 ft in length within current SMAs and (2) implement a mandatory DSZ program applicable to most vessels greater than or equal to 35 ft in length. In addition to the impacts discussed in section 5.2.1.1, the inclusion of a DSZ program would provide additional short and long-term benefits for right whales. Using the locations of recent 2021 DMA/Slow Zones as a general guide (Figure 2 Appendix B) for where DSZ might be declared in the future, NMFS anticipates most of these DSZs would be triggered in the Mid-Atlantic and Northeast regions. Since 2008, 93% of DMAs/Slow Zones were triggered in the Mid-Atlantic and Northeast regions. Provided there is adequate visual and acoustic monitoring of areas/time outside active SMAs, the implementation of the DSZ would be expected to offer elevated protection from lethal vessel strikes for right whales, albeit with a slight deficit relative to seasonal areas. Where seasonal speed restrictions proactively provide a conservation benefit, DSZs would provide near real time protections that require a) the detection of right whales and b) the DSZ designation and dissemination of DSZ information. There is some degree of conservation cost to these hurdles relative to seasonal areas, but they offer substantial benefits over voluntary efforts. Compared to the status quo, Alternative 4 is anticipated to have **short and long-term moderate beneficial impacts** to right whales.

<u>Other Large Whale Species</u>

For the same reasons discussed above and in section 5.2.1.1, NMFS anticipates Alternative 4 will provide long-term benefits to other large whales but given that DSZs are highly tailored to right whale presence, there is a great deal of unpredictability regarding possible benefits from the DSZ program to other whale species. Given this uncertainty, Alternative 4 is expected to have **short and long-term moderate beneficial impacts** on other large whales.

5.4.1.2 Impacts on Other Marine Species

For the same reasons discussed above and in section 5.2.1.2, NMFS anticipates Alternative 4 will provide long-term benefits to other marine species. As stated above, DSZs are highly tailored to right whale presence, leading to unpredictability regarding possible benefits from the DSZ program to other marine species. Additionally, given the geographic distribution of current voluntary DMAs/Slow Zones, the DSZ program is unlikely to provide more than negligible benefits in the Southeast region. Alternative 4 is expected to have **short and long-term minor beneficial impacts** on other marine species.

5.4.2 Impacts on Physical Resources

5.4.2.1 Impacts on Air Quality and Climate Change

Implementing Alternative 4 would have direct, short- and long-term, beneficial impacts on air quality and climate change. In addition to the beneficial effects described in section 5.2.2.1 for Alternative 2, if DSZs are established through the new mandatory program, vessels would be expected to either transit around the area or reduce speed through the area. If the vessel reduces speed through the DSZ, there would be a temporary reduction in emissions emanating from the vessels' engines. While slowing a vessel's speed linearly increases the time of impact of a marine emissions plume on a receptor and the emissions per mile, the amount of energy required to propel the vessel through the water decreases as the cube of the speed (Psaraftis et al. 2009). Thus, the net effect of speed reductions in DSZs would be to reduce the emissions from each vessel affected as well as the total air emissions near the DSZ. Alternative 4 would have **short and long-term minor beneficial impacts** on air quality and climate change.

5.4.2.2 Impacts on Ocean Noise

Implementing Alternative 4 would have direct, short and long-term, beneficial impacts on ocean noise levels. In addition to the beneficial effects described in section 5.2.2.2 for Alternative 2, implementation of a mandatory DSZ program would either temporarily redistribute noise around a DSZ if impacted vessels choose to avoid it or reduce the level of noise if vessels transit through the area at reduced speed. Depending on the type of engine, lower speeds generally result in lower noise emissions. The use of DSZs would likely impact a wide, and changing variety of vessel types and sizes. Regardless of the vessel types impacted, as discussed above, reducing vessel speeds will generally result in lower noise emissions (MacGillvray et al. 2019; Kipple and Gabriele 2007b). Based on the above information, Alternative 4 is expected to have **short and long-term minor beneficial impacts** on ocean noise.

5.4.3 Impacts on Socioeconomic Resources

Section 2.6.2.5 of the Draft RIR details the estimated socioeconomic impacts of Alternative 4 and is incorporated herein by reference. The socioeconomic assessment estimated delayed (or additional) transit hours that would likely accrue to each vessel type, in each region, based on the modifications included in Alternative 2 with the addition of a mandatory DSZ program. Since the location of future DSZ remains uncertain, the location of all DMAs/Slow Zones established during 2021 were used as a proxy for future DSZs. This approach likely overestimates DSZ designations since the program would require additional determinations prior to DSZ designation that are not part of the current voluntary DMA/Slow Zone program.

Alternative 4 is expected to impact a total of 7,316 vessels, at an annual cost of $16,578,970. The majority of these costs would accrue to passenger (39.4%), industrial work (21.5%), and pilot (13.6%) vessels. The total expected costs of $6,528,992 for passenger vessels is highest, due to the combined DSZ estimates for all vessel size classes, costs associated with vessels 35 to 65 ft in length in active SMAs, and high operating costs. In comparison, costs for commercial shipping vessels, estimated at $2,167,646, is entirely due to speed restrictions imposed by DSZs.

Other commercial vessel categories such as commercial fishing, other vessels, and towing/pushing vessels have an associated cost as a combined result of SMA and DMA regulations, but to a lesser degree than the shipping, industrial work, passenger, and pilot vessels. Recreational vessels across both size classes would incur yearly estimated costs of $867,072 under Alternative 4.

Additional practical factors further impact the potential burdens associated with Alternative 4. Implementing a mandatory DSZ program without modifying the existing SMAs may present practical and logistical problems for implementation. Given the current misalignment of SMAs and right whale distribution trends, the creation of numerous DSZs is likely, since right whales would be expected to aggregate regularly in areas external to current SMAs. This may prove cumbersome to the regulated community and more onerous to keep track of potentially many mandatory speed restricted areas at once. Examining the existing voluntary DMA/Slow Zone program, there were 67 DMAs/Slow Zones declared in 2021 while NMFS estimates that only 11 of those would have been declared had the expanded SSZ boundaries been in place.

Based on the assessment of socioeconomic costs to mariners, Alternative 4 is expected to have **short and long-term moderate adverse impacts** on socioeconomic resources.

5.5 Alternative 5 (Preferred Alternative): Combination of Alternatives 2, 3, and mandatory Dynamic Speed Zone program

5.5.1 Impacts on Biological Resources

5.5.1.1 Impacts on Large Whales

<u>North Atlantic Right Whales</u>

Alternative 5 (Preferred Alternative) would restrict the speed of most vessels greater than or equal to 35 ft in length and less than 65 ft in length through current SMAs, modify the existing SMAs to create new SSZs, and implement a new mandatory DSZ program. This alternative would provide a large cumulative increase in risk reduction compared to the Alternative 1 (no-action) and Alternatives 2, 3, and 4, as standalone actions.

