Amendment 25 (Revised)

to the

Northeast Multispecies Fishery Management Plan

Appendix VII

Cumulative Effects
Supplemental Information

This appendix includes additional detailed information to supplement the Cumulative Effects assessment (Section 6.7) of Amendment 25.

6.7 CUMULATIVE EFFECTS

6.7.1 Introduction

The purpose of the cumulative effects assessment (CEA) is to consider the combined effects of many actions on the human environment over time that would be missed if each action were evaluated separately. The intent is to focus on those effects that are truly meaningful. The following remarks address the significance of the expected cumulative impacts as they relate to the federally managed Northeast multispecies (groundfish) fishery.

A cumulative effects assessment makes effect determinations based on a combination of: 1) impacts from past, present, and reasonably foreseeable future actions; 2) the baseline conditions of the VECs (the combined effects from past, present, and reasonably foreseeable future actions plus the present condition of the VEC); and 3) impacts of the alternatives under consideration for this action.

6.7.1.1 Consideration of the Valued Ecosystem Components (VECs)

The valued ecosystem components for the groundfish fishery are generally the "place" where the impacts of management actions occur, and are identified in Section 5.0.

- *Regulated groundfish stocks (target and non-target);*
- *Non-groundfish species (incidental catch and bycatch);*
- *Protected species (ESA-listed and/or MMPA protected);*
- *Habitat, including non-fishing effects; and*
- *Human Communities (including economic and social effects on the fishery and fishing communities).*

The CEA identifies and characterizes the impacts on the VECs by the alternatives under consideration when analyzed in the context of other past, present, and reasonably foreseeable future actions.

6.7.1.2 Temporal Boundaries

Overall, while the effects of the historical groundfish fishery are important and considered in the analysis, the temporal scope of past and present actions for regulated groundfish stocks, non-groundfish species and other fisheries, the physical environment and EFH, and human communities is primarily focused on actions that occurred after FMP implementation (1977). An assessment using this timeframe demonstrates the changes to resources and the human environment that have resulted through management under the Council process and through U.S. prosecution of the fishery. For protected species, the scope of past and present actions is focused on the 1980s and 1990s (when NMFS began generating stock assessments for marine mammals and sea turtles that inhabit waters of the U.S. EEZ) through the present.

The temporal scope of future actions for all VECs extends about five years (2026-2031) into the future beyond the implementation of this action. The dynamic nature of resource management for these species and lack of information on projects that may occur in the future make it difficult to predict impacts beyond this timeframe with any certainty. The impacts discussed in Section 6.7.3 are focused on the cumulative effects of the proposed action (i.e., the suite of preferred alternatives) in combination with the relevant past, present, and reasonably foreseeable future actions over these time scales.

6.7.1.3 Geographic Boundaries

The analysis of impacts focuses on actions related to the commercial and recreational harvest of regulated groundfish. The Western Atlantic Ocean is the core geographic scope for each of the VECs. The core geographic scope for the managed species is the management unit (Section 5.5 and detailed in Appendix VI). For non-groundfish species, that range may be expanded and would depend on the range of each species in the Western Atlantic Ocean. For habitat, the core geographic scope is focused on EFH within the EEZ but includes all habitat utilized by regulated groundfish, and non-groundfish species in the Western Atlantic Ocean. The core geographic scope for protected species is their range in the Western Atlantic Ocean. For human communities, the core geographic boundaries are defined as those U.S. fishing communities from the U.S.-Canada border to, and including, North Carolina directly involved in the harvest or processing of regulated groundfish (see Section 5.7.7 and Appendix VI for additional detail).

6.7.2 Relevant Actions Other Than Those Proposed in this Document

This section summarizes the past, present, and reasonably foreseeable future actions and effects that are relevant for this cumulative effects assessment. Some past actions are still relevant to the present and/or future actions.

6.7.2.1 Fishery Management Actions

6.7.2.1.1 Managed Resources (Regulated Groundfish)

Past, present, and reasonably foreseeable future actions for regulated groundfish management include the establishment of the original FMP, all subsequent amendments and frameworks, and the setting of annual specifications (annual catch limits and measures to constrain catch and harvest). Key actions are described below.

Past and Present Actions: Groundfish stocks were managed under the MSA beginning with the adoption of a groundfish plan for cod, haddock, and yellowtail flounder in 1977. A detailed discussion of the history of the FMP up to 2009 can be found in Amendment 16 (NEFMC 2009). Key actions, beginning with Amendment 16, are described in Table 1. Table 2 summarizes reasonably foreseeable future actions.

Table 1- Key Regulated Groundfish Past and Present Actions.

Key Council Actions	Effective Date	Summary of Action
Amendment 16	May 1, 2010	Adopted a broad suite of management measures in order to achieve the fishing mortality targets necessary to rebuild overfished stocks and meet other requirements of the MSA. Amendment 16 made major changes to the FMP. Greatly expanded the sector management program and adopted a process for setting ACLs to be set in biennial specifications packages. The Amendment adopted a system of ACLs and AMs that are designed to ensure catches remain below desired targets for each stock in the management complex. There were a host of mortality reduction measures for "common pool" (i.e. non-sector) vessels and the recreational component of the fishery.
Amendment 17	2011	Allowed for NOAA-sponsored state-operated permit banks to function within the structure of Amendment 16.
Framework 45	May 1, 2011	Adopted further modifications to the sector program and fishery specifications.
Framework 47	May 1, 2012	Set specifications for some groundfish stocks for FY 2012 – 2014, modified AMs for the groundfish fishery and the administration of the scallop fishery AMs, and revised common pool management measures; modification of the Ruhle trawl definition and clarification of regulations for charter/party and recreational groundfish vessels fishing in groundfish closed areas were proposed under the RA authority.
Framework 48	May 1, 2013	Revised status determination criteria for several stocks, modified the sub-ACL system, adjusted monitoring measures for the groundfish fishery, and changed several AMs.
Framework 51	May 1, 2014	Modified rebuilding programs for GOM cod and American plaice, set specifications for FY2014-2016, and modified management measures in order to ensure that overfishing does not occur including additional management measures related to U.S./Canada shared stocks and yellowtail flounder in the groundfish and scallop fisheries.

