

**DRAFT**

**BOEM and NOAA Fisheries  
North Atlantic Right Whale and Offshore Wind Strategy**

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U.S. Department of the Interior  
Bureau of Ocean Energy Management



U.S. Department of Commerce  
National Oceanic and Atmospheric Administration  
NOAA Fisheries

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## Acronyms and Abbreviations

ASRG	Atlantic Scientific Review Group
BOEM	Bureau of Ocean Energy Management
BWRI	Blue World Research Institute, Inc.
CEQ	Council on Environmental Quality
COP	Construction and Operations Plan
CZMA	Coastal Zone Management Act
DCO	Deputy Commandant for Operations
EBM	ecosystem-based management
EIS	environmental impact statements
ESA	Endangered Species Act
ESP	Environmental Studies Program
MARAD	Maritime Administration
MMPA	Marine Mammal Protection Act
NARW	North Atlantic right whale
NEPA	National Environmental Protection Act
NGO	Non-Governmental Organizations
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	NOAA's National Marine Fisheries Service
OCS	Outer Continental Shelf
OSW	offshore wind
PAM	passive acoustic monitoring
PBR	potential biological removal
PET	Population Evaluation Tool
PSO	protected species observers
RWSC	Regional Wildlife Science Collaborative for Offshore Wind
UAV	unmanned aerial vehicle
UXO	unexploded ordinances

# 1 Preface

Climate change poses a significant global threat causing planet-wide physical, chemical, and biological changes that substantially affect the world's oceans, lands, and atmosphere. The most recent National Climate Assessment puts the climate crisis in stark terms: "Without significant reductions in greenhouse gas emissions, extinctions and transformative impacts on some ecosystems cannot be avoided, with varying impacts on the economic, recreational, and subsistence activities they support" (U.S. Global Change Research Program 2018).

Offshore wind (OSW) is an abundant, efficient, and clean alternative domestic energy resource found close to major coastal cities, where more than half of the U.S. population resides and energy needs are high. Compared to onshore winds, offshore winds are generally stronger and more consistent. As higher wind speeds can produce significantly more energy, there is increasing interest in developing OSW. In March 2021, in response to Executive Order 14008, [Tackling the Climate Crisis at Home and Abroad](#),<sup>1</sup> the Departments of the Interior, Energy, and Commerce announced a [national goal to deploy 30 gigawatts of OSW by 2030](#)<sup>2</sup> while protecting biodiversity and promoting ocean co-use. In response to this interest and Administration climate goals, the [Bureau of Ocean Energy Management \(BOEM\)](#)<sup>3</sup> plans, by 2025, to hold up to five additional OSW lease sales and complete the review of at least 16 plans to construct and operate commercial OSW facilities, which would represent more than 22 gigawatts of clean energy for the nation.

BOEM and the National Oceanic and Atmospheric Administration's (NOAA's) [National Marine Fisheries Service \(NOAA Fisheries\)](#)<sup>4</sup> recognize this development (from siting to decommissioning) must be undertaken responsibly including managing and mitigating the impacts to endangered species like the North Atlantic right whale (NARW, *Eubalaena glacialis*). The NARW population is currently in decline, mainly due to vessel strikes and entanglement in fishing gear, necessitating precaution to ensure that OSW development is carried out in a way that minimizes the potential for adverse effects to the species and the ecosystems on which it depends. Previous, current, and ongoing research efforts supported by BOEM, NOAA Fisheries, industry, and other partners and stakeholders over the past 15 years provide the best available science to inform management decisions today on OSW development and its potential impacts to NARWs. The agencies are working to understand the effects of OSW development on NARWs and their ecosystem, and to develop strategies to mitigate and monitor impacts to NARWs from OSW development. As the OSW industry continues to grow and projects begin construction, BOEM and NOAA Fisheries will continue to implement measures to reduce risk to NARWs, evaluate existing strategies, and collect and apply best available data and insights to inform future decisions, including monitoring and mitigation programs.

BOEM and NOAA Fisheries initiated development of this shared draft *North Atlantic Right Whale and Offshore Wind Strategy* (hereinafter called "Strategy") to focus and integrate past, present, and future

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<sup>1</sup> [www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/](http://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/)

<sup>2</sup> [www.doi.gov/news/interior-joins-government-wide-effort-advance-offshore-wind](http://www.doi.gov/news/interior-joins-government-wide-effort-advance-offshore-wind)

<sup>3</sup> [www.boem.gov](http://www.boem.gov)

<sup>4</sup> <https://www.fisheries.noaa.gov/>

efforts related to NARW and OSW development. In response to Executive Order 14008, both agencies share a common vision *to protect and promote the recovery of North Atlantic right whales while responsibly developing offshore wind energy*. This vision reflects the combined legislative mandates of the two agencies and commitment to the Administration's goal of developing OSW while protecting biodiversity and promoting ocean co-use. To achieve the common vision and to meet the agencies' legislative mandates, this Strategy identifies a number of actions under three categories: (1) Mitigation and Decision-Support Tools; (2) Research and Monitoring; and (3) Collaboration, Communication, and Outreach. This draft Strategy is being made available for public comment; following review of these comments, the agencies will finalize the Strategy. However, the agencies intend to keep the Strategy as a "living" document that will be regularly evaluated and updated as progress is made and new information becomes available.

BOEM and NOAA Fisheries recognize that there are ongoing efforts with similar goals and objectives inside and outside of the agencies. Executing this Strategy will involve collaboration and coordination among the many Federal and non-Federal partners with shared interests. This Strategy is also an integral step to most effectively organize BOEM, NOAA Fisheries, and their partners around a shared vision and a clear path to study and manage this issue.

This Strategy does not define new policy or regulatory actions; rather, it recognizes efforts to date and identifies areas where BOEM and NOAA Fisheries will work together alongside our industry partners in an effort to focus on the information and science needed to responsibly develop OSW while protecting and recovering NARWs. All OSW projects (ongoing, planned, and future) are subject to the National Environmental Protection Act (NEPA), Endangered Species Act (ESA), and Marine Mammal Protection Act (MMPA), and there are many ways that conditions can, and will continue to, be required for projects to mitigate effects. BOEM and NOAA Fisheries will continue to work together during the life of this Strategy to ensure a robust and comprehensive analysis of the effects of OSW development on NARWs and develop and implement effective measures to avoid, minimize, and monitor effects of construction, operations, and eventual decommissioning.

## 2 Issue Description

### 2.1 Current Status of Atlantic OSW

Climate change poses a significant global threat, causing planet-wide physical, chemical, and biological changes that substantially affect the world's oceans, lands, and atmosphere. Use of wind turbines to produce energy does not release emissions that can pollute the air or water (with rare exceptions), and using wind to produce energy has fewer effects on the environment than many other energy sources. Wind turbines may also reduce the amount of electricity generation from fossil fuels, which would result in lower total air pollution and carbon dioxide emissions.

Responsible OSW development is a cornerstone in advancing the Administration's plans to confront climate change, create good-paying jobs, drive a robust domestic supply chain, and accelerate the nation's transition to a cleaner energy future. As directed by President Biden's Executive Order 14008, BOEM has partnered with other Federal agencies to increase renewable energy production, including a commitment to deploy 30 gigawatts of OSW by 2030. Further, investments under the recently signed [Inflation Reduction Act](#)<sup>5</sup> will lower energy costs by hundreds of dollars per year for families by making clean energy more affordable and accessible. By 2025, BOEM plans to hold up to five additional OSW lease sales and complete the review of at least 16 plans to construct and operate commercial OSW facilities, which would represent more than 22 gigawatts of clean energy for the nation.