Based on information provided throughout this document, NMFS has demonstrated the substantial benefits that would accrue to right whales from slowing vessel speeds within their habitat, particularly where lethal vessel strike risk remains elevated. NMFS modeled the coast-wide risk of right whale vessel strike mortality and used the model (Garrison et al. 2022) to evaluate the modifications (where possible) included in Alternative 5. Based on these model simulations, the new SSZs and DSZs proposed under Alternative 5 are expected to address more than 90 percent of vessel strike risk attributable to regulated vessels transiting at speeds greater than 10 knots. The model is not able to fully account for collision risk from vessels less than 65 ft in length due to a lack of AIS data for this vessel size class, but NMFS anticipates that much of this risk would be addressed by the SSZ and DSZ programs. Therefore, Alternative 5 (Preferred Alternative) is expected to have **short and long-term major beneficial impacts** on right whales.

Other Large Whale Species

Alternative 5 (Preferred Alternative) would reduce vessel strike risk and severity for large whales occurring in the same regions/seasons covered by this alternative. These beneficial effects would likely be moderate given that other large whale habitats only partially overlap with areas of high right whale vessel strike risk and the DSZ component of Alternative 5 is designed to provide protections to discrete right whale detections. Therefore, Alternative 5 (Preferred Alternative) would have a **short and long-term moderate beneficial impact** on other large whales.

5.5.1.2 Impacts on Other Marine Species

While Alternative 5 (Preferred Alternative) is designed to address lethal right whale vessel strike risk, NMFS anticipates ancillary benefits will accrue with regard to vessel strike for other marine species, especially large whales and sea turtles in areas where these species currently overlap in time and space with high speed vessel traffic. Alternative 5 (Preferred Alternative) would have **short and long-term minor beneficial impacts** on other marine species.

5.5.2 Impacts on Physical Resources

5.5.2.1 Impacts on Air Quality and Climate Change

Implementing Alternative 5 (Preferred Alternative) would have direct, short and long-term, beneficial impacts on air quality and climate change. As discussed in sections 5.2.2.1 and 5.3.2.1, slowing vessel speeds generally reduces vessel emissions, which research shows improves air quality and climate change conditions. The greatest benefits would occur with Alternative 5 but NMFS requires additional information to conduct quantitative assessments of the benefits and more conclusively determine which vessels provide the greatest benefits for air quality and climate change by slowing their speeds.

Based on the best available information, Alternative 5 (Preferred Alternative) is expected to have **short and long-term minor beneficial impacts** on air quality and climate change.

5.5.2.2 Impacts on Ocean Noise

Implementing Alternative 5 (Preferred Alternative) would have direct, short and long-term, beneficial impacts on ocean noise levels. A combination of the modifications included in Alternatives 2, 3, and implementing a mandatory DSZ program would have a beneficial impact on noise levels in the affected areas for the duration of the proposed measures. Although reduced speeds would increase the amount of transit time in the new SSZs due to the spatial and temporal modification of speed restricted areas compared to current SMAs, the magnitude of underwater noise produced by vessel traffic would be expected to diminish relative to current conditions, where and when speed restrictions are in place, and especially in areas of heavy vessel traffic. As described in Section 5.2.4.2, mandatory DSZs would not adversely affect introduced vessel noise. Vessels 35 ft and longer would reduce speed through the new mandatory DSZs, which would reduce levels of ocean noise in these particular areas. Alternative 5 (Preferred Alternative) is expected to have **short and long-term moderate beneficial impacts** on ocean noise.

5.5.3 Impacts on Socioeconomic Resources

Section 2.6.2.6 of the Draft RIR details the estimated socioeconomic impacts of Alternative 5 and is incorporated herein by reference. Under Alternative 5 (Preferred Alternative), NMFS estimates that 15,899 vessels would be affected at an estimated cost of $46,216,122 per year. Of the affected vessels, recreational boats represent 59 percent, OGVs represent 22 percent, and commercial, industrial, and other vessel types represent 19 percent. The number of affected vessels less than 65 ft in length, especially recreational vessels, are likely substantially overestimated. Commercial ships would bear the majority of costs (35.3%) associated with implementing this alternative, along with passenger vessels (25.6%) and industrial work vessels (17.6%).

Alternative 5 (Preferred Alternative) is expected to have **short and long-term moderate adverse impacts** on ocean noise.

5.6 Cumulative Impacts

5.6.1 Context for Analysis

Chapter 4.0, Affected Environment, described the current status of each potentially impacted resource. The preceding sections in Chapter 5.0, Environmental Consequences, evaluated the effects of no action and four action alternatives on the current status of each resource. This section considers the cumulative effects of the alternatives on key resources – North Atlantic right whales, other large whales, other marine species, air quality and climate change, ocean noise, and socioeconomic resources – in the context of the effects of past actions, current conditions, and reasonably foreseeable future actions and conditions that have a reasonably close causal relationship to the proposed action.

5.6.2 North Atlantic Right Whales and Other Large Whales

Large whales face cumulative threats from entanglement in fishing gear, vessel strikes and climate change (which may affect feeding areas and subsequent whale distribution), and the impacts of ocean noise on their ability to communicate, find food, and navigate.

Vessel Strikes

Vessel strikes remain a major threat to right whale recovery and are a source of ongoing mortality for other large whale species (Henry et al. 2021, Hayes et al. 2021). Section 1.1 details the ongoing problem of vessel collisions for right whales. Between 1999 and 2017 NMFS documented 131 large whale vessels strikes in U.S. waters (or first sighted in U.S. waters) between Maine and Florida (NMFS 2020). Large whale habitat and migration routes are close to major ports along the Atlantic coastline and often overlap with shipping lanes. This is particularly problematic when high traffic corridors overlap with key feeding areas. For example, the shipping approaches into the Port of Boston were modified to reduce overlap with foraging habitat to the north of Cape Cod in 2007 following a successful application to the IMO led by the Stellwagen Bank National Marine Sanctuary and NMFS.

Large whales experience two main types of vessel interaction injuries: contact with the vessel hull leading to a blunt force trauma injury, and/or contact with the hull or propeller leading to sharp trauma and laceration injuries (Moore et al. 2005, Sharp et al. 2019). Vessels of nearly any size can injure or kill a right whale. Hydrodynamic modeling of whale-vessel interactions indicates that when whale-vessel contact occurs at the surface, whales are more likely to experience blunt force trauma injuries, whereas when contact occurs sub-surface, whales are more likely to be pulled toward the propeller and suffer lacerations (Silber et al. 2010). Furthermore, modeling indicates the intensity of impact and risk of serious injury and/or mortality increases with higher vessel speed (Vanderlaan and Taggart 2007, Silber et al. 2010, Conn and Silber 2013).

Ocean Noise

Ocean noise from human activities such as shipping, boating, construction, and energy exploration and development has increased in the Northwest Atlantic. Noise from these activities can interrupt the behavior of whales and interfere with their communication. It can also reduce their ability to navigate, feed, find mates, and detect and avoid human hazards.