Key Council Actions	Effective Date	Summary of Action
Framework 53	May 1, 2015	Updated status determination criteria, set specifications for FY2015-2017, adopted U.S./Canada TACs, established management measures for GOM cod that revise rolling closures and possession limits to enable GOM cod protection while providing the opportunity for the groundfish fishery to prosecute healthy stocks in other times and areas, implemented default specifications, and revised regulations governing Sector Annual Catch Entitlement (ACE) carryover.
Framework 55	May 1, 2016, and October 31, 2016	Incorporated stock status changes for groundfish stocks, set specifications for all groundfish stocks for FY2017-2019, adopted an additional sector and modified the sector approval process, modified the definition of a haddock separator trawl so that the separator panel is easily identifiable, made changes to the groundfish monitoring program and to the management measures for U.S./Canada TACs in order to move GB cod quota from the eastern management area to the western management area, and modified the Gulf of Maine Cod Protection Measures so that the recreational possession limit for GOM cod can once again be modified by the Regional Administrator.
Amendment 18	May 1 and May 22, 2017	Addressed fleet diversity and accumulation limits.
Framework 59	July 20, 2020	Revised the allocation between commercial and recreational fisheries for GOM cod and GOM haddock based on new data from the Marine Recreational Information Program (MRIP), along with setting specifications for some groundfish stocks for FY2020-2022, and several other minor changes to management measures.
Framework 63	July 15, 2022	Modified recreational fishery management measures for GB cod, revised the default specifications process, and set specifications for several groundfish stocks for FY2022-2024.
Amendment 23	December 15, 2022, and January 9, 2023,	Addressed improvements to the groundfish monitoring program.

Key Council Actions	Effective Date	Summary of Action
Framework 65	August 18, 2023	Revised the rebuilding plan for GOM cod, set specifications for many groundfish stocks for FY2023-2025 including a GB cod catch target for the recreational fishery, temporarily removed the sector management uncertainty buffer for GOM haddock and white hake, and temporarily modified commercial accountability measures for GB cod.

Table 2- Regulated Groundfish Reasonably Foreseeable Future Actions.

Council Actions	Summary of Action	Status
Framework 69	Set specifications for several groundfish stocks for fishing years 2025-2027, U.S./Canada TACs for 2025, and incorporated revisions to scallop fishery flatfish AM triggers. The Council included in Framework 69 status determination criteria and specifications for FY2025-FY2027 for the revised cod stock units, and measures to address Phase 1 of the Atlantic Cod Management Transition Plan, but those measures have been repackaged into this action, revised Amendment 25.	The Council took final action in December 2024.
Framework 68	Aims to modify and/or replace the existing acceptable biological catch (ABC) control rule that is applied in the context of setting groundfish ABCs. The goal of this action is to modify/replace the existing groundfish ABC control rules with a tiered groundfish control rule that enables consideration for increasing uncertainty/variability in stock assessments, stock status, including unknown and rebuilt, changes in environmental conditions, productivity regimes, climate-resilient management objectives, and National Standard Guidelines. The new control rule would produce catch advice that prevents overfishing, rebuilds stocks, improves attainment of optimum yield, and seeks to minimize large changes in catch advice as appropriate.	The development is ongoing and will be in coordination with the Council's Risk Policy.

6.7.2.1.2 Non-target Species (Non-groundfish)

There are Management Plans in place for non-target, non-groundfish species, including the Skate FMP, Herring FMP (jointly managed with ASMFC), Scallop FMP, Summer Flounder, Black Sea Bass, and Scup FMP (managed by the MAFMC), Monkfish FMP (jointly managed with the MAFMC), and Spiny Dogfish FMP (jointly managed with the MAFMC).

6.7.2.1.3 Physical Habitat/EFH

Table 3 summarizes Council habitat/EFH management actions. Additionally, EFH designations for other groundfish stocks will be developed in a groundfish action in 2026.

Table 3- Habitat/EFH Management Actions.

Council Actions	Effective Date	Summary of Action
EFH Omnibus Amendment 2 (Groundfish A14)	April 2018	Reviewed and updated EFH designations, identified Habitat Areas of Particular Concern (HAPC), and updated the status of current knowledge of gear impacts. Implemented new spatial management measures throughout New England for minimizing the adverse impact of fishing on EFH that affect all species managed by the NEFMC.
Clam Dredge Framework (Groundfish FW60)	June 2020	Designated three exemption areas within the Great South Channel Habitat Management Area where clam and mussel dredges are allowed.
Deep-sea Coral Amendment (Groundfish A24)	June 2021	Developed to protect deep-sea coral habitats throughout New England from the negative impacts of fishing gears. Designated the Georges Bank Deep-Sea Coral Protection Zone between the U.S./Canada EEZ boundary, the boundary between the NEFMC and MAFMC regions, and the seaward boundary of the U.S. EEZ, with the landward boundary at the 600 m contour. The zone is a closure to all bottom-tending gears, with an exemption for the red crab pot fishery. Two mobile bottom-tending gear closures

Council Actions	Effective Date	Summary of Action
		were also implemented in federal waters in eastern Maine.
Southern New England HAPC Framework (Groundfish FW64)	February 2024	Includes designating cod spawning and complex HAPCs that overlap with wind energy areas in Southern New England.
2025 EFH Framework (Groundfish FW70)	TBD; Council final action September 2025	Revise EFH designations for all life history stages of Atlantic cod.

6.7.2.1.4 **Protected Resources**

NMFS has implemented specific actions to reduce injury and mortality of protected species from gear interactions. NMFS has implemented specific actions to reduce injury and mortality of protected species from gear interactions. Table 4 summarizes past and present actions and Table 5 summarizes reasonably foreseeable future actions.

Table 4- Protected Species Past and Present Actions.

NMFS Actions	Summary of Action	Additional information
Atlantic Large Whale Take Reduction Plan (TRP) Harbor Porpoise TRP Bottlenose Dolphin TRP	Regulatory measures to reduce the serious injury and mortality to specific marine mammal species from interactions with commercial fixed (i.e., gillnet, pot/trap) gear.	Appendix VI (Section 5.6.1)
Atlantic Trawl Gear Take Reduction Strategy	Non-regulatory recommendations to reduce trawl interactions with small cetaceans.	Appendix VI (Section 5.6.1)
May 27, 2021 Biological Opinion (Opinion) issued on 8 FMPs (including the Northeast Multispecies FMP) and two ISFMPs. On September 13, 2023, the Opinion was reinitiated, with extensions to the reinitiation issued January 8, 2025, and November 25, 2025.	The Opinion considered the impacts of the authorization of these FMPs, and ISFMPs, on ESA-listed species and designated critical habitat. In 2023, given new information on Atlantic sturgeon, the Opinion was reinitiated on the 8 FMPs; the two ISMPs are not considered in the reinitiation due to the Consolidated Appropriations Act (CAA), 2023. Consultation is still ongoing.	Section 7.4
Implementing regulations for Framework Adjustment 15 to the Monkfish FMP/Framework Adjustment 6 to the Spiny Dogfish FMP	Established area-based gillnet gear requirements in both FMPs in order to minimize bycatch of Atlantic sturgeon.	89 FR 102834 (December 18, 2024); Framework 15 to the Monkfish FMP; Framework 6 to the Spiny Dogfish FMP