As of September 2022, there were 27 renewable energy lease areas in the Atlantic Outer Continental Shelf (OCS) and there are 42 megawatts of installed OSW capacity. The OCS is the area of the continental shelf that begins at the edge of state marine boundaries (typically 3 nautical miles offshore except 9 miles for Texas and the west coast of Florida) and extends to 200 nautical miles, and more in some places. Additional lease sales are expected to be held in the Gulf of Maine and the Central Atlantic. In total, the area in existing leases and being considered for leasing in planning areas in the Atlantic OCS covers 22.237 million acres (about 8% of the Atlantic OCS). The OSW infrastructure currently proposed for installation by 2030 would be located on about 2.349 million acres, use fixed turbine technologies, and include 3,411 turbines and foundations and 9,874 miles of export and inter-array submarine cables. In addition, the Biden-Harris Administration has announced the goal of 15 gigawatts of floating OSW capacity by 2035. These metrics of development will change over time; but for the purposes of this Strategy, the metrics demonstrate the large-scale nature of the development planned and underway.

### 2.2 BOEM & NOAA Fisheries' Missions and Responsibilities

BOEM's mission is to manage the energy and mineral resources of the OCS in an environmentally and economically responsible way. BOEM promotes energy independence, environmental protection, and economic development through responsible, science-based management of energy and mineral resources on the OCS. BOEM ensures that environmental protection—informed by the best available science as required by law—is a foremost concern and an indispensable consideration in BOEM's decision-making. The OCS Lands Act directs BOEM to study and consider coastal, marine, and human

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<sup>5</sup> [www.whitehouse.gov/briefing-room/statements-releases/2022/08/15/by-the-numbers-the-inflation-reduction-act/](https://www.whitehouse.gov/briefing-room/statements-releases/2022/08/15/by-the-numbers-the-inflation-reduction-act/)

environmental impacts, and BOEM must also comply with many other statutes, regulations, executive orders, and policies in making decisions—including the ESA.

One of BOEM’s key programs is [offshore renewable energy](#)<sup>6</sup> development on the OCS. In 2009, the U.S. Department of the Interior announced final regulations for the OCS Renewable Energy Program, which was authorized by the Energy Policy Act of 2005. These regulations provide a framework for issuing leases, easements, and rights-of-way for OCS activities to support production and transmission of energy from sources other than oil and natural gas, including environmental safeguards. Furthermore, the ESA requires BOEM to ensure that any action it takes to implement the OCS Renewable Energy Program is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat determined for any listed species, including the NARW (ESA section 7(a)(2)). Additionally, section 7(a)(1) of the ESA requires BOEM (and all other Federal agencies) to “utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species.”

NOAA Fisheries is a steward of the nation’s living marine resources, including fisheries, most marine mammals, anadromous and marine endangered and threatened species, and their habitats and ecosystems. NOAA Fisheries also assesses many living marine resources to promote their recovery and long-term sustainability. NOAA Fisheries' responsibilities for marine mammals and endangered species are defined under the ESA and MMPA. Pursuant to these laws, NOAA Fisheries monitors, assesses, protects, and recovers marine mammals and endangered and threatened species, and conserves the habitats upon which these species depend. NOAA Fisheries strives to take an ecosystem-based approach to managing living marine resources, recognizing the interconnectedness of ecosystem components and the value of resilient and productive ecosystems to living marine resources.

NOAA Fisheries’ has responsibilities for the [NARW](#)<sup>7</sup> under the MMPA and ESA. This species, whose range overlaps with the area proposed for OSW development, is one of the most endangered large whales in the world (Hayes et al. 2022). NOAA Fisheries, working with other Federal agencies and organizations, is heavily invested in protecting and recovering this species. This species provides important ecosystem services, and its potential extinction could be a leading indicator for other ecosystem disruptions (Pershing et al. 2021). As noted above, section 7(a)(2) of the ESA requires BOEM, in consultation with NOAA Fisheries, to ensure that any action the agencies authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered species or result in the destruction or adverse modification of designated critical habitat; this coordination is accomplished through ESA section 7 consultations. BOEM and NOAA Fisheries are required by the ESA to use the best scientific and commercial data available when carrying out these consultations.

In response to a request for consultation, NOAA Fisheries prepares a Biological Opinion detailing how an agency (i.e., BOEM) action affects a threatened or endangered species and/or its critical habitat and a conclusion as to whether the proposed action is likely to jeopardize the continued existence of the species. It considers whether the action will result in reductions in reproduction, numbers, or distribution of the species and then considering whether these reductions would reduce appreciably the likelihood of both the survival and recovery of the species, as those terms are defined for purposes of

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<sup>6</sup> [www.boem.gov/renewable-energy](http://www.boem.gov/renewable-energy)

<sup>7</sup> [www.fisheries.noaa.gov/species/north-atlantic-right-whale](http://www.fisheries.noaa.gov/species/north-atlantic-right-whale)



the ESA. The Biological Opinion also includes a determination as to whether the proposed action is likely to result in the destruction or adverse modification of designated critical habitat. If a “jeopardy” or “adverse modification” conclusion is reached, the Biological Opinion would include one or more Reasonable and Prudent Alternatives to the proposed action that would avoid the likelihood of jeopardizing the continued existence of the listed species or the destruction or adverse modification of designated critical habitat.

If a “no jeopardy” conclusion is reached, either based on the proposed action and its mitigation or after adopting a Reasonable and Prudent Alternative, NOAA Fisheries may issue an Incidental Take Statement that exempts a certain amount and type of take from the ESA section 9 prohibitions on take. The Incidental Take Statement includes Reasonable and Prudent Measures and Terms and Conditions to minimize and monitor that take. When processing requests for incidental take authorizations for OSW under the MMPA, NOAA Fisheries may only authorize take of small numbers of marine mammals and must find that the total authorized take will have a negligible impact on the affected marine mammal species and stock. In any marine mammal incidental take authorization, NOAA Fisheries must also prescribe mitigation measures that affect the least practicable adverse impact on marine mammals and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and include requirements pertaining to monitoring and reporting.

### 2.3 Status of the NARW

NARWs are listed as endangered under the ESA and considered depleted under the MMPA. The species is in decline (Pace III et al. 2017; Pace III et al. 2021) and experiencing an ongoing unusual mortality event, which was declared in 2017 (Daoust et al. 2018; NOAA Fisheries 2022a). The population estimate in NOAA Fisheries’ most recent Stock Assessment Report (Hayes et al. 2022) is 368 individuals (95% CI: 356–378); this estimate is based on information through January 2019. The most recent population estimate (Pettis et al. 2022) is 336 individuals; an official updated estimate will be included in subsequent stock assessments. The potential biological removal (PBR) level for the species, defined as the maximum number of animals that can be removed annually while allowing the stock to reach or maintain its optimal sustainable population level, is less than 1 (Hayes et al. 2022). In addition to vessel strikes and entanglement in fishing gear, which are the primary causes of NARW mortality and serious injury, modeling indicates that low female survival, a male-biased sex ratio, and low calving rates are contributing to the population’s current decline (Pace III et al. 2017). The species has low genetic diversity, as would be expected based on its low abundance, and the species’ resilience to future perturbations is expected to be very low (Hayes et al. 2018).

Decreased prey abundance, climate-driven changes in habitat, and, potentially, ocean noise, also are contributing to the species decline and could further reduce calving rates and increase susceptibility to disease and predation. Entanglement in fishing gear appears to have had substantial health and energetic costs that affect survival, reproduction, and decreased size at maturation for NARW (Stewart et al. 2022; Stewart et al. 2021; van der Hoop et al. 2017). Sublethal effects from changes in prey availability are difficult to separate from other sublethal effects (e.g., entanglement in fishing gear). These stressors likely decrease the health of NARWs, which causes a decrease in calving rates. Calving rates have slowed from 1 calf/female every 3–4 years to 1 calf/female every 7–10 years (Pettis et al. 2022).