Right whales, and other large whales, communicate over long distances in the open ocean using low-frequency, long-wavelength sounds, which are subject to masking by human activities (Rolland et al. 2012, Rice et al. 2014). Right whales use vocal calls for social communication, including mate attraction (Parks and Tyack 2005). Studies indicate low-frequency vessel noise can mask the whales' vocalizations (Clark et al. 2009; Hatch et al. 2012) and that right whales have vocally adapted to noisy environments by modifying the duration and frequency of their vocalizations (Parks et al. 2009; Parks et al. 2011). Whales may respond to increased noise by leaving certain habitats, changing behavior, and/or changing their vocalization patterns (Nowacek et al. 2007; Weilgart 2007). The cost of this behavior modification may include increased energy expenditure or modification of the original information of the signal, but more data are needed to fully understand the effects of anthropogenic sound on right whale communication (Parks et al. 2011).

Both vessel speed and transit frequency can influence exposure to noise. A study estimating vessel noise exposures to humpback whales from cruise and tour vessels found that vessels traveling at 13 knots produced cumulative sound exposure levels three times lower than vessels traveling at 20 knots (Frankel and Gabriele 2017). Right whales showed lower baseline levels of glucocorticoids (hormones secreted in response to stress) in fecal samples following a 6 dB reduction in ambient noise from reduced vessel activity (Rolland et al. 2012). Chronic elevations of fecal hormone metabolites have been shown to negatively affect growth, immune system response, and reproduction in a variety of vertebrate species (Sapolsky et al. 2000; Romero and Butler 2007). Rolland et al. (2012) also suggested that anthropogenic noise pollution may have negative consequences for the North Atlantic right whale's continued viability.

Effects of vessel noise on marine mammals include changes in both physical and acoustic behavior, masking of communication and echolocation sounds, and stress (Erbe et al. 2019). Studies have shown that underwater-radiated noise from vessels may have both short- and long-term negative impacts on marine life, especially marine mammals. Given the overlap of right whale habitat with high levels of human activity such as vessel traffic, right whales are at a high risk for exposure to anthropogenic noise. Noise from vessels is the main contributor to increased noise levels in right whale coastal habitats. The acoustic signals produced by right whales and other marine mammals, and their ability to sense signals from other members of their species, are directly affected by the level of ambient noise in their underwater environment. Organisms that rely on an underwater acoustic environment for communication (e.g., right whales) are threatened by rising underwater noise levels, as it limits the distance over which they can effectively communicate with each other. The estimated peak hearing sensitivity of right whales directly overlaps with low frequency underwater noise; therefore, there is potential for auditory masking across this wide frequency range. Right whales appear to exhibit vocal shifts in the presence of vessel noise, including an increase in frequency, change in call duration, and increase in amplitude (Matthews and Parks 2021). In addition, acoustic "shadow zones" may reduce ship detection by near-surface mysticetes like right whales. This is due to a phenomenon in which mysticetes near the ocean surface may have a more difficult time localizing oncoming vessels than in deeper waters. As a result, the range of detection for a ship may be too close for a mysticete to successfully evade the vessel, potentially resulting in a collision with that vessel (Allen et al. 2012).

Climate Change

The changing climate, and more specifically the associated oceanographic changes in the Northwest Atlantic, are factors contributing to reduced reproduction and higher susceptibility to human-caused threats. Over the past decade, right whales changed some of their distribution patterns, likely in response to changes in prey location and availability due to warming oceans. As their prey moved, the whales began spending more time in areas with fewer protections from vessel strikes and entanglements.

Recent modeling efforts by Meyer-Gutbrod et al. (2018) further indicate that because right whales feed primarily on dense aggregations of *Calanus spp.* copepods, the population may decline towards extinction if prey conditions worsen as predicted under future climate scenarios (Grieve et al. 2017, Johnson et al. 2017, Krumhansl et al. 2018), and anthropogenic mortalities are not reduced (Meyer-Gutbrod et al. 2018). Recent data from the Gulf of Maine and Gulf of St. Lawrence indicate prey densities may already be declining (Johnson et al. 2018, Meyer-Gutbrod et al. 2018, Meyer-Gutbrod and Greene 2018, Record et al. 2019). Additionally, changes in prey distribution have shifted right whales into new areas with nascent mitigation measures so they are at additional risk of anthropogenic mortality (Plourde et al. 2019, Record et al. 2019).

A dip in right whale births and lengthened calving intervals (from 3 to 5 years to 6 to 10 years) indicates that reproductively active females have struggled in recent years to find sufficient food resources to support pregnancy. As their environment changes, right whales will likely continue to modify their distribution and behavior to adapt, resulting in a more uncertain and unpredictable future for the species.

Cumulative Impact Considerations

Two critical past and present conditions that continue to cumulatively impact right whales are 1) past and ongoing human induced mortalities and serious injuries, and 2) the long-term impact of sub-lethal human induced traumas which are increasingly understood to impact individual fitness, reproductive output, and ultimately population recovery potential (Hayes et al. 2021; Moore et al. 2021; Stewart et al. 2021; Stewart et al. 2022). Lethal events result from both vessel strike and entanglement, but sub-lethal impacts largely accrue from entanglement in fishing gear, although the degree to which vessel strikes may also contribute to this problem is not well understood since certain vessel injuries can be more challenging to detect. These conditions result from both U.S and non-U.S. based activities, highlighting the need to address these anthropogenic risks throughout the species' range. Failure to address these conditions range-wide will impede stabilization of the right whale population and long-term species recovery.

NMFS is addressing risks to right whales from fishing gear entanglement through separate regulatory actions as informed by the Atlantic Large Whale Take Reduction Team (ALWTRT) and continues to work on additional measures to further reduce lethal entanglements. The MMPA directs NMFS to reduce incidental entanglements in commercial fisheries that cause mortalities and serious injuries of marine mammal stocks above a biological reference point (i.e., PBR) through a consensus-based Take Reduction Process. The ALWTRT is a large stakeholder group NMFS has convened numerous times since 1996 to develop recommendations to reduce mortality and serious injury of right whales and other large whales covered under the Atlantic Large Whale Take Reduction Plan. The Team continues to meet regularly to develop recommendations to further modify the Plan and reduce right whale entanglements in commercial fisheries.

The U.S. and Canada are working to reduce right whale serious injuries and mortalities due to both vessel strikes and entanglements. With adequate protection measures, the magnitude of these complementary efforts is sufficient to assume that improved reduction of right whale serious injuries and mortalities is reasonably foreseeable, despite the trends mentioned above of increasing vessel traffic, offshore wind development, and global climate change. This proposed action is one part of a larger, long-term multi-national effort to ensure that mortalities and serious injuries are reduced significantly to extremely low levels (less than one mortality or serious injury per year) in order to allow the North Atlantic right whale population to recover. This proposed action is anticipated to provide a beneficial cumulative effect, as it is designed to act in concert with other actions from the U.S. and Canada to reduce right whale serious injury and mortality due to vessel strike and entanglement. All of these combined efforts are cumulatively necessary to reduce levels of right whale serious injury and mortality low enough to recover the population.