Table 5- Protected Species Reasonably Foreseeable Future Actions

NMFS Actions	Summary of Action	Additional Reference Information
ALWTRP amendments	To further reduce the risk of mortalities and serious injuries of North Atlantic right, fin, and humpback whales in U.S. East Coast fixed gear fisheries. Given the CAA, 2023, it is expected that a final rule to amend the ALWTRP would have an implementation date of December 31, 2028.	ALWTRP; CAA (Section 101, Division JJ-North Atlantic Right Whales)

6.7.2.1.5 Human Communities

All actions taken under the Northeast Multispecies FMP have had effects on human communities. Many actions have included specific measures designed to improve flexibility and increase efficiency. Amendment 18 addressed fleet diversity and accumulation limits. Amendment 23 adjusted the groundfish monitoring program, including establishing target coverage levels up to 100 percent, and is expected to have distributional impacts on individuals and ports participating in the fishery.

6.7.2.1.6 Other Fishery Management Actions

In addition to the Northeast Multispecies FMP, there are many other FMPs and associated fishery management actions for other species that impacted these VECs over the temporal scale described in Section 6.7.1.2. These include FMPs managed by the Mid-Atlantic Fishery Management Council, New England Fishery Management Council, Atlantic States Marine Fisheries Commission, and to a lesser extent, the South Atlantic Fishery Management Council. Omnibus amendments are also frequently developed to amend multiple FMPs at once. Actions associated with other FMPs and omnibus amendments have included measures to regulate fishing effort for other species, measures to protect habitat and forage species, and fishery monitoring and reporting requirements.

6.7.2.1.7 Fishery Management Action Summary

The Council has taken many actions to manage the associated commercial fisheries in its jurisdiction. Actions taken in other FMPs, and some Omnibus Actions are described in Section 6.7.2.1. The MSA is the statutory basis for federal fisheries management. The cumulative impacts on the VECs of past, present, and reasonably foreseeable future federal fishery management actions under the MSA should generally be associated with positive long-term outcomes because they constrain fishing effort and manage stocks at sustainable levels. Constraining fishing effort through regulatory actions can have negative short-term socioeconomic impacts. These impacts are sometimes necessary to bring about long-term sustainability of a resource, and as such should promote positive effects on human communities in the long-term.

The combined effects of past, present, and future management actions under Amendment 25 vary across VECs. Regulated groundfish stocks show mixed past outcomes and short-term negative effects due to ongoing overfishing, but present and future regulations are expected to support rebuilding and lead to long-term positive effects. Non-groundfish species have benefitted from reduced effort and improved habitat protection, with current and anticipated future regulations limiting bycatch and discards, resulting in overall positive effects. Endangered and other protected species have seen slight improvements from

reduced interactions, and while future selective gear requirements may further reduce impacts, some interactions may increase, producing mixed overall effects. Habitat conditions have improved in some areas due to reduced fishing effort, but non-fishing pressures continue to degrade habitat, leading to mixed effects across all time frames. Human communities have experienced both support and constraints from management; short-term economic impacts from reduced effort and catch limits are likely, but long-term rebuilding of stocks is expected to eventually improve revenues and community stability, producing an overall mixed outcome.

6.7.2.2 Non-Fishing Impacts

6.7.2.2.1 **Other Human Activities**

Non-fishing activities that occur in the marine nearshore and offshore environments and connected watersheds can cause the loss or degradation of habitat and/or affect the fish and protected species that utilize those areas. The impacts of most nearshore, human-induced, non-fishing activities tend to be localized in the areas where they occur, although effects on species could be felt throughout their populations since many marine organisms are highly mobile. For offshore projects, some impacts may be localized while others may have regional influence, especially for larger projects. The following discussion of impacts is based on past assessments of activities and assumes these activities will continue as projects are proposed.

Examples of non-fishing activities include point source and non-point source pollution, shipping, dredging/deepening, wind energy development, oil and gas development, construction, and other activities. Specific examples include at-sea disposal areas, oil and mineral resource exploration, aquaculture, construction of offshore wind farms, and bulk transportation of petrochemicals. Episodic storm events and the restoration activities that follow can also cause impacts. The impacts from these activities primarily stem from habitat loss due to human interaction and alteration or natural disturbances. These activities are widespread and can have localized impacts on habitat related to accretion of sediments, pollutants, habitat conversion, and shifting currents and thermoclines. For protected species, primary concerns associated with non-fishing activities include vessel strikes, dredge interactions (especially for sea turtles and sturgeon), and underwater noise. These activities have both direct and indirect impacts on protected species. Wherever these activities co-occur, they are likely to work additively or synergistically to decrease habitat quality and as such may indirectly constrain the productivity of managed species, non-target species, and protected species. Decreased habitat suitability tends to reduce the tolerance of these VECs to the impacts of fishing effort. Non-fishing activities can cause target, non-target, and protected species to shift their distributions away from preferred areas and may also lead to decreased reproductive ability and success (from current changes, spawning disruptions, and behavior changes), disrupted or modified food web interactions, and increased disease. While localized impacts may be more severe, the overall impact on the affected species and their habitats on a population level is unknown, but likely to have impacts that mostly range from no impact to slight negative, depending on the species and activity.

Non-fishing activities permitted by other Federal agencies (e.g., beach nourishment, offshore wind facilities) require examinations of potential impacts on the VECs. The MSA imposes an obligation on other Federal agencies to consult with the Secretary of Commerce on actions that may adversely affect EFH (50 CFR 600.930). NMFS and the eight regional fishery management councils engage in this review process by making comments and recommendations on federal or state actions that may affect habitat for their managed species. Agencies need to respond to, but do not necessarily need to adopt these recommendations. Habitat conservation measures serve to potentially minimize the extent and magnitude of indirect negative impacts federally-permitted activities could have on resources under NMFS' jurisdiction. In addition to guidelines mandated by the MSA, NMFS evaluates non-fishing effects during

the review processes required by Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act for certain activities that are regulated by Federal, state, and local authorities. Non-fishing activities must also meet the mandates under the ESA, specifically Section 7(a)(2)[1], which ensures that agency actions do not jeopardize the continued existence of endangered species and their critical habitat.

In recent years, offshore wind energy has become an important activity in the Greater Atlantic region. This development is expected to impact all VECs, as described below. Offshore wind farms include the installation of turbines into the seabed, inter-array cables connecting the turbines, and export cables to transfer electricity to shore. Site assessment occurs over a period of a few years, construction occurs over 1-2 years, and the wind farm operates for about 25 years, though offshore wind contracts can be negotiated for up to 30 years.