NARWs feed primarily on the late-stage, lipid-rich copepod *Calanus finmarchicus* but supplement their diet with other zooplankton species (Baumgartner et al. 2017). To survive, right whales must find and feed on dense aggregations of copepods (Baumgartner and Mate 2003). Climate-driven changes in ocean conditions have shifted the distribution of NARW prey (e.g., Grieve et al. (2017), Record et al. (2019), Meyer-Gutbrod and Greene (2017), Meyer-Gutbrod et al. (2021)). NARWs have in turn shifted their distribution into areas such as Canada's Gulf of St. Lawrence (Crowe et al. 2021) and southern New England, where they are occupying areas not previously occupied for at least the past few decades (O'Brien et al. 2022). This shift in distribution has coincided with increased entanglements in fishing gear and vessel strikes (O'Brien et al. 2022) and may be responsible for the increased detections of NARWs in OSW development areas in southern New England (Quintana-Rizzo et al. 2021).

As of October 2022, the ongoing [NARW Unusual Mortality Event](#)<sup>8</sup> includes a total of 91 documented animals: 34 dead stranded NARWs (21 found in Canada; 13 in the United States), 21 seriously injured free-swimming NARWs, and [36 sublethally injured or ill NARWs](#)<sup>9</sup> (morbidity) (NOAA Fisheries 2022a; 2022c). Examinations by necropsy or photo documentation have been conducted on 23 of the 34 dead whales. Final results from some examinations are pending; however, preliminary findings indicate vessel strikes or entanglements in fishing gear as the causes of death. Additionally, 20 live free-swimming non-stranded whales have been documented with serious injuries from entanglements or vessel strikes, and 36 more have been documented with sublethal injuries and or illness. To date, more than 20 percent of the population has been impacted by the UME based on the documented cases and the 2017 abundance estimate, which is when the UME began. The actual situation is certainly much worse, with cryptic mortality (unobserved mortality, see Pace III et al. (2021)) estimated to be 64% of all mortality.

Based on this information, roughly 230 animals have died since the population peaked at 481 in 2011, exceeding the PBR level on average by more than 40x for the past 5 years. Human-caused mortality is so high that no adult NARW has been confirmed to have died from natural causes in several decades; for a species that might live a century, most animals have a low probability of surviving past 40. Consequently, for the remaining reproductively active females (currently fewer than 70 in number) and any subsequent calves that might mature, their lifetime calving potential has been reduced from more than a dozen to perhaps just 2–3 calves. In addition, the proportion of the population with compromised body condition has increased steadily for 20 years. Today, about 42% of the population is known to be in reduced health (Hamilton et al. 2021), likely contributing to the smaller body sizes at maturation (Stewart et al. 2022) and making them more susceptible to threats generally, including potential impacts from OSW development.

Due to the declining status of NARWs, the resilience of this population to stressors affecting their distribution, abundance, and reproductive potential is low. The species faces a high risk of extinction, and the population size is small enough that the death of even some individuals can have a measurable effect on its population status, trend, and population dynamics. Further, the loss of even one individual

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<sup>8</sup> <https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2022-north-atlantic-right-whale-unusual-mortality-event>

<sup>9</sup> [https://www.fisheries.noaa.gov/feature-story/thirty-six-morbidity-cases-added-north-atlantic-right-whale-unusual-mortality-event?check\\_logged\\_in=1](https://www.fisheries.noaa.gov/feature-story/thirty-six-morbidity-cases-added-north-atlantic-right-whale-unusual-mortality-event?check_logged_in=1)

a year may reduce the likelihood of recovery and of the species' achieving optimum sustainable population.<sup>10</sup>

NOAA Fisheries' [North Atlantic Right Whale Priority Action Plan for 2021–2025](#)<sup>11</sup> identifies the need to improve our knowledge of factors that may limit NARW recovery, such as OSW development (NOAA Fisheries 2021). The plan identifies the need for a robust and comprehensive analysis of temporary and long-term direct and indirect impacts of OSW development from construction through decommissioning. Assessing and mitigating threats associated with the development of OSW has also been identified in NOAA Fisheries' [North Atlantic Right Whale Road to Recovery](#),<sup>12</sup> which describes NOAA Fisheries' overall efforts to stop the current population decline and recover the species (NOAA Fisheries 2022b). Within the *Road to Recovery*, NOAA Fisheries identifies major existing threats to NARWs, including entanglements, vessel strikes, ocean noise, and climate-driven changes in habitat and habitat use (including prey). Given these threats, OSW must be developed responsibly in order to not exacerbate the species dire status.

## 2.4 Intersection of NARWs and OSW

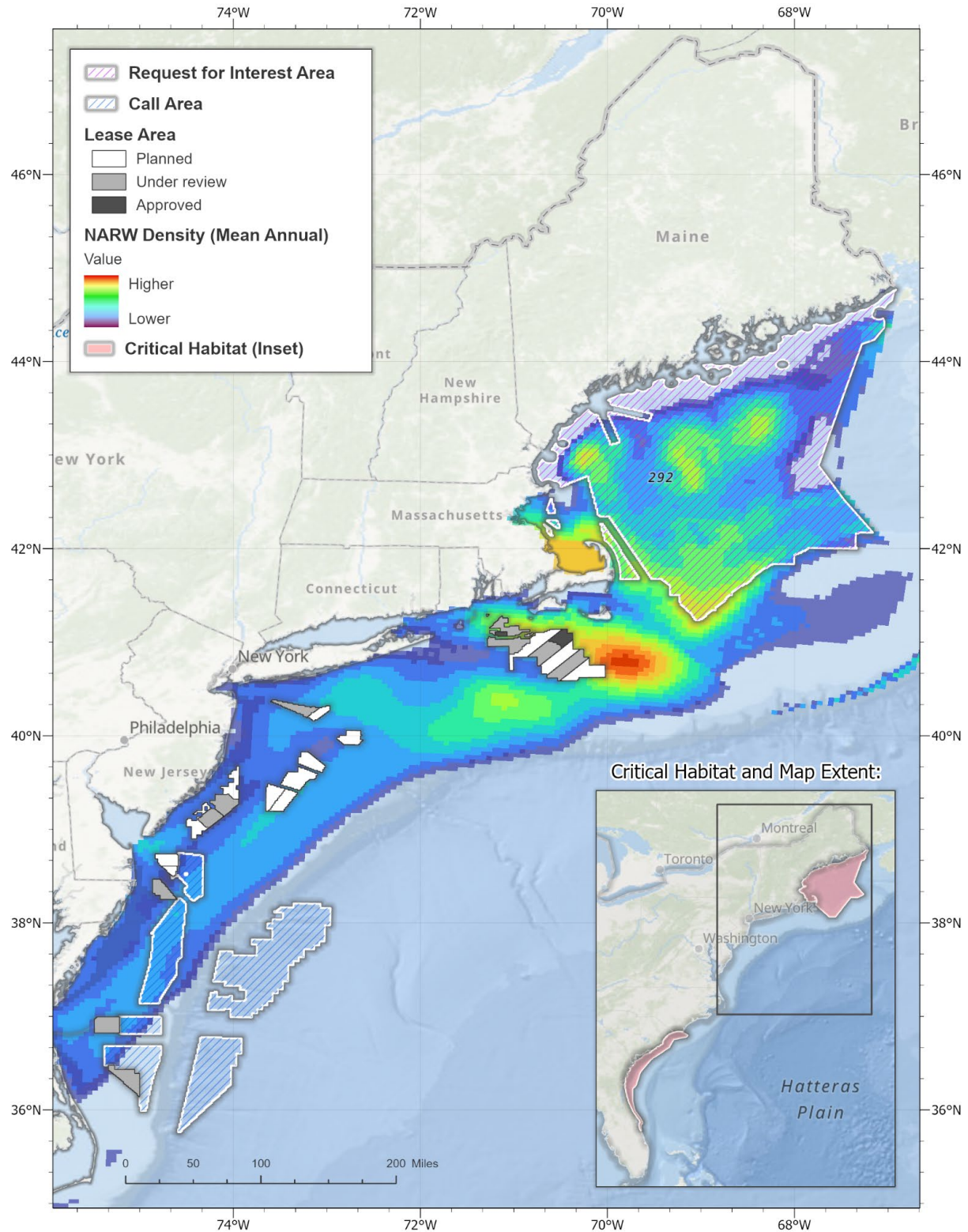
NARWs inhabit the waters of the U.S. and Canadian Atlantic, with some parts of their range designated as critical habitat under the ESA (81 FR 4838, January 27, 2016) and Canada's Species At Risk Act (Fisheries and Oceans Canada 2014). Within the areas proposed for OSW development in the U.S., NARWs engage in migration, foraging, socializing, reproductive, calving, and resting behaviors critical to their survival (Leiter et al. 2017; Muirhead et al. 2018; Quintana-Rizzo et al. 2021; Zoidis et al. 2021). The overlap between OSW development (planned, leased, and permitted) and NARW habitat extends to corridors outside the immediate development sites, where vessel traffic between ports and offshore sites would further overlap with the distribution of NARWs (**Figures 1a and 1b**, and **Appendix C**). Noise and ecosystem-level changes resulting from OSW development that may impact NARWs are also likely to extend beyond the immediate OSW lease areas. In the OCS off the southeast U.S., overlap between OSW development is highly seasonal, with NARWs mostly present between November and May. In the OCS off the northeast and Mid-Atlantic regions, NARWs are present year-round. See **Appendix C** for detailed maps of NARW density and distribution by month in relation to current and planned OSW activity.