5.6.3 Relevant Foreseeable Future Actions or Conditions

Several reasonably foreseeable future actions or conditions have the potential to impact right whales, other large whales, other marine species (as included above), air quality and climate change, ocean noise, and socioeconomic resources, including:

Increasing Vessel Traffic

Expanding vessel traffic has the potential to increase strike risks, disturbance from ocean noise, and climate change inducing vessel emissions. Increased traffic from a variety of vessel sectors is a near certainty along the U.S. east coast. Projections indicate an approximate 3% increase per year in merchant ship traffic globally (March et al. 2021), recreational boat sales are at historic levels in the U.S. (NMMA 2021) and coastwide, future wind energy development will bring increased vessel activity associated with both construction and long-term operations. As a result, maintaining the status quo and taking no action will functionally result in increased adverse impacts to right whales. However, increased vessel traffic over the long term may provide (or signal) economic benefits to many maritime sectors and stakeholder groups. Direct commercial and recreational vessel-related opportunities may convey substantial economic gains in future years. The proposed regulations are designed to reduce the risk of lethal collisions within this environment, so even as overall vessel transits increase over time, which will likely occur in many sectors (exclusive of speed regulation impacts), the traffic present (transiting less than 10 knots) will be less likely to cause right whale mortalities or serious injuries.

Offshore Wind Energy Development

The Bureau of Ocean Energy Management (BOEM) is considering offshore wind energy development in parts of the Atlantic Outer Continental Shelf (OCS) that overlap substantially with right whale habitat and proposed SSZs. BOEM is planning for future development to occur within lease areas both inside and outside of named project boundaries and considers these activities to be reasonably foreseeable. All phases of wind energy development and operations are expected to contribute to vessel traffic within the proposed SSZs and broader right whale habitats within U.S. waters in the coming years. Pre-construction actions include geophysical, habitat, and biological surveys, as well as potential deployment of meteorological buoys/towers for data collection. During construction, foundation installation (including pile driving at some projects) to support wind turbine generators and electric service platforms, and installation of submarine cables, is expected. During operational and maintenance phases, anticipated activities include the use of vessels to transfer crew, equipment, and supplies for maintenance, as well as the operation of the turbines themselves.

Climate Change

The Northwest Atlantic Ocean is expected to warm at a rate of up to three times faster than the global average (Saba et al. 2016). Climate change has already contributed to oceanographic and marine ecosystem shifts (Doney et al. 2012), including in the North Atlantic (Greene et al. 2013). Warming seas have shifted suitable habitats and resource availability for marine vertebrates including marine mammals, sea turtles, and fisheries in the region (Boavida-Portugal et al. 2018). In addition to higher water temperatures, climate change is also expected to increase the frequency and intensity of oxygen depletion, harmful algal blooms, ocean stratification, and acidification (Doney et al. 2012, Stramma et al. 2012, Birchenough et al. 2015, Deutsch et al. 2015, Gobler et al. 2017). These changes can adversely impact the physiological health of marine organisms and habitats and their capacity to respond to additional stressors.

5.6.4 Alternatives and Cumulative Impacts

Table 5 (Appendix A) summarizes cumulative impacts relative to the five alternatives presented. Under Alternative 1 (No Action Alternative), NMFS would continue to enforce the current speed rule and enforce mandatory ESA and MMPA prohibitions, but would not make the modifications to the 2008 speed rule necessary to reduce vessel strike risk for North Atlantic right whales in U.S. waters. As a result, the current level of vessel strike risks, described in Chapter 1.0, Purpose and Need for Action, and Section 4.1.1, North Atlantic Right Whales, would continue and could increase. These levels of vessel strike risk may interact with the factors described above (increasing vessel traffic, offshore wind development, and climate change-induced prey distribution) to harm the fitness of individual right whales and the population as a whole. Continuation of these risks, in combination with adverse effects of entanglement in U.S. and Canadian waters and vessel strike in Canadian waters, could have adverse cumulative effects on right whales.

Under the action alternatives, NMFS would modify the current speed rule in an effort to reduce right whale serious injuries and mortalities due to vessel strikes in U.S. waters. The resulting benefits to right whales may help offset the potential adverse cumulative effects described above. Alternative 2 would restrict the speed of most vessels greater than or equal to 35 ft and less than 65 ft in length to 10 knots or less within current SMAs. While Alternative 2 would reduce collisions with vessels in a smaller size class than currently regulated under the 2008 speed rule, this alternative would not address the misalignment between existing SMAs and vessel strike risk areas. Alternative 3 would spatially and temporally modify existing SMAs (to be referred to as SSZs). While this alternative would address the misalignment issue, it would not address the issue of collisions with vessels less than 65 ft in length, which pose a significant risk to right whales. Alternative 4 would combine Alternative 2 with a new mandatory DSZ program. While the new mandatory DSZ program included as part of Alternative 4 would help to address the shortcomings of Alternative 2 with regard to the misalignment of existing SMAs, it would be extremely onerous to monitor the entire extent of these currently unregulated high vessel strike risk areas along the U.S. East Coast in order for the new mandatory DSZ program to provide meaningful conservation benefits to right whales. In addition to being an inefficient use of agency resources, the mandatory DSZ program in this context would never reach the same level of risk reduction that properly sited static speed restricted areas would afford. Alternative 5 (Preferred Alternative) would combine Alternatives 2 and 3 with a new mandatory DSZ program. Under this alternative, strike risk from most vessels greater than or equal to 35 ft and less than 65 ft in length would be notably reduced, the current misalignment of existing SMAs would be remedied through spatial and temporal modifications resulting in new SSZs, and the mandatory DSZ program would function as an efficient mechanism to reduce potential vessel strike risk outside the new SSZs. The effects of Alternative 5 (Preferred Alternative) would be a combination of the beneficial impacts to right whales as described for Alternatives 2 through 4. The effects are additive, and NMFS does not anticipate any additional cumulative impacts from combining two alternatives and the new mandatory DSZ program into one package.

6.0 Rationale for Selecting the Preferred Alternative

NMFS has determined that Alternative 5 (Preferred Alternative), the modification of the speed rule to: 1) include most vessels greater than or equal to 35 ft and less than 65 ft in length in the size class subject to speed restriction, 2) modify the spatial and temporal boundaries of current SMAs (to create new SSZs), and 3) create a mandatory DSZ program, is preferred based upon the pressing conservation needs of endangered right whales along the U.S. East Coast. As detailed in Chapter 5 above, Alternative 5 (Preferred Alternative) provides the level of protection necessary to anticipate a substantive reduction in lethal vessel strikes and subsequent contribution to other separate efforts to stabilize the right whale population.

Maintaining the status quo (Alternative 1) would not result in any additional reduction in vessel strike risk, and would practically lead to increased strike risk over time. Alternative 2 would address vessel strike risk from most vessels greater than or equal to 35 ft and less than 65 ft in length, but fails to remedy the spatial and temporal misalignment of current SMAs, leaving right whales vulnerable to vessel collision in many areas. Alternative 4 partially addresses this issue by further extending mandatory protections through the DSZ framework, but given the broad spatial/temporal extent of the areas NMFS has identified as high risk outside the current SMAs, the use of a dynamic framework would be inadequate to mitigate the constant vessel strike risk in certain areas/seasons, and would create a cumbersome and less predictable regulatory structure. Alternative 3 successfully addresses much of the spatial and temporal misalignment of current SMAs but fails to address the risk from vessels less than 65 ft in length, which account for at least 42% of documented lethal strike events in U.S. waters since the current speed rule was implemented in 2008. Alternative 5 (Preferred Alternative) provides a high likelihood of a substantial reduction in lethal vessel strike events involving most vessels greater than or equal to 35 ft transiting at speeds greater than 10 knots. Furthermore, Alternative 5 meets all the required alternative selection criteria listed in section 3.1.