Impacts of offshore wind energy development on Biological Resources (Target species, Non-target species, Protected Species) and the Physical Environment

Construction activities may have both direct and indirect impacts on marine resources, ranging from temporary changes in distribution to injury and mortality. Impacts could occur from changes to habitat in the areas of wind turbines and cable corridors and increased vessel traffic to and from these areas. Species that reside in affected wind farms year-round may experience different impacts than species that seasonally reside in or migrate through these areas. Species that typically reside in areas where wind turbines are installed may return to the area and adapt to habitat changes after construction is complete. Inter-array and electricity export cables will generate electromagnetic fields, which can affect patterns of movement, spawning, and recruitment success for various species. Effects will depend on cable type, transmission capacity, burial depth, and proximity to other cables. Substantial structural changes in habitats associated with cables are not expected unless cables are left unburied (see below). Surface lay or shallow burial (target burial depth is typically 4-6 feet) is not the preferred approach because it places the cable at risk but may be required in bottom types where trenching is not possible or when crossing another cable. In such instances, concrete mats are used to cover the cable. The cable burial process may also alter sediment composition along the corridor, thereby affecting infauna and emergent biota. Taormina et al. (2018) provide a recent review of various cable impacts, and Hutchinson et al. (2020) and Taormina et al. (2020) examine the effects of electromagnetic fields in particular.

The full build out of offshore wind farms will result in broad habitat alteration. The wind turbines will alter hydrodynamics of the area, which may affect primary productivity and physically change the distribution of prey and larvae. It is not clear how these changes will affect the reproductive success of marine resources. Scour and sedimentation could have negative effects on egg masses that attach to the bottom. Benthic habitat will be altered due to the placement of scour protection at wind turbine foundations, and over cables that are not buried to target depth in the sediment, converting soft substrates into hard substrates. This could alter species composition and predator/prey relationships by increasing favorable habitat for some species and decreasing habitat for others. The placement of wind turbines will also establish new vertical structure in the water column, which could serve as reefs for bottom species, fish aggregating devices for pelagic species, and substrate for the colonization of other species, e.g., mussels. Various authors have studied these types of effects (Finneran 2015; Finneran 2016; Madsen *et al.* 2006; Nowacek *et al.* 2007; NRC 2000; 2003; 2005; Popper *et al.* 2014; Richardson *et al.* 1995; Thomsen *et al.* 2006).

[1] "Each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency (hereinafter in this section referred to as an "agency action") is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat."

Elevated levels of sound produced during site assessment activities, construction, and operation of offshore wind facilities will impact the soundscape[2]. Temporary, acute, noise impacts from construction activity could impact reproductive behavior and migration patterns; the long-term impact of operational noise from turbines may also affect behavior of fish and prey species, through both vibrations in the immediate area surrounding them in the water column, and through the foundation into the substrate. Depending on the sound frequency and source level, noise impacts to species may be direct or indirect (Bailey et al. 2014; Bailey et al. 2010; Bergström et al. 2014; Ellison et al. 2011; Ellison et al. 2018; Forney et al. 2017; Madsen et al. 2006; Nowacek et al. 2007; NRC 2003; 2005; Richardson et al. 1995; Romano et al. 2004; Slabbekoorn et al. 2010; Thomsen et al. 2006; Wright et al. 2007). Exposure to underwater noise can directly affect species via behavioral modification (avoidance, startle, spawning) or injury (sound exposure resulting in internal damage to hearing structures or internal organs) (Forney et al. 2017; Richardson et al. 1995; Slabbekoorn et al. 2010; Thomsen et al. 2006). Indirect effects are likely to result from changes to the acoustic environment of the species, which may affect the completion of essential life functions (e.g., migrating, breeding, communicating, resting, foraging)[3] (Association 2020).

Wind farm survey and construction activities and turbine/cable placement will substantially affect NMFS existing scientific research surveys, including stock assessment surveys for fisheries and protected species[4] and ecological monitoring surveys. Disruption of such scientific surveys could increase scientific uncertainty in survey results and may significantly affect NMFS' ability to monitor the health, status, and behavior of marine resources and protected species and their habitat use within this region. Based on existing regional Fishery Management Councils' acceptable biological catch control rule processes and risk policies (e.g., 50 CFR §§ 648.20 and 21), increased assessment uncertainty could result in lower commercial quotas and recreational harvest limits that may reduce the likelihood of overharvesting and mitigate associated biological impacts on fish stocks. However, this would also result in lower associated fishing revenue and reduced recreational fishing opportunities, which could result in indirect negative impacts on fishing communities. It is possible that new survey technologies will be developed that mitigate these impacts, but it is uncertain whether they will be developed, and (or) how quickly they can be adopted. NOAA and BOEM published a survey mitigation strategy in December 2022[5] and NEFSC developed draft Fisheries Survey Mitigation Plans in spring of 2024[6], with an implementation plan expected soon.

Impacts of Offshore Wind Energy Development on Socioeconomic Resources

Several potential offshore wind energy sites have been leased or identified for future wind energy development in federal waters from Maine to North Carolina. According to BOEM, approximately 22 gigawatts (close to 2,000 wind turbines based on current technology) of Atlantic offshore wind development via 19 projects are reasonably foreseeable along the east coast by 2030 (BOEM 2021).

Offshore wind energy development is well underway within the lease areas off Rhode Island and Massachusetts. The groundfish fishery has been active in the Massachusetts/Rhode Island lease areas and is expected to be for the near future (Map 1). As of December 2024, South Fork Wind (12 turbines) is

[2] NMFS Ocean Noise Strategy Roadmap

[3] NMFS Ocean Noise Strategy Roadmap

[4] Changes in required flight altitudes due to proposed turbine height would affect aerial survey design and protocols (BOEM 2020).

[5] Hare et al. 2022. NOAA Fisheries and BOEM Federal Survey Mitigation Implementation Strategy - Northeast U.S. Region. https://doi.org/10.25923/jqse-x746

[6] Draft NEFSC Fisheries Survey Mitigation Plans: https://www.fisheries.noaa.gov/event/peer-review-draft-nefsc-fisheries-survey-mitigation-plans

now commissioned and operational and Vineyard Wind 1 (62 turbines) is nearing completion (the project is experiencing delays due to a blade failure that occurred in summer 2024). Revolution Wind was permitted by BOEM during 2023 and construction is well under way and is expected to be in operation in 2026. Sunrise Wind (project off Rhode Island with power brought to shore in New York) began construction in summer 2024 and is expected to be in operation in 2026. In December 2024, BOEM announced the approval of the SouthCoast Wind project; construction is expected to begin in 2025. Other projects in Southern New England that are earlier in the site assessment and planning phases include: New England Wind 1 and 2, Beacon Wind, and Vineyard Northeast. In 2023, the Council developed a Habitat Area of Particular Concern (HAPC) overlapping the Southern New England lease areas in order to promote conservation of cod spawning grounds and complex benthic habitats. A final rule on this measure was published in February 2024[7].