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<sup>10</sup> The term "optimal sustainable population" is defined in the MMPA as "with respect to any population stock, the number of animals which will result in the maximum productivity of the population or the species, keeping in mind the carrying capacity of the habitat and the health of the ecosystem of which they form a constituent element."

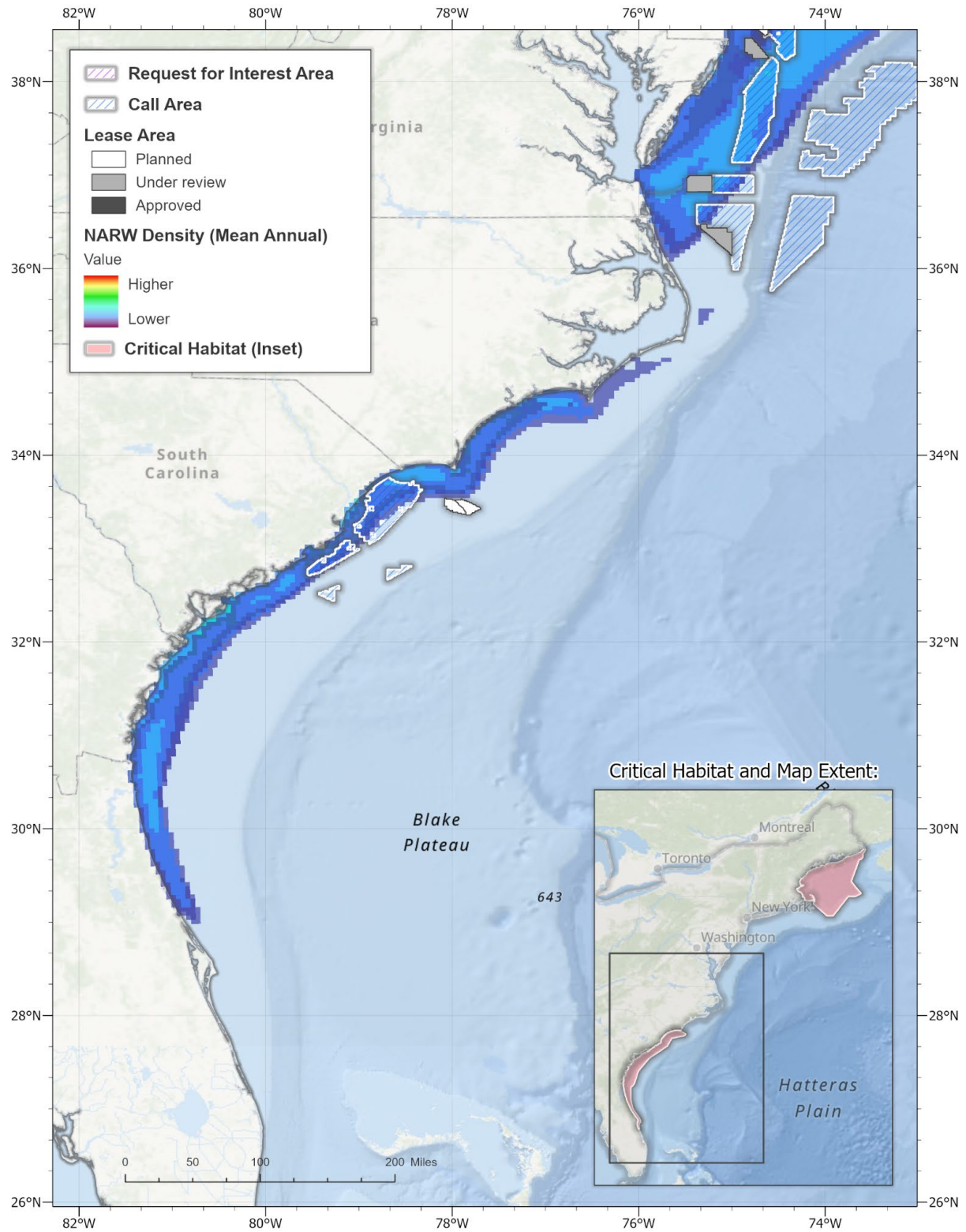
<sup>11</sup> [www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2021-2025-north-atlantic-right-whale](http://www.fisheries.noaa.gov/resource/document/species-spotlight-priority-actions-2021-2025-north-atlantic-right-whale)

<sup>12</sup> [www.fisheries.noaa.gov/species/north-atlantic-right-whale#road-recovery](http://www.fisheries.noaa.gov/species/north-atlantic-right-whale#road-recovery)



**Figure 1a. Status of OSW activity overlaid on mean annual density of NARWs in the northeast U.S. (2010–2019) (Roberts et al. 2016; Roberts and Halpin 2022)**

Inset shows designated NARW critical habitat in U.S. waters.