NMFS recognizes that this regulatory option imposes a moderate burden on the regulatory community that will be disproportionately borne by those vessels that frequently transit at high speeds (in excess of 10 knots) in areas and at times that overlap with proposed SSZs or DSZs.

NMFS has worked on right whale vessel strike reduction for many years. These efforts have resulted in science-based, incremental measures and have included input from, and collaboration with, the maritime community and other federal agencies. Despite these ongoing efforts, which have made progress in reducing collision risk, lethal vessel strikes continue to occur at an unsustainable rate, impeding right whale recovery. The situation demands substantial further reduction in lethal vessel strikes to stabilize the ongoing population decline of this highly endangered species. The only alternative NMFS identified that meets the objective of stabilizing the right whale population from further decline while also minimizing burdens to small entities is Alternative 5 (Preferred Alternative). There are no other viable alternative actions that would meet NMFS' objectives and be feasible and practicable to implement for the maritime community.

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8.0 List of Preparers

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9.0 Appendices

9.1 Appendix A: Tables

Table 1. Known North Atlantic right whale vessel strike mortalities and serious injuries in U.S. waters (or first sighted in U.S. waters) since 1999.

Date	Location	Whale	Outcome	Strike in Active SMA*?	Vessel Size	Vessel Speed (knots)
Events Prior to Speed Rule Implementation						
4/2/1999	Cape Cod Bay, MA	Adult female #1014	Mortality	Yes (based on hindcast)	Unknown	Unknown
3/17/2001	Assateague Island, VA	Male calf	Mortality	No	≥ 65 ft in length (likely)	Unknown
6/18/2001	Jones Inlet, Long Island, NY	Female calf	Mortality	No	≥ 65 ft in length (likely)	Unknown
8/22/2002	Offshore of Ocean City, MD	Juvenile Female #3102	Mortality	No	Unknown	Unknown
2/7/2004	Virginia Beach, VA	Adult female #1004	Mortality	Unknown	Unknown	Unknown
11/17/2004	Inshore of Chesapeake Bay	Adult female #1909	Mortality	Yes	≥ 65 ft in length	Unknown
1/12/2005^	Cumberland Island, GA	Adult female #2143	Mortality	Unknown	Unknown	Unknown
3/10/2005	Cumberland Island, GA	Adult female #2425	Serious Injury	Yes	< 65 ft in length	Unknown
4/28/2005	Chatham, MA	Adult female #2617	Mortality	Unknown	Unknown	Unknown
1/10/2006	Mayport Jetty, Jacksonville, FL	Male calf	Mortality	Unknown	≥ 65 ft in length (likely)	Unknown
3/11/2006	Cumberland Island, GA	Male juvenile #3522	Serious Injury	Unknown	≥ 65 ft in length (likely)	Unknown
12/30/2006	Brunswick, GA	Male juvenile #3508	Mortality	Unknown	≥ 65 ft in length (likely)	Unknown
Events Following Speed Rule Implementation						

7/2/2010	SE of Great Wass Is., ME	Juvenile female #3901	Mortality	Unknown	Unknown	Unknown
1/20/2011	SE of Edisto Beach, SC	Juvenile male #3853	Serious Injury	Unknown	≥ 65 ft in length (likely)	Unknown
3/27/2011	Nags Head, NC	Adult female #1308	Mortality	Unknown	Unknown	Unknown
3/27/2011	Nags Head, NC	Dependant calf of #1308	Serious Injury	Unknown	Unknown	Unknown
12/7/2012	E of Ossabaw Island, GA	Unknown	Serious Injury	Yes, on border	< 65 ft in length	12-13
4/9/2014	Cape Cod Bay, MA	Unknown adult	Serious Injury	Yes	< 65 ft in length	9
5/3/2016	Morris Island, MA	Male Calf #4681	Mortality	Unknown, possibly	Unknown	Unknown
4/13/2017	NW of Dennis, MA	Female juvenile #4694	Mortality	Yes (based on hindcast)	Unknown	Unknown
1/8/2020	E of Altamaha Sound, GA	Calf of #2360	Serious Injury	Unknown	Unknown	Unknown
6/24/2020	Elberon, NJ	Male calf of #3560	Mortality	No	< 65 ft in length	~28
2/12/2021	St. Augustine, FL	Adult female #3230	Serious Injury	Yes	< 65 ft in length	22
2/12/2021	St. Augustine, FL	Male calf of #3230	Mortality	Yes	< 65 ft in length	22

*In some cases, a vessel struck whale was first detected within an active SMA but the actual location of the strike event is unknown. For records prior to the start of the speed rule in December 2008, “Strike in Active SMA” indicates whether the strike occurred within an area and timeframe consistent with an active SMA under the current rule.

^An adult female died as a result of healed propeller wounds, from an earlier vessel strike when she was a calf, that reopened as a result of pregnancy. The date of the original strike event is unknown.

Table 2. ESA listed species/DPSs and MMPA protected species encountered within the potentially affected environment (action area) along the U.S. East Coast.

Potential Effect	***Category***	***Species***	***Status and Listing Unit***
Expected Beneficial Impacts	**Large Whales (Odontocetes and Mysticetes)**	North Atlantic right whale *Eubalaena glacialis*	Endangered
		Fin whale *Balaenoptera physalus*	Endangered
		Humpback whale *Megaptera novaeangliae*	Protected
		Minke whale *Balaenoptera acutorostrata*	Protected
		Sei whale *Balaenoptera borealis*	Endangered
		Sperm whale *Physeter macrocephalus*	Endangered
Likely Beneficial Impacts	**Sea Turtles**	Green Sea Turtle *Chelonia mydas*	Threatened (Florida breeding colonies listed as endangered); North Atlantic Distinct Population Segment (DPS)
		Hawksbill Sea Turtle *Eretmochelys imbricata*	Endangered
		Kemp's Ridley Sea Turtle *Lepidochelys kempii*	Endangered
		Leatherback Sea Turtle *Dermochelys coriacea*	Endangered
		Loggerhead Sea Turtle *Caretta caretta*	Threatened; Northwest Atlantic Ocean DPS
Possible but Undetermined Beneficial Impacts	**Pinnipeds**	Gray seal *Halichoerus grypus*	Protected
		Harbor seal *Phoca vitulina richardsii*	Protected
		Harp seal *Pagophilus groenlandica*	Protected
		Hooded seal *Cystophora cristata*	Protected
	Mysticetes	Blue Whale *Balaenoptera musculus*	Endangered
	Odontocetes	Atlantic spotted dolphin *Stenella frontalis*	Protected
		Atlantic white-sided dolphin *Lagenorhynchus acutus*	Protected