Further south in the Mid-Atlantic region, beyond the footprint of the groundfish fishery and most groundfish species, there are many other offshore wind energy leases and planning areas. In August 2024, the first two 'Central Atlantic' lease areas were auctioned off Delaware/Maryland and Virginia and BOEM is currently undertaking a second round of wind energy area (WEA) identification for subsequent leasing in the Central Atlantic.

BOEM began a planning process for the Gulf of Maine via a regional intergovernmental renewable energy task force (https://www.boem.gov/Gulf-of-Maine). In October 2024, the Department of the Interior announced the provisional winners on four lease areas in the Gulf of Maine, including three off Massachusetts and one off Maine (there were eight offshore wind energy lease areas available as part of the auction). These offshore wind leases are expected to be executed to the two auction winners in December 2024. Given the water depth in the region, floating turbines will likely be the primary type of wind turbine foundations to be deployed. The Gulf of Maine final lease areas overlap with groundfish fishing areas and the redfish sector exemption area, though do not overlap the redfish exemption area cod closure nor the redfish exemption area seasonal closure II. In addition, Pine Tree Offshore Wind LLC, in partnership with the State of Maine, holds a research lease in the Gulf of Maine southeast of Portland.

The social and economic impacts of offshore wind energy on fisheries could be generally negative due to the overlap of wind energy areas with productive groundfish fishing grounds. Impacts may vary by year based on species availability. It remains unclear exactly how fishing or transiting to and from fishing grounds might be affected by the presence of a wind farm. While no offshore wind developers have expressed an intent to exclude fishing vessels from wind turbine arrays once construction is complete, it could be difficult for operators to tow bottom-tending mobile gear or transit amongst the wind turbines, depending on the spacing and orientation of the array and weather conditions.[8] Floating wind farms are likely to cause greater displacement of fishing activity as compared to fixed turbines given the presence of floating inter-array cables and anchoring systems. If vessel operators choose to avoid fishing or transiting within wind farms, effort displacement and additional steaming time could result in negative socioeconomic impacts to affected communities, including increased user conflicts, decreased catch and associated revenue, safety concerns, and increased fuel costs. If vessels elect to fish within wind farms, the effects could be both positive due to potential increased recreational catch and negative due to reduced commercial fishery catch and associated revenue, user conflicts, gear damage/loss, and increased risk of allision or collision.

[7] https://d23h0vhsm26o6d.cloudfront.net/240205-Final-Rule-HAPC-2024-02239.pdf

[8] The United States Coast Guard has considered transit and safety issues related to the Massachusetts and Rhode Island lease areas in a recent port access route study and has recommended uniform 1 mile spacing in east-west and north-south directions between turbines to facilitate access for fishing, transit, and search and rescue operations. Future studies in other regions could result in different spacing recommendations (USCG 2020).

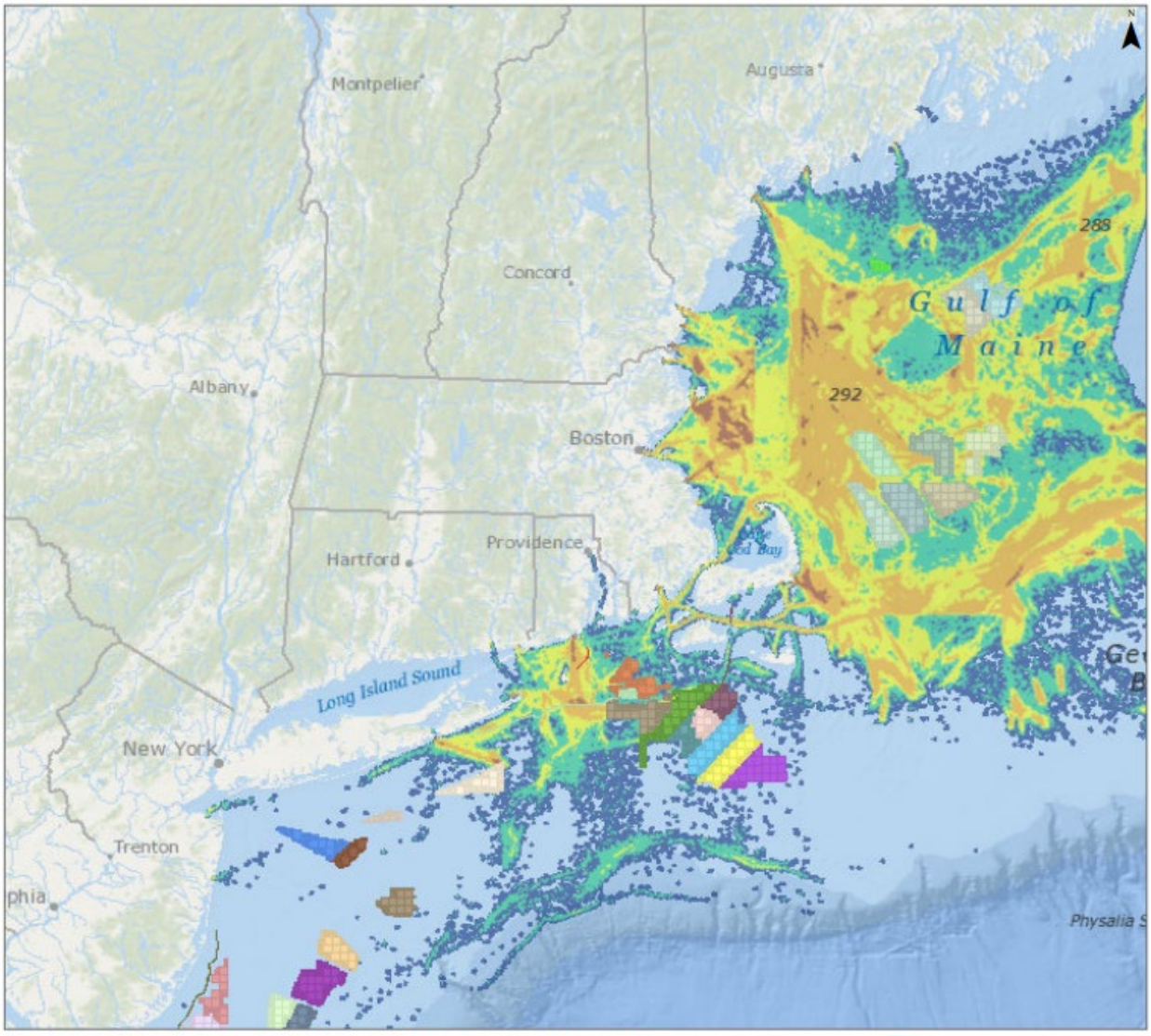
Turbine structures could increase the presence of, and recreational fishing for, structure-affiliated species, including some groundfish species such as Atlantic cod. This could potentially lead to socioeconomic benefits in terms of increased for-hire fishing revenues and angler satisfaction in certain wind development areas. There could also be social and economic benefits in the form of jobs associated with construction and maintenance, and replacement of some electricity generated using fossil fuels with renewable sources (AWEA 2020).