**Figure 1b. Status of OSW activity overlaid on mean annual density of NARWs in the southeast U.S. (2010–2019) (Roberts et al. 2016; Roberts and Halpin 2022)**

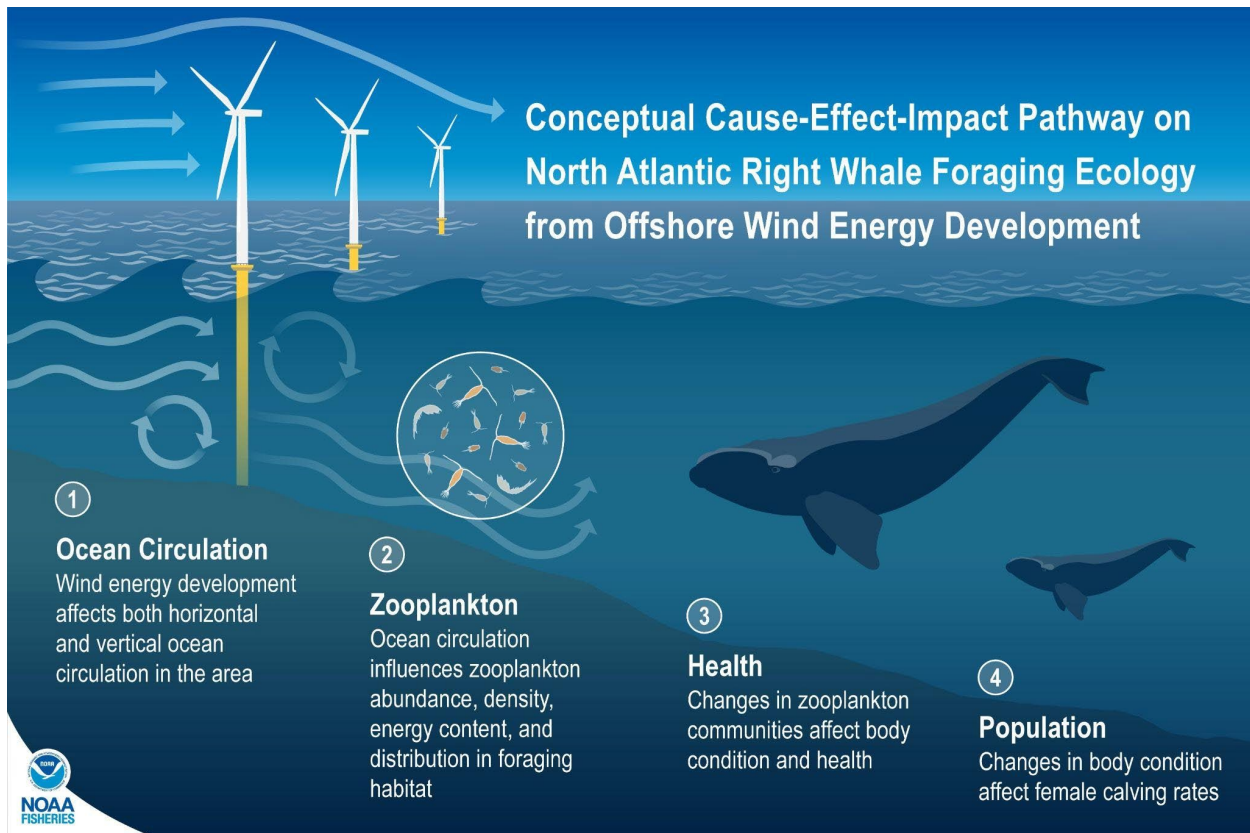
Inset shows designated NARW critical habitat in U.S. waters.

The activities associated with OSW development would introduce stressors that may affect NARWs into the environment (Dorrell et al. 2022; Leiter et al. 2017; Maxwell et al. 2022; Quintana-Rizzo et al. 2021). The four primary stressors identified in this Strategy include the following:

1. **Exposure to noise and/or pressure**, which, depending on the activity, could result in injury, hearing impairment, and/or behavioral disturbance (as well as pressure-related mortality and injury for detonations of unexploded ordinances [UXO])
2. **Entanglement related to OSW development**, including changes in fishing activities leading to increased NARW entanglement risk in fishing gear, biological monitoring activities, or entanglement linked to appurtenances of development (e.g., from floating wind turbines, cables, moorings)
3. **Increased risk of strikes from vessels involved in OSW projects**, including development and long-term operations and maintenance activities, and from potential shifts in species and/or vessel distribution (e.g., if vessels get pushed out of lease areas and into areas where there are more NARWs)
4. **Changes to habitat**, which may affect the abundance, quality or availability of prey (e.g., changes in ocean circulation and mixing from in-water structures, including turbines and foundations, and impingement or entrainment of prey in cooling water intakes associated with High Voltage Direct Current cable systems) or attract predators (e.g., predators with an affinity for a new “reef structure” in the environment)

Sublethal effects can be direct or indirect, and often the indirect effects are difficult to quantify (although some indirect effects such as bioenergetic costs can be modeled). Currently, a large data gap in OSW impact assessments is the indirect impacts of OSW on marine mammal prey availability and consumption potential. For example, if sublethal effects from impacts to foraging habitats occur, they could follow the cause-effect-impact pathway below and result in impacts to female condition and calving rates (**Figure 2**):

- Wind energy development occurs in or near NARW foraging habitat
- Wind energy development affects sub-mesoscale (1–10 km) horizontal and vertical circulation (e.g., currents and mixing)
- Wind energy development affects mesoscale (10–200 km) horizontal and vertical circulation (e.g., currents and mixing)
- Changes in sub-mesoscale and or mesoscale circulation affects zooplankton abundance/concentration, energy content, and distribution
- Changes in zooplankton abundance/concentration, energy content and distribution affects the quality of NARW foraging habitat
- Changes in NARW foraging habitat affects female condition and calving rates



**Figure 2. Conceptual cause-effect-impact pathway on NARW foraging ecology from OSW development**

Similar cause-effect-impact pathways can be developed for other sublethal effects, such as displacement from calving grounds, impacts of ocean noise, reduced lactation or reduced nursing, and reduced ability to become pregnant or maintain a viable pregnancy. Ultimately, sublethal effects, such as reduced calving (due to either lack of conception or failed gestation), can have a similar impact on the species as lethal effects, as they reduce the potential for the population to grow (Moore et al. 2021; Sharp et al. 2019). Moreover, increased energetic costs (e.g., from displacement from foraging areas due to noise or prey availability) could lead to increased susceptibility to other stressors (e.g., a shift in distribution can change the overlap with vessel traffic and fishing activities). Cause-effect-impact pathways also can vary based on body condition (Bishop et al. 2022; Christiansen et al. 2020; Moore et al. 2021; Pettis et al. 2017). Whales that are in compromised condition (e.g., injured, entangled, malnourished) and exposed to stressors from OSW are more likely to experience severe consequences than healthy animals (Christiansen et al. 2020; Knowlton et al. 2022; Moore et al. 2021; Pettis et al. 2017).

Effects to NARWs could result from exposure to a single project and may be compounded by exposure to multiple projects. It is important to recognize that NARWs migrating along the U.S. Atlantic Coast travel through or nearby every proposed OSW development. If the OSW development being considered in the Gulf of Maine moves forward, it would occur in designated NARW critical habitat (Leiter et al. 2017; O'Brien et al. 2022; Quintana-Rizzo et al. 2021; Stone et al. 2017).

## 2.5 NARW and OSW Research and Monitoring Efforts

Previous, current, and ongoing research efforts supported by BOEM, NOAA, OSW industry, and other partners and stakeholders over the past 15 years provide the best available science to inform consideration of the effects of OSW on NARWs. To ensure BOEM and NOAA Fisheries had an inventory of available and planned research and mitigation methods and technologies prior to developing this Strategy, BOEM contracted with the Blue World Research Institute, Inc. (BWRI) to synthesize current and near-term NARW research and monitoring efforts, in-use or developing tools and methods, and measures to avoid or minimize OSW-related impacts on the NARW population (see Silber et al. (in review)). BWRI canvassed OSW energy industry representatives, NARW researchers, environmental groups, and others about their ongoing and planned work and their views on innovations that may be applied in a 1- to 5-year time horizon. The research emphasized emerging or novel uses of existing methodologies that study NARW occurrence, distribution, and health, as well as potential impact-mitigating methods and technologies.