		Blainville's beaked whale *Mesoplodon densirostris*	Protected
		Cuvier's beaked whale *Ziphius cavirostris*	Protected
		Gervais' beaked whale *Mesoplodon europaeus*	Protected
		Sowerby's beaked whale *Mesoplodon biden*	Protected
		True's beaked whale *Mesoplodon mirus*	Protected
		Bottlenose dolphin *Tursiops truncatus*	Protected; Depleted (Western North Atlantic Northern Florida Coastal, Western North Atlantic Northern Migratory Coastal, Western North Atlantic South Carolina-Georgia Coastal, and Western North Atlantic Southern Migratory Coastal)
		Clymene dolphin *Stenella clymene*	Protected
		Dwarf sperm whale *Kogia sima*	Protected
		False killer whale *Pseudorca crassidens*	Protected
		Fraser's dolphin *Lagenorhynchus hosei*	Protected
		Harbor porpoise *Phocoena phocoena*	Protected
		Killer whale *Orcinus orca*	Protected
		Long-finned pilot whale *Globicephala melas*	Protected
		Melon-headed whale *Peponocephala electra*	Protected
		Northern bottlenose whale *Hyperoodon ampullatus*	Protected
		Pantropical spotted dolphin *Stenella attenuata*	Protected
		Pygmy killer whale *Feresa attenuata*	Protected
		Pygmy sperm whale *Kogia breviceps*	Protected

		Risso’s dolphin *Grampus griseus*	Protected
		Rough-toothed dolphin *Steno bredanensis*	Protected
		Short-beaked common dolphin *Delphinus delphis*	Protected
		Short-finned pilot whale *Globicephala macrorhynchus*	Protected
		Spinner dolphin *Stenella longirostris*	Protected
		Striped dolphin *Stenella coeruleoalba*	Protected
		White-beaked dolphin *Lagenorhynchus albirostris*	Protected
	Fishes	Atlantic salmon *Salmo salar*	Endangered; Gulf of Maine DPS
		Atlantic sturgeon *Acipenser oxyrinchus*	Threatened; Gulf of Maine DPS
		Atlantic sturgeon *Acipenser oxyrinchus*	Endangered; New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs
		Shortnose sturgeon *Acipenser brevirostrum*	Endangered
		Giant Manta Ray *Manta birostris*	Threatened
		Oceanic Whitetip Shark *Carcharhinus longimanus*	Threatened
		Scalloped Hammerhead Shark *Sphyrna lewini*	Threatened; Central & Southwest Atlantic DPS
		Smalltooth sawfish *Pristis pectinata*	Endangered; U.S. DPS

Table 3. Guidelines for establishing the direction and magnitude of alternative impacts.

	Resource Status	Types of Impact		
		Beneficial (+)	**Adverse (-)**	**No Impact (0)**
North Atlantic Right Whale and Other Large Whales	Varies. All are ESA listed and/or MMPA protected species. All populations are impacted by maritime activities with some heavily impacted (i.e., right whales).	Alternatives that include changes to maritime activities that result in reduced risk of lethal interactions/take of ESA listed species and/or MMPA protected species.	Alternatives that result in elevated risk of lethal interactions/take of ESA listed species and/or MMPA protected species.	Alternatives that do not impact ESA listed species and/or MMPA protected species.
Other Marine Species	Varies. All are ESA listed and/or MMPA protected species. Some are thriving while others are in decline and/or heavily impacted by human activities.	Alternatives that include changes to maritime activities which result in reduced risk of lethal interactions/take of ESA listed species and/or MMPA protected species.	Alternatives that result in elevated risk of lethal interactions/take of ESA listed species and/or MMPA protected species.	Alternatives that do not impact ESA listed species and/or MMPA protected species.
Air Quality and Climate Change	Air quality remains variable along the coast and emission contributions to climate change continue to grow.	Alternatives that improve air quality and/or decrease emission contributions to climate change.	Alternatives that degrade air quality and/or increase emission contributions to climate change.	Alternatives that do not impact air quality and/or emission contributions to climate change.
Ocean Noise	Increasing and impacting ESA listed and/or MMPA protected species.	Alternatives that include changes to maritime activities which result in reduced ocean noise.	Alternatives that include changes to maritime activities which result in elevated ocean noise.	Alternatives that do not impact ocean noise.
Socioeconomic Resources	Strong. Maritime activity and associated economic contribution continues to grow. Some sectors experienced recent impacts due to the COVID-19 pandemic.	Alternatives that increase vessel-based revenue and/or mariner well-being.	Alternatives that decrease vessel-based revenue, mariner well-being and/or restrict vessel operations.	Alternatives that do not impact vessel-based revenue, mariner well-being or vessel operations.
	Magnitude of Impact			
Impact qualifiers used to indicate magnitude of uncertainty	Negligible	To such a small degree to be indistinguishable from no impact		
	Minor	To a lesser degree / slight		
	Moderate	To an average degree (i.e., more than "slight" but not "high")		
	Major	To a substantial degree (not significant unless stated)		
	Significant	Affecting the resource condition to a great degree.		
	Likely	Some degree of uncertainty associated with the impact		

Table 4. Alternatives comparison summary table.

Resource	Alternative 1 No Action	Alternative 2	Alternative 3	Alternative 4	Alternative 5 Preferred Alternative
North Atlantic right whale	Major adverse impacts.	Moderate beneficial impacts.	Moderate beneficial impacts.	Moderate beneficial impacts.	Major beneficial impacts.
Other large whales	Moderate adverse impacts.	Moderate beneficial impacts.	Moderate beneficial impacts.	Moderate beneficial impacts.	Moderate beneficial impacts.
Other marine species	Minor adverse to no impacts.	Likely minor beneficial impacts.	Minor beneficial impacts.	Minor beneficial impacts.	Minor beneficial impacts.
Air Quality and Climate Change	Minor adverse impacts.	Negligible to Minor beneficial impacts.	Minor beneficial impacts.	Minor beneficial impacts.	Minor beneficial impacts.
Ocean Noise	Minor adverse impacts.	Minor beneficial impacts.	Moderate beneficial impacts.	Minor beneficial impacts.	Moderate beneficial impacts.
Socioeconomic Resources	No impacts.	Moderate adverse impacts.	Minor to Moderate adverse impacts.	Moderate adverse impacts.	Moderate adverse impacts.