As the number of wind farms increases, so too would the level and scope of impacts to affected habitats, marine resources, and human communities. Development of these areas may cause regional changes to fishing practices which could cause indirect effects on the groundfish resource and fishery. Overall, this analysis represents only a rough approximation of potential negative and positive effects from offshore wind energy development.

Offshore Energy Summary

The overall impact of offshore wind energy development on the affected species and their habitats at a population level is unknown but could range from slight positive impact to moderate negative, depending on the number and locations of projects that occur, and the given species. The individual project phases (site assessment, construction, operation, and decommissioning) as well as different aspects of the technology (foundations, cables/pipelines, turbines) will have varying impacts on resources. Mitigation efforts, such as habitat conservation measures, time-of-year construction restrictions, layout modifications, and fishery compensation funds could lessen the magnitude of negative impacts as well. The overall impact on socioeconomic resources is likely slight positive to moderate negative; potentially positive due to a potential increase in jobs and recreational fishing opportunities, but negative due to displacement and disruption of commercial fishing effort.

Map 1 – Northeast Multispecies FMP vessel activity (VMS, May 2015 – April 2019) relative to wind energy active lease areas (bright multicolored) and planning areas (pastel multicolored).



6.7.2.2.2 **Global Climate Change**

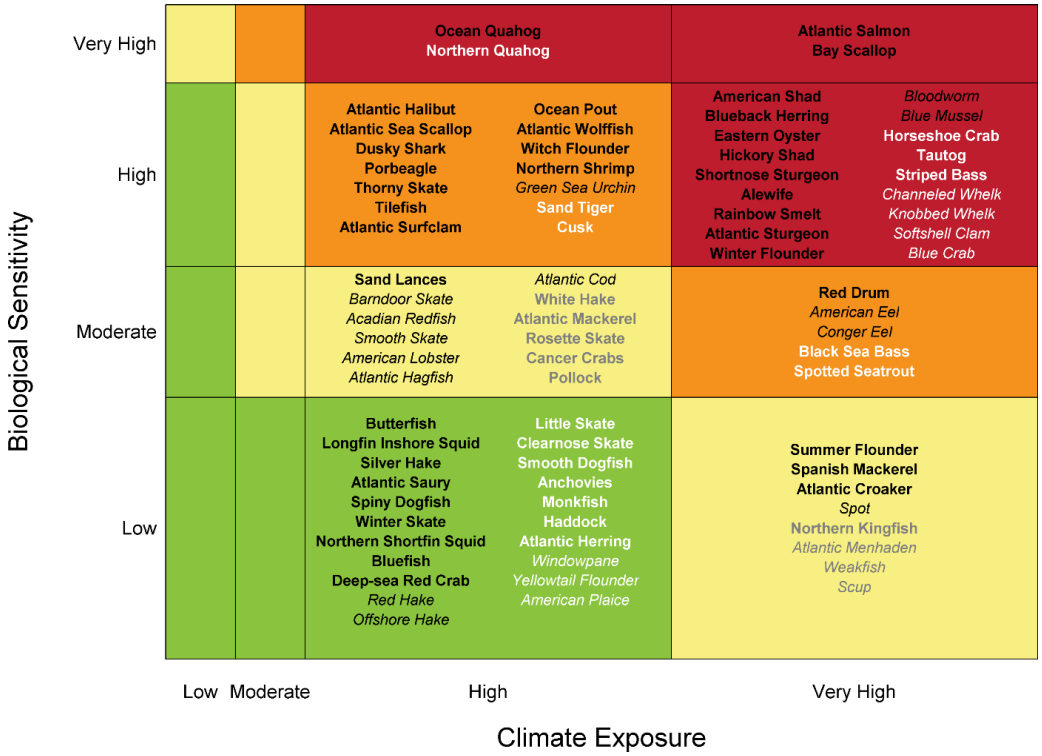
Global climate change affects all components of marine ecosystems, including human communities. Physical changes that are occurring and will continue to occur to these systems include sea-level rise, changes in sediment deposition; changes in ocean circulation; increased frequency, intensity and duration of extreme climate events; changing ocean chemistry; and warming ocean temperatures. The rates of physical and chemical changes in marine ecosystems have been most rapid in recent decades (Johnson et al. 2019). Emerging evidence demonstrates that these physical changes are resulting in direct and indirect ecological responses within marine ecosystems, which may alter the fundamental production characteristics of marine systems (Hare et al. 2016). The general trend of changes can be explained by warming causing increased ocean stratification, which reduces primary production, lowering energy supply for higher trophic levels and changing metabolic rates. Different responses to warming can lead to altered food-web structures and ecosystem-level changes. Shifts in spatial distribution are generally to higher latitudes (i.e., poleward) and to deeper waters as species seek cooler waters within their normal temperature preferences. Climate change will also potentially exacerbate the stresses imposed by fishing and other non-fishing human activities and stressors. Survival of marine resources under a changing climate depends on their ability to adapt to change, but also how and to what degree those other human activities influence their natural adaptive capacity.

Results from the Northeast Fisheries Climate Vulnerability Assessment indicate that climate change could have impacts on Council-managed species that range from negative to positive, depending on the adaptability of each species to the changing environment (Hare et al. 2016).

Based on this assessment, groundfish species were scored as having a range of climate vulnerability. Winter flounder were scored as having very high climate vulnerability with high certainty (Hare et al. 2016). Witch flounder, Atlantic halibut, ocean pout, and Atlantic wolfish were scored as having high climate vulnerability with very high certainty (Hare et al. 2016). Atlantic cod and Acadian redfish were scored as having moderate climate vulnerability with high certainty, while white hake and pollock were scored as having moderate climate vulnerability with moderate certainty (Hare et al. 2016). Haddock were scored as having low climate vulnerability with moderate certainty (Hare et al. 2016). Finally, yellowtail flounder, American plaice, and windowpane flounder were scored as having low climate vulnerability with low certainty (Hare et al. 2016). Refer to the Risk Policy Matrices (Appendix V) which include a summary of climate impacts for each stock.