The report's findings acknowledge the magnitude of work previously and currently being undertaken related to NARWs and OSW (as well as future planned efforts), but the document does not include an exhaustive list of all research efforts to date. Examples of this work include support for workshops, working groups, passive acoustic monitoring, vessel and aerial monitoring, photo identification, infrared camera and related technology studies, satellite, and unmanned aerial vehicle (UAV) remote sensing, tagging and telemetry, oceanographic, ecological and prey studies, noise and quieting, stress and health, modeling, habitat-based density modeling and analysis techniques, and risk assessments (including vessel strike, entanglement and population-level risk assessment) (Silber et al. in review).

The following workshops held over the past five years provide an overview of areas where BOEM and NOAA Fisheries recently have been focusing efforts and will improve the understanding of the interaction between NARW and OSW:

- March 2017 *Workshop on Best Management Practices Workshop for Atlantic Offshore Wind Facilities and Marine Protected Species* (BOEM 2018)
- May 2018 *Workshop on a Framework for Studying the Effects of Offshore Wind Development on Marine Mammals and Turtles* (Kraus et al. 2019)
- June 2019 *Workshop on Health Assessment Workshop for North Atlantic Right Whales* (Fauquier et al. 2020)
- October 2019 *Workshop on Monitoring and Surveillance: North Atlantic Right Whale Expert Working Group* (Oleson et al. 2020)
- October 2020 *Workshop on New York Bight Passive Acoustic Monitoring* (Wildlife Conservation Society 2021)
- November 2020 *Workshop on the State of the Science on Wildlife and Offshore Wind Energy 2020: Cumulative Impacts* (Southall et al. 2021)
- Periodic meetings of the Atlantic Scientific Review Group (ASRG) to advise on the status of marine mammal stocks



- April 2022 workshop on *Oceanographic Impacts of Offshore Wind Energy Development: Implications for Protected Species* (report under development)

Overall, the BWRI report demonstrates how BOEM, NOAA Fisheries, and others have actively worked to understand NARWs and the intersection of this species and OSW development, and to develop mitigation strategies that minimize impacts to NARWs. As the OSW industry continues to grow and as projects begin construction, BOEM and NOAA Fisheries will continue to work with our partners to evaluate existing strategies and to further collect and apply newly available information to inform future decisions. This Strategy is an integral step to organize BOEM, NOAA Fisheries, and their partners around a shared vision and clear path to effectively study and manage this issue moving forward.

### 3 Strategy Framework

In March 2021, in response to Executive Order 14008, the Departments of the Interior, Energy and Commerce announced a national goal to deploy 30 gigawatts of OSW by 2030, while protecting biodiversity and promoting ocean co-use. This Strategy's shared vision, therefore, is *to protect and promote the recovery of North Atlantic right whales while responsibly developing offshore wind energy*. This Strategy identifies areas where BOEM and NOAA Fisheries will work together, and with partners, to improve the information and science needed to responsibly develop OSW and protect and recover NARWs.

This Strategy addresses three main goals: 1) Mitigation and Decision-Support Tools, 2) Research and Monitoring, and 3) Collaboration, Communication and Outreach. This Strategy then identifies more specific priorities and specific actions under each of those goals (see below; also see **Appendix A** for more detail on the actions). This Strategy also lays out the agencies' plan to engage stakeholders, partners, and other ocean users throughout (per Goal 3) and identifies potential sources for financial resources needed for successful implementation.

This Strategy is intended to be a "living" document that will be regularly evaluated and updated as we make progress and new information becomes available. A joint BOEM-NOAA Fisheries NARW and OSW strategy implementation group will be formed to update progress regularly; to identify resources, needs, and collaborations for continued implementation; and to employ adaptive approaches for implementing of the Strategy. The Strategy is part of and important to NOAA Fisheries' broader overall strategy for NARWs laid out in NOAA Fisheries (2022b).

BOEM and NOAA Fisheries recognize the ongoing efforts internal and external to Federal agencies with similar goals. For example, we encourage coordination of research and monitoring efforts through the [Regional Wildlife Science Collaborative for Offshore Wind](#) (RWSC)<sup>13</sup> to increase effectiveness, utility, and data sharing. As another example, NOAA Fisheries' *North Atlantic Right Whale Road to Recovery* highlights the need to address threats to the species and monitor its progress toward recovery; this Strategy provides more detail on the threats and mitigation of these threats specifically related to OSW energy development. This Strategy will be implemented in coordination with the NOAA Fisheries *Road to Recovery* and other NOAA Fisheries and BOEM activities related to NARW protection and recovery.

It is important to note that this Strategy will not supersede the policy and regulatory processes of the two agencies; it is intended to provide direction to agencies and partners for improving information and science needed to support the agencies' work related to policy, the application of regulations to OSW, and project approvals. This work also will support the continued development and refinement of mitigation and monitoring standards that will be adapted as new information is collected and collated under the Strategy. Further, NOAA and BOEM recognize that the majority of the funding required to support the actions described in this Strategy will require support from multiple sources, including, government, states, industry and other stakeholders. This funding has not been secured; this Strategy can be used to guide efforts to secure funding to further information and science to support the agencies' shared vision.

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<sup>13</sup> <https://rwsc.org/>

## GOAL 1: Mitigation and Decision-Support Tools

*Develop, use, and evaluate measures that avoid or minimize impacts of OSW activities on NARWs and their habitat. Establish quieting performance standards for OSW. Work to improve and develop tools to support decision-making as it relates to OSW development and NARW recovery. Ensure mitigation and decision-support tool development are undertaken in close coordination with those entities involved in regulation, rulemaking, and decisions related to NARWs and OSW.*

The definition of mitigation used in this Strategy is derived from the Council on Environmental Quality (CEQ) NEPA regulations (40 CFR 1508.1(s)). [NOAA's Mitigation Policy for Trust Resources](#)<sup>14</sup> (NAO 216-123) uses the CEQ definitions and then bins mitigation into three elements: avoidance, minimization, and compensation.<sup>15</sup> As defined below, this Strategy supports avoiding impacts as the primary goal wherever practicable, followed by impact minimization.

- **Avoid** – avoid the impact altogether by not taking a certain action or parts of an action or by modifying the action to avert impacts
- **Minimize** – minimize the impact by limiting the degree or magnitude of the impact, the action, or its implementation

The key actions for this category are noted below and described in more detail in **Appendix A**.

- 1.1 Refine and develop additional general mitigation and monitoring measures that are effective at avoiding or minimizing effects of OSW projects on NARWs, individually and cumulatively. Review and update these measures (on a case-by-case basis or programmatic basis) as more information becomes available.
- 1.2 Prioritize research, development, and implementation of mitigation on quieting technology and methods for OSW.
- 1.3 Develop risk-analysis and decision-support tools to improve how project-specific and cumulative environmental effects from OSW are evaluated for NARWs and their habitat considering each primary threat to NARW recovery related to OSW, including entanglement, vessel strike, acoustics/noise, changes in habitat and habitat use (including prey).