Table 5. Summary of Cumulative Impacts of Alternatives

	Right Whales/ Large Whales	Other Marine Species	Ocean Noise/Emissions	Socioeconomic Resources
Alt. 1	Serious injury and mortality would continue to impede right whale population recovery and health. Other large whales impacted to a lesser degree.	Increasing vessel traffic may elevate strike risk and noise exposure over time.	Ocean noise and vessel emissions would likely increase along the U.S. East Coast with increasing high-speed vessel traffic over time.	No additional impacts or costs to vessel operators; lack of right whale recovery reduces public welfare benefits.
Alt. 2	Some reduction in right whale vessel strike serious injury and mortality would accrue; mother/calf pairs may benefit in particular, given their more coastal distribution in certain areas.	Potential reduction in vessel strikes and noise impacts, especially for sea turtles in areas currently characterized by high-speed vessel traffic < 65 ft in length.	Likely reductions in ocean noise in areas characterized by high-speed vessel traffic < 65 ft in length. Possible but potentially negligible impacts on vessel emissions.	Vessel operators of regulated vessels (< 65 ft) would potentially sustain new time delays/costs. No additional impacts or costs to operators of vessels > 65 ft in length.
Alt. 3	Some reduction in right whale vessel strike serious injury and mortality would accrue.	Possible reductions in strike risk may accrue, likely accruing to species with more offshore distributions.	Likely reductions in ocean noise and possible reductions in emissions.	Vessel operators of regulated vessels (> 65 ft) would potentially sustain additional time delays/costs.
Alt. 4	Some reduction in right whale vessel strike serious injury and mortality would accrue; mother/calf pairs may benefit in particular, given their more coastal distribution in certain areas. Degree of benefits from DSZs would depend on the need for use of that mitigation tool.	Similar to Alt 2. Degree of additional benefits would depend on where and when DSZs may occur relative to the distribution of other marine species.	Similar to Alt 2. Degree of additional reductions would depend on where and when DSZs may occur relative to the density of high-speed traffic in those areas.	Vessel operators of regulated vessels (< 65 ft) would potentially sustain new time delays/costs. Operators of vessels > 65 ft in length would see limited costs/impacts depending on the frequency of DSZs.
Alt. 5	Lethal vessel strikes would decline and support stabilization of the right whale population. Other large whales would likely see declines in lethal vessel strikes although be impacted to a lesser degree.	Reductions in vessel strike risk likely to accrue to some marine species, especially sea turtles, in areas currently characterized by high-speed vessel traffic.	Ocean noise would decrease along the U.S. East Coast, especially in areas with existing high-speed traffic that overlaps with proposed SSZs. Vessel emissions may also decline in areas with similar traffic regimes.	Vessel operators of regulated vessels (≥ 35 ft) would potentially sustain additional time delays/costs. Public welfare would increase due to improved status of right whales and potentially other large whale species.

9.2 Appendix B: Figures

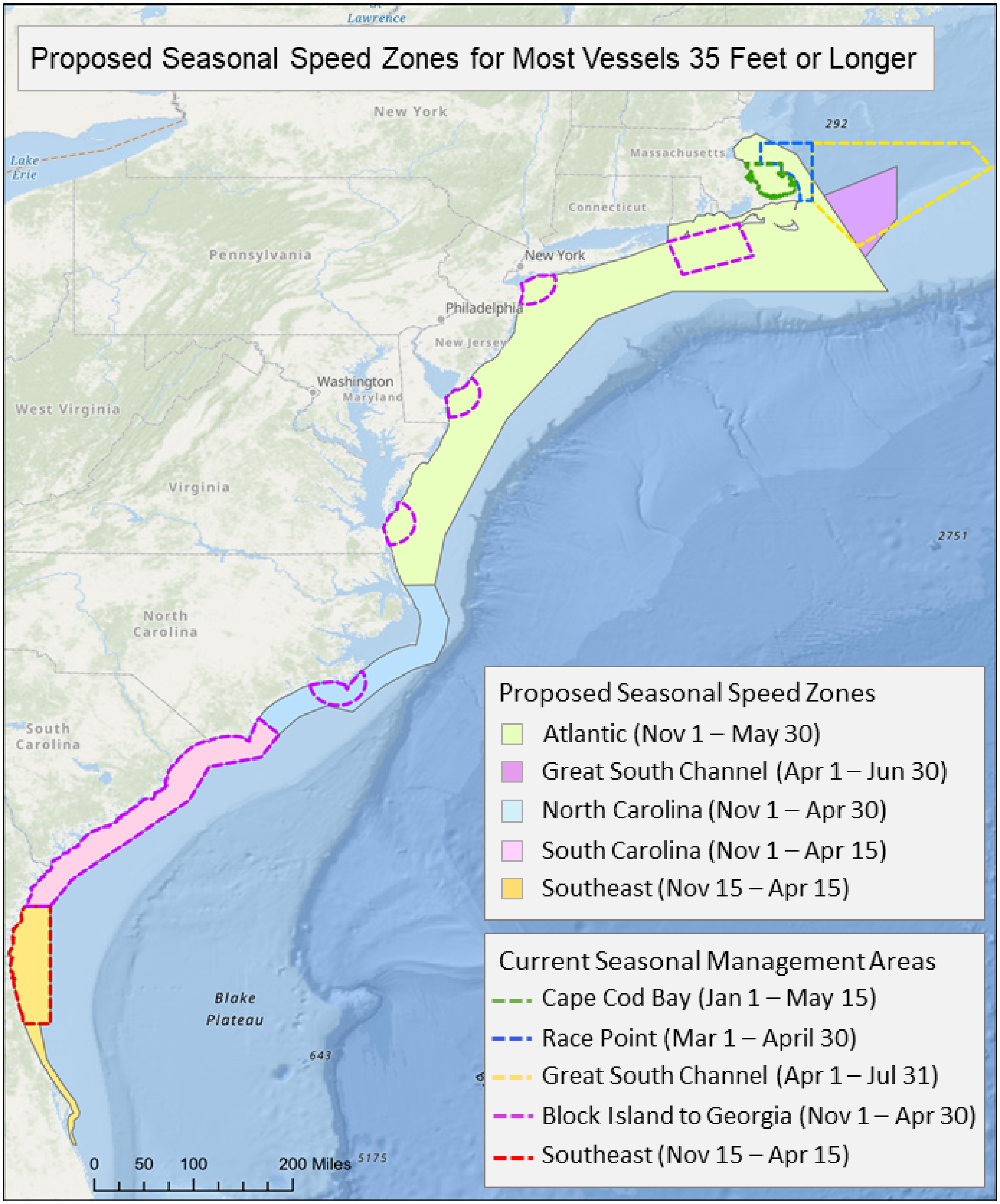

Figure 1. Proposed Seasonal Speed Zones and Existing Seasonal Management Areas.