Overall vulnerability results for additional Greater Atlantic species, including most of the non-target species identified in this action, are shown in Figure 1 (Hare et al. 2016). While the effects of climate change may benefit some habitats and the populations of species through increased availability of food and nutrients, reduced energetic costs, or decreased competition and predation, a shift in environmental conditions outside the normal range can result in negative impacts for those habitats and species unable to adapt. This, in turn, may lead to higher mortality, reduced growth, smaller size, and reduced reproduction or populations. Thus, already stressed populations are expected to be less resilient and more vulnerable to climate impacts. Climate change is expected to have impacts that range from positive to negative depending on the species. However, future mitigation and adaptation strategies to climate change may mitigate some of these impacts. The science of predicting, evaluating, monitoring and categorizing these changes continues to evolve. The social and economic impacts of climate change will depend on stakeholder and community dependence on fisheries, and their capacity to adapt to change. Commercial and recreational fisheries may adapt in different ways, and methods of adaptation will differ among regions. In addition to added scientific uncertainty, climate change will introduce implementation uncertainty and other challenges to effective conservation and management.

Figure 1 – Overall climate vulnerability score for fish and invertebrates on the Northeast U.S. Continental Shelf (Hare et al. 2016).



Overall climate vulnerability is denoted by color: low (green), moderate (yellow), high (orange), and very high (red). Certainty in score is denoted by text font and text color: very high certainty (>95%, black, bold font), high certainty (90–95%, black, italic font), moderate certainty (66–90%, white or gray, bold font), low certainty (<66%, white or gray, italic font).

6.7.3 **Magnitude and Significance of Cumulative Effects**

In determining the magnitude and significance of the cumulative impacts of the preferred alternatives, the incremental impacts of the direct and indirect impacts should be considered, on a VEC-by-VEC basis, in addition to the effects of all actions (those identified and discussed relative to the past, present, and reasonably foreseeable future actions of both fishing and non-fishing actions). Table 1 in the Executive Summary (Section 1.0) provides a summary of likely impacts found in the various groups of management alternatives contained in this action. The CEA baseline, as described above in Section 6.7.2, represents the sum of past, present, and reasonably foreseeable future actions and conditions of each VEC. When an alternative has a positive impact on the VEC, for example, reduced fishing mortality on a managed species, it has a positive cumulative effect on the stock size of the species when combined with "other" actions that were also designed to increase stock size. In contrast, when an alternative has negative effects on a VEC, such as increased mortality, the cumulative effect on the VEC would be negative and tend to reduce the positive effects of the other actions. The resultant positive and negative cumulative effects are described below for each VEC. As seen above in Section 6.7.2.2, non-fishing impacts on the VECs generally range from positive to negative.

6.7.3.1 Magnitude and Significance of Cumulative Effects on Managed Resources

Past fishery management actions taken through the Northeast Multispecies FMP and the annual specifications process such as catch limits and allocations ensure that stocks are managed sustainably and that measures are consistent with the objectives of the FMP under the guidance of the MSA. The impacts of annual specification of management measures are largely dependent on how effective those measures are in meeting the objectives of preventing overfishing and achieving optimum yield, and on the extent to which mitigating measures, such as accountability measures, are effective; however, these actions have generally had a positive cumulative effect on groundfish. It is anticipated that the future management actions described in Section 6.7.2.1 will have additional indirect positive effects on the target species through actions that reduce and monitor bycatch, protect habitat, and protect the ecosystem services on which the productivity of the target species depends.

As noted previously in Section 6.2, none of the preferred alternatives are expected to result in significantly increased levels of fishing effort or changes to the character of that effort relative to current conditions. Therefore, impacts of the fisheries on target species are not expected to change relative to current conditions under the preferred alternatives (i.e., generally positive for target species). The proposed actions described in this document would positively reinforce the past and anticipated positive cumulative effects on target species by achieving the objectives specified in the FMP.

When the direct and indirect effects of the Amendment 25 alternatives are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant positive impacts on regulated groundfish resource.*

6.7.3.2 Magnitude and Significance of Cumulative Effects on Non-target Species

The combined impacts of past federal fishery management actions on non-target species have been mixed, as decreased effort and reduced catch of non-target species continue, though some stocks are in poor status. Current regulations continue to manage for sustainable stocks, thus controlling effort on direct and discard/bycatch species. As noted in Section 6.2, the actions proposed by Amendment 25 would likely continue this trend. Future actions are anticipated to continue rebuilding non-target stocks and limit the take of incidental/bycatch in the groundfish fishery, particularly through mitigation measures like sub-ACLs and AMs. The other measures proposed in this action would likely have some impacts on non-target species since fishing activity is expected to overlap with non-target species of interest. Continued management of directed stocks will also control catch of non-target species.

As noted previously in Section 6.2, none of the preferred alternatives are expected to result in significantly increased levels of fishing effort or changes to the character of that effort relative to current conditions. Therefore, impacts of the fishery on non-target species are not expected to change relative to the current condition under the preferred alternatives (i.e., slight positive for non-target species). The proposed actions in this document would positively reinforce past and anticipated cumulative effects on non-target species by achieving the objectives in the FMP.

When the direct and indirect effects of Amendment 25 alternatives are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant positive impacts on non-target species.*

6.7.3.3 Magnitude and Significance of Cumulative Effects on Physical Environment

Past fishery management actions taken through the Habitat amendments, the Northeast Multispecies FMP and annual specifications process have had negligible to slightly positive cumulative effects on habitat. The actions have constrained fishing effort both at a large scale and locally and have implemented gear requirements which may reduce impacts on habitat. As required under Omnibus Habitat Amendment 2, EFH and Habitat Areas of Particular Concern were designated for the managed resources. It is anticipated that the future management actions described in Section 6.7.2.1 will result in additional direct or indirect positive effects on habitat through actions which protect EFH and protect ecosystem services on which these species' productivity depends.

Many additional non-fishing activities, as described above in Section 6.7.2.2 are concentrated near-shore and likely work either additively or synergistically to decrease habitat quality. The effects of these actions, combined with impacts resulting from years of commercial fishing activity, have negatively affected habitat. These impacts could be broad in scope. All the VECs are interrelated; therefore, the linkages among habitat quality, managed resources and non-target species productivity, and associated fishery yields should be considered. Some actions, such as coastal population growth and climate change may indirectly impact habitat and ecosystem productivity; however, these actions are beyond the scope of NMFS and Council management. Reductions in overall fishing effort and protection of sensitive habitats have mitigated some negative effects.