With respect to Action 1.1, the agencies have developed a list of preliminary measures that have potential to avoid and minimize impacts to NARWs from OSW activities. These measures are categorized by renewable energy development stages: (1) project planning, siting, and leasing; (2) site characterization and UXO surveys; and (3) construction and operations. The intent of the measures identified for project planning, siting, and leasing are to avoid and minimize impacts to NARWs at the

<sup>14</sup> <https://www.noaa.gov/organization/administration/noaa-administrative-orders-chapter-216-program-management/nao-216-123-noaa-mitigation-policy-for-trust-resources>

<sup>15</sup> CEQ defines compensation as to “offset or compensate for the impact by replacing or providing equivalent substitute resources or environments.” Compensation in the context of offsetting impacts to NARW from one sector through modifications to activities in another sector has not been considered through NEPA, ESA, or MMPA, thus this strategy focuses on avoiding and minimizing impacts to NARWs from OSW.

onset of exploring potential lease areas, which provides the most protection to the species. During site characterization/UXO survey phases, the measures are designed to minimize noise from survey sources into the marine environment and minimize exposure of NARWs to unavoidable noise sources. Lastly, during construction and operation, the measures are designed to minimize noise footprints and NARW exposure to noise during construction; avoid vessel strikes and entanglement; and ensure detection of NARWs is maximized through the use of protected species observers (PSOs) and passive acoustic monitoring (PAM) to trigger mitigative actions. The agencies also have developed preliminary monitoring measures to better understand, detect, and mitigate impacts to NARWs during site assessment/UXO survey and construction and operation phases. Details regarding these measures can be found in **Appendix B**.

The agencies are sharing the measures to communicate the types of requirements that regulatory agencies and project proponents have, and will continue, to consider for individual projects. It is important to note that these measures will be updated, as appropriate, and that none of the measures included here supersede measures developed during project-specific environmental review approvals or other regulatory actions (e.g., vessel speed rule). Furthermore, commitments by developers to implement any or all of these measures in proposed plans or other documents seeking authorization from BOEM or NOAA Fisheries does not ensure approval of projects or other authorizations, as those decisions are made on a case-by-case basis.

Action 1.2 recognizes that the benefits of quieting the oceans apply to many marine resources, including marine mammals, sea turtles, fish, and invertebrates. With respect to addressing noise impacts, the agencies share a common goal of reducing noise generated during OSW construction and operation. Though many activities associated with OSW operation and construction produce noise, this Strategy currently focuses on quieting pile-driving and vessel noise. For example, when activities such as pile driving cannot be avoided (e.g., through the use of foundations that do not require pile driving), pile-driving-quieting technology and methods should be applied. Although developers are already committing to using quieting technology, such as noise abatement systems during pile driving of turbine and substation foundations, the effectiveness of such technology can be improved by broadening the scope of quieting actions and through further technological innovation, especially with respect to lower frequency hearing specialists like NARWs. BOEM intends to pursue development of a quieting performance standard for impact pile driving to set a common goal for providing additional environmental protection, promoting predictability, and driving technological innovation. Goal 1 includes several actions involving quieting technology and methods (see **Appendix A**) to reduce noise during impact and vibratory pile driving of foundation piles and to encourage integration of vessel quieting technology in new OSW vessels built in the United States.

Finally, Action 1.3 identifies the needs for decision-support tools that address the four identified stressors to NARWs from OSW: entanglement, vessel strike, acoustics/noise, and climate-driven changes in habitat and habitat use (including effects to prey). This action includes assessing our current understanding of these threats to identify any data gaps, evaluating the current tools available to support evaluation of effects, and developing tools to provide for both qualitative and quantitative analyses. Over time, the intent is to develop and combine tools to evaluate cumulative and synergistic effects (Goal 2).

## GOAL 2: Research and Monitoring

*Identify, support, and conduct research and monitoring to better understand the current status of NARWs (e.g., abundance, distribution, life history, health, habitat use, and ecological interactions);<sup>16</sup> understand the impacts to NARW from project-level and cumulative effects from multiple projects; and evaluate and address any uncertainty associated with the effects of OSW development.*

Monitoring under this goal relates to “general monitoring” specific to NARW and OSW that is conducted to increase knowledge of the species, improve tool development, and enhance understanding of the effects of OSW development on NARWs. This differs from “mitigation monitoring” (i.e., observation/detection), which is discussed under Goal 1 (Mitigation and Decision Support) and is carried out to avoid or minimize an effect during a particular OSW activity (e.g., monitoring an area for NARWs prior to starting pile driving). The actions under general monitoring are predominantly long-term efforts and could involve collecting data before and during OSW construction, and during operation. The study design for any particular general monitoring effort will differ depending on the specifics of the situation (e.g., location, desired data, methodology).

The key actions for this category are noted below and described in more detail in **Appendix A**.

- 2.1 Develop and disseminate a research plan that identifies key data gaps related to NARW and OSW development and details how to work with partners, stakeholders, and other ocean users to fill data gaps. The research plan will include a variety of research methods (e.g., acoustic and vessel surveys, aerial surveys, tagging, eDNA) appropriate to the question being addressed.
- 2.2 Support the development of studies with sufficient statistical power to detect changes in NARW ecology and demographics resulting from OSW development (e.g., changes in foraging activity, residency in key habitats, displacement) at various scales (e.g., turbine, development, regional, ecosystem).
- 2.3 Develop and support efforts to improve understanding of OSW impacts on oceanographic and lower trophic level ecosystem processes for all foundation, turbine, mooring, and layout types, with a particular focus on understanding impacts on the distribution and abundance of NARW zooplankton prey.
- 2.4 Implement NARW monitoring efforts identified in the draft [NOAA Fisheries and BOEM Northeast U.S. Federal Survey Mitigation Strategy](#)<sup>17</sup> to mitigate disruption of existing survey strategies by OSW development.

<sup>16</sup> Note that NOAA Fisheries’ *North Atlantic Right Whale Road to Recovery* includes an objective of “Monitor Population and Health,” which provides an understanding of individual health and reproduction, as well as distribution, abundance, and habitat-use patterns of the population. NOAA Fisheries is developing a comprehensive U.S. strategy related to NARW population and health status, as well as distribution and habitat use (NOAA Fisheries 2022b).

<sup>17</sup> [media.fisheries.noaa.gov/2022-03/NOAA%20Fisheries-and-BOEM-Federal-Survey-Mitigation\\_Strategy\\_DRAFT\\_508.pdf](https://media.fisheries.noaa.gov/2022-03/NOAA%20Fisheries-and-BOEM-Federal-Survey-Mitigation_Strategy_DRAFT_508.pdf)

- 2.5 Monitor and assess how OSW development changes NARW risk to vessel strikes and entanglement, including vessel strike and entanglement risk from OSW development itself, as well as risk from non-OSW activities that are influenced by OSW development (e.g., shifts in fishing or vessel activity due to construction and operation of OSW projects).
- 2.6 Support innovation and improvements in NARW detection technologies, including acoustic and visual techniques.
- 2.7 Assess cumulative impacts of all phases of all OSW on NARWs and the ecosystems on which they depend.
- 2.8 Develop and support long-term data management and archival systems for data collected as part of the Strategy.
- 2.9 Evaluate uncertainties in ability to monitor, document, or detect impacts from OSW development on NARWs and develop plans to address those uncertainties.

In implementing these key actions, the following additional data and research areas are prioritized:

- Data and research to assess the potential of OSW to alter NARW foraging ecology, habitat and habitat use (inclusive of foraging, calving, migration, socializing, and other behaviors), and predation risk, as well as to assess when such alterations may have population-level consequences (lethal and/or sublethal effects).
- Data and research to assess how OSW development may contribute to vessel strike risk. Considering NOAA Fisheries' existing NARW vessel speed regulations and forthcoming modifications, research should include monitoring vessel strike risk associated with OSW development and assessing how non-OSW vessel traffic affected by OSW development may change risk (e.g., shifts in vessel patterns due to presence of OSW structures) that may warrant additional mitigation through project-specific approvals.
- Data and research to assess how OSW development may contribute to entanglement risk. Evaluate entanglement risk from appurtenances (e.g., cables) associated with OSW development or biological monitoring activities associated with development of floating wind technology. Develop approaches to reduce entanglement risk. Understand how changes in fishing effort resulting from OSW development changes the risk profile for NARW entanglement in fishing gear.
- Data and research to assess, avoid, and minimize noise/acoustic impacts from OSW activities, including long-term operation of wind turbines.
- Data and research to assess the cumulative effects of OSW combined with other human activities. The definition of cumulative effective for purposes of this Strategy is derived from the CEQ NEPA regulations (40 CFR 1508.1): "Cumulative effects, which are the impact on the environment resulting from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions."