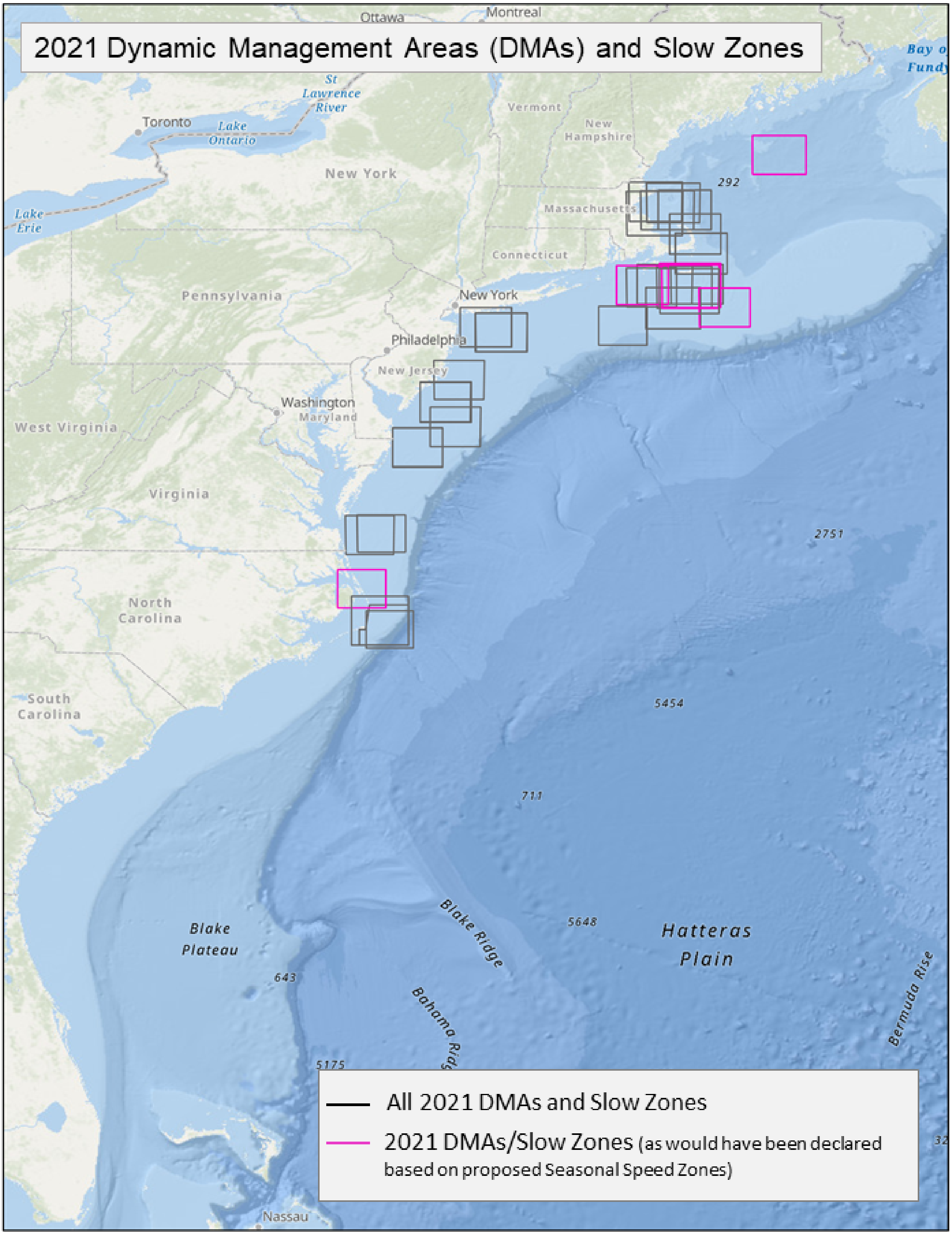

Figure 2. All 2021 Dynamic Management Areas/Slow Zones and DMAs/Slow Zones that would have been declared (in pink) based on proposed Seasonal Speed Zones.

9.3 Appendix C: Seasonal Speed Zone Coordinates and Active Periods

(1) Atlantic Zone (north of Kill Devil Hills, NC to north of Gloucester, MA): During the period of November 1 to May 30 each year, includes marine waters beginning at the charted mean high water line within the area bounded by straight lines connecting the following points in Table 1 in the order stated from north to south;

Table 1 to paragraph (a)(1)

Latitude	**Longitude**
42°38'23" N	070°34'21" W
42°20'10" N	069°59'30" W
40°21'0" N	068°38'54" W
40°21'0" N	071°51'21" W
39°56'53" N	072°52'28" W
38°30'46" N	074°12'12" W
36°50'21" N	075°6'15" W
36°6'00" N	075°15'00" W
36°6'00" N	at shoreline

thence bounded on the west by the shoreline and the Convention on the International Regulations for Preventing Collisions at Sea (COLREGS) Demarcation Lines, from 36°6'00" N north to 40°21'0" N; thence bounded by the following point 41°04′16″ N, 71°51′21″ W; thence to the shoreline at 71°51′21″ W; thence bounded on the north by the shoreline and the COLREGS Demarcation Lines to 70°39'23" W, 41°30'54" N; thence bounded by the shoreline to 70°52'54" W, 42°18'37" N; thence bounded by the following point 70°54'3"W 42°25'14"N; thence bounded by the shoreline and the COLREGS Demarcation Lines back to the starting point.

(2) Great South Channel Zone (east of Cape Cod, MA): During the period of April 1 to June 30 each year, in all waters bounded by straight lines connecting the following points in Table 2 in the order stated.

Table 2 to paragraph (a)(2)

Latitude	**Longitude**
41°44′08″ N	069°34′50″ W
42°10′00″ N	068°31′00″ W
41°24′53″ N	068°31′00″ W

40°50′28″ N	068°58′40″ W

(3) North Carolina Zone (Wilmington, NC to north of Kill Devil Hills, NC): During the period of November 1 to April 30 each year, includes marine waters beginning at the charted mean high water line within the area bounded on the west by the shoreline and the COLREGS Demarcation Lines, and on the east by straight lines connecting the following points in Table 3 in the order stated from north to south.

Table 3 to paragraph (a)(3)

Latitude	**Longitude**
36°06'00" N	at shoreline
36°06'00" N	075°15'00" W
35°36'30" N	075°03'00" W
35°15'10" N	075°06'30" W
34°59'10" N	075°14'40" W
34°53'30" N	075°32'40" W
34°39'00" N	075°59'10" W
34°15'50" N	076°27'30" W
34°21'25" N	076°49'15" W
34°11'50" N	077°13'50" W
33°56′40″ N	077°31′30″ W
34°10′30″ N	at shoreline

(4) South Carolina Zone (north of Brunswick, GA to Wilmington, NC): During the period of November 1 to April 15 each year, includes marine waters beginning at the charted mean high water line within the area bounded on the west by the shoreline and the COLREGS Demarcation Lines, and on the east by straight lines connecting the following points in Table 4 in the order stated from north to south.

Table 4 to paragraph (a)(4)

Latitude	**Longitude**
34°10′30″ N	at shoreline
33°56′40″ N	077°31′30″ W
29°45′00″ N	080°51′36″ W

33°36′30″ N	077°47′06″ W
33°28′24″ N	078°32′30″ W
32°59′06″ N	078°50′18″ W
31°50′00″ N	080°33′12″ W
31°27′00″ N	080°51′36″ W
31°27′00″ N	at shoreline

(5) Southeast Zone (south of Cape Canaveral, FL to north of Brunswick, GA): During the period of November 15 to April 15 each year, includes marine waters beginning at the charted mean high water line within the area bounded on the west by the shoreline and the COLREGS Demarcation Lines, and on the east by straight lines connecting the following points in Table 5 in the order stated from north to south.

Table 5 to paragraph (a)(5)

Latitude	**Longitude**
31°27′00″ N	at shoreline
31°27′00″ N	080°51′36″ W
29°45′00″ N	080°51′36″ W
29°45′00″ N	081°01′00” W
29°15′00″ N	080°55′00” W
29°08′00″ N	080°51′00” W
28°50′00″ N	080°39′00” W
28°38′00″ N	080°30′00” W
28°28′00″ N	080°26′00” W
28°24′00″ N	080°27′00” W
28°21′00″ N	080°31′00” W
28°16′00″ N	080°31′00” W
28°11′00″ N	080°33′00” W
28°00′00″ N	080°29′00” W
28°00′00″ N	At shoreline