As noted previously in Section 6.3, none of the preferred alternatives are expected to result in significantly increased levels of fishing effort or changes to the character of that effort relative to current conditions. Although the impacted areas have been fished for many years with many different gear types, continued fishing effort will continue to impact habitats at the same effort level. Therefore, the impacts of the fishery on the physical environment are not expected to change relative to the current condition under the preferred alternatives (i.e., slight negative for physical environment).

When the direct and indirect effects of the Amendment 25 alternatives are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant slight negative impacts on the physical environment and EFH.*

6.7.3.4 Magnitude and Significance of Cumulative Effects on Protected Species

Given their life history dynamics, large changes in protected species abundance over long time periods, and the multiple and wide-ranging fisheries management actions that have occurred, the cumulative impacts on protected species were evaluated over a long-time frame (i.e., from the early 1970s when the Marine Mammal Protection Act and Endangered Species Act were implemented through the present).

Taking into consideration the above information, past fishery management actions taken through the respective FMPs and annual specifications process, and non-fishing activities have had mixed cumulative effects on protected species. The management actions have constrained fishing effort both at a large scale and locally, and have implemented, pursuant to the ESA, MMPA, or MSA, gear modifications, requirements, and management areas. These measures and/or actions have served to reduce interactions between protected species and fishing gear. It is anticipated that future management actions, described in Section 6.7.2.1 will result in mixed effects on protected species, as continued catch and effort controls are likely to reduce gear encounters through effort reductions; however, should such controls result in improved groundfish stock conditions, effort increases are possible. Should the latter occur, additional management actions taken under ESA/MMPA would help to mitigate the risk of gear interactions.

Non-fishing activities and their impacts are described in Section 6.7.2.2. It is expected that these activities will result in both direct and indirect effects to protected species, with impacts most likely ranging from

negligible to slight negative. For example, activities like offshore wind development, shipping, and dredging, can result in vessel interactions and exposure to elevated underwater noise that can result in the injury or mortality to the species. Non-fishing activities can also cause protected species to shift distributions, decrease habitat suitability, decreased reproductive success or foraging, and reduce tolerance to fishing efforts.

The preferred alternatives would not substantially modify current levels of fishing effort in terms of the overall amount of effort, timing, and location. They would allow existing fishing effort to continue, thereby maintaining existing tolerances to impacts from fishing effort. As described in Section 6.4, the proposed action is expected to have impacts on protected species that range from slight negative to slight positive, depending on the species.

When the direct and indirect effects of the Amendment 25 alternatives are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant slight negative impacts to slight positive impacts.*

6.7.3.5 Magnitude and Significance of Cumulative Effects on Human Communities

Past fishery management actions taken through the respective FMPs and annual specifications process such as catch limits and allocations have had both positive and negative cumulative effects on human communities. They have benefited domestic fisheries through sustainable fishery management but can also reduce participation in fisheries. The impacts from annual specification of management measures are largely dependent on how effective those measures are in meeting their intended objectives and the extent to which mitigating measures like AMs are effective. Quota overages may alter the timing of commercial fishery revenues such that revenues can be realized a year earlier. Fishermen may be impacted by reduced revenues in years which the overages are deducted. Similarly, recreational fisheries may have decreased harvest opportunities due to reduced harvest limits as a result of overages and more restrictive management measures (e.g. minimum fish size, possession limits, fishing seasons) implemented to address overages.

It is anticipated that the future management actions described in Section 6.7.2.1 will result in long-term positive effects for human communities due to sustainable management practices, although additional indirect negative effects on some human communities could occur if management actions result in short-term reduced revenues. Despite the potential for negative short-term effects on human communities due to reduced revenue, positive long-term effects are expected due to the long-term sustainability of the managed stocks.

By providing revenues and contributing to the overall functioning of and employment in coastal communities, the groundfish fishery has both direct and indirect positive social impacts. As previously described in Section 6.5 and Section 6.6, it is uncertain whether the preferred alternatives will result in substantial changes to levels of fishing effort or the character of that effort relative to current conditions. However, through implementation of this action, the Council seeks to achieve the primary objective of the MSA, which is to achieve OY from the managed fisheries.

When the direct and indirect effects of the Amendment 25 alternatives are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant slight negative impacts to slight positive impacts.* However, the overall combination of impacts thus far has been consistently negative for human communities.

6.7.4 **Proposed Action on all the VECs**

The Council's preferred alternatives (i.e., the proposed action) are described in Section 4.0. The direct and indirect impacts of the proposed action on the VECs are described in Section 6.0 and are summarized in the Executive Summary in Section 1.0 and below in Table 6. The magnitude and significance of the cumulative effects, including additive and synergistic effects of the proposed actions, as well as past, present, and future actions, have been taken into account (Section 6.7.3).

The preferred alternatives are consistent with other management measures that have been implemented in the past for the fishery. These measures are part of a broader management scheme for the groundfish fishery. This management scheme has helped to rebuild stocks and ensure long-term sustainability, while minimizing environmental impacts.

The regulatory atmosphere within which federal fishery management operates requires that management actions be taken in a manner that will optimize the conditions of managed species, habitat, and human communities. Consistent with NEPA, the MSA requires that management actions be taken only after consideration of impacts to the biological, physical, economic, and social dimensions of the human environment. Given this regulatory environment, and because fishery management actions must strive to create and maintain sustainable resources, impacts on all VECs from past, present and reasonably foreseeable future actions have generally been mixed and are expected to continue in that manner for the foreseeable future. Although some aspects of VECs may experience negative impacts if effort increases as groundfish stocks improve, continued catch and effort controls and additional management actions taken under ESA/MMPA should help mitigate the risk of gear interactions.

There are no significant cumulative effects associated with the preferred alternatives based on the information and analyses presented in this document and in past FMP documents (Table 6). Cumulatively, through 2030 it is anticipated that the preferred alternatives will result in non-significant impacts on all VECs, ranging from slight negative to slight positive.

Table 6 – Summary of Cumulative Effects of the Preferred Alternatives.

	Managed Resource	**Non-Target Species**	**Habitat**	**Protected Resources**	**Human Communities**
Direct/Indirect Impacts of Preferred Alternative	Mixed (slight positive, negligible, and slight negative)	Mixed (slight positive, negligible, and slight negative)	Mixed (slight negative, negligible, and slight positive)	Mixed (slight negative to slight moderate positive)	Negative to positive
Combined Cumulative Effects Assessment Baseline Conditions	Negative (short-term), positive (long-term)	Positive	Mixed	Mixed	Negative (short-term), positive (long-term)
Cumulative Effects	Slight positive	Slight positive	Slight negative	Mixed	Negative (short-term), positive (long-term)