## GOAL 3: Collaboration, Communication and Outreach

*BOEM and NOAA Fisheries recognize that continued collaboration between the two agencies is needed for the success of this Strategy. Further, the two agencies recognize that internal and external communication and outreach are important for the success of this Strategy. NOAA Fisheries and BOEM will have a transparent process for communication and outreach to support the appropriate goals of this Strategy. To meet this goal, BOEM and NOAA Fisheries will develop and implement this Strategy by strengthening partnerships, combining resources, and sharing and communicating information. BOEM and NOAA Fisheries will also ensure professional, transparent, and equitable communication; and engagement with Tribes, Federal and state agencies, partners, and stakeholder groups.*

The key action for this category is noted below and described in more detail in **Appendix A**.

- 3.1 Develop long-term and proactive coordination strategies, including establishing a NOAA and BOEM NARW and OSW strategy implementation group, and share outreach and communications plans.

The objectives of this goal include the following:

- For BOEM and NOAA Fisheries to collaborate effectively on implementing this Strategy, including integrating this Strategy with NOAA Fisheries' *Road to Recovery*
- To provide opportunities for partners and stakeholders to comment on and contribute to the Strategy
- To develop a collaborative environment to provide for interaction between stakeholders and partners
- To emphasize scientific processes, including scientific integrity, peer-reviewed publications, scientific presentations, independent peer review, and publicly accessible data and documents
- To properly consider Indigenous Traditional and Local Ecological Knowledge
- To conduct outreach on the Strategy from development through implementation

Communication and outreach will consist of the following methods:

- **Publications:** Scientific publications are foundational to the scientific process. Publishing, particularly when peer review is involved, improves the quality of the science, ensures the results are publicly available, and provides a record of the scientific progress supported by the Strategy.
- **Presentations:** NOAA Fisheries and BOEM will be proactive in presenting and communicating the Strategy to scientists, policy makers, partners, stakeholders, and the public, whenever appropriate. Such meetings may include scientific conferences, regional planning meetings, workshops, and information seminars.
- **Workshops:** As new information becomes available, workshops will be used to further progress on different components of the Strategy. These workshops will serve to develop and inform specific areas related to the Strategy as new information warrants.

- **Solicitation of Comments:** There will be opportunities for partners and the public to provide comments and input on the Strategy. NOAA and BOEM will share information on the public input process as the initiative evolves.
- **Public Access to Information:** Relevant documents will be posted online and available to the public on a website dedicated to this Strategy.
- **Press Releases and Science Briefs:** All important events—such as relevant meeting announcements, and start and completion of projects and plans—will be announced publicly via press releases.
- **Independent Scientific Peer Review:** Where appropriate, independent peer-review panels will evaluate different components of the Strategy, such as associated research plans, changes in statistical designs, and new analyses based on new data.



## 4 Partners

The Strategy calls for a collaborative approach to support the protection, and to promote the recovery, of NARW while responsibly developing OSW. Engagement with federally recognized Tribes, Federal and state agencies, industry, partners, stakeholders, and other ocean users are critical to the success of the Strategy. Though not an exhaustive list, the following represents key partners.

### 4.1 Government

**NOAA Office of National Marine Sanctuaries** is the trustee for a network of underwater parks, including Stellwagen Bank and Gray's Reef National Marine Sanctuaries in the U.S. Atlantic. Stellwagen Bank National Marine Sanctuary is one of the world's premiere whale-watching destinations and a historically important fishing ground. Gray's Reef National Marine Sanctuary is a natural live-bottom reef and is part of the NARW's calving grounds. NOAA Fisheries and NOAA National Marine Sanctuaries share NOAA's mission to 1) understand and predict changes in climate, weather, ocean and coasts; 2) share that knowledge and information with others; and 3) conserve and manage coastal and marine ecosystems and resources. (More information at [sanctuaries.noaa.gov/about/](https://sanctuaries.noaa.gov/about/))

The **Marine Mammal Commission** is an independent government agency charged by the MMPA to further the conservation of marine mammals and their environment. The Commission works to ensure that marine mammal populations are restored and maintained as functioning elements of healthy marine ecosystems. They provide science-based oversight of domestic and international policies and actions of Federal agencies with mandates to address human impacts on marine mammals and their ecosystems. (More information at [www.mmc.gov/](http://www.mmc.gov/))

The **U.S. Navy** is responsible for compliance with a suite of Federal environmental laws and regulations that apply to marine mammals and other marine protected species, including the ESA and MMPA. As part of the regulatory compliance process associated with these Acts, the Navy is responsible for meeting specific requirements for monitoring and reporting on military readiness activities involving active sonar and underwater detonations from explosives and explosive munitions. These military readiness activities include Fleet training events and Navy-funded research, development, test, and evaluation activities. The U.S. Navy, BOEM, and NOAA Fisheries have partnered for decades on issues related to marine mammal and endangered species protection and recovery. (More information at [www.navy.mil/](http://www.navy.mil/))

The **U.S. Department of Transportation Maritime Administration** is the Department of Transportation agency responsible for America's waterborne transportation system, the Maritime Administration (MARAD). MARAD supports the technical aspects of America's maritime transportation infrastructure, such as ships and shipping, port and vessel operations, national security, environment, and safety. MARAD promotes the use of waterborne transportation and ensures that its infrastructure integrates seamlessly with other methods of transportation. (More information at [www.maritime.dot.gov/](http://www.maritime.dot.gov/))

The **Bureau of Safety and Environmental Enforcement** promotes safety, protects the environment, and conserves resources offshore through vigorous regulatory oversight and enforcement. The agency ultimately will work to ensure that OSW development lessees/operators comply with all required laws

and regulations, and requirements in leases, plans and permits, including applied mitigations and conditions of approval. (More information at [www.bsee.gov/](http://www.bsee.gov/))

The **Department of Energy** supports a broad portfolio of OSW research, development, and demonstration projects and continues to work jointly with the Department of Interior to advance OSW development. (More information at [www.energy.gov/eere/wind/wind-energy-technologies-office](http://www.energy.gov/eere/wind/wind-energy-technologies-office))

The **Environmental Protection Agency** works to protect human health and the environment. The agency reviews all Federal environmental impact statements (EISs) prepared by other agencies under NEPA and permits projects under the Clean Air Act. (More information at [www.epa.gov/](http://www.epa.gov/))

The **National Science Foundation** is an independent Federal agency created by Congress in 1950 to promote the progress of science; to advance national health, prosperity, and welfare; and to secure national defense. (More information at [www.nsf.gov/](http://www.nsf.gov/))

The **Deputy Commandant for Operations (DCO) of the United States Coast Guard** is charged with developing and overseeing the execution of operational planning, policy, and international engagement at the strategic level. Additionally, it establishes and maintains relations with interagency partners and maritime stakeholders to support policy development and resource acquisition. The DCO also is charged with ensuring the alignment within mission areas to optimize mission execution as the recognized international leader of Maritime Safety, Security and Stewardship. (More information at [www.dco.uscg.mil/](http://www.dco.uscg.mil/))

The **U.S. Army Corps of Engineers** is an engineer formation of the U.S. Army with three primary mission areas: Engineer Regiment, military construction, and civil works. The Corps' mission is to deliver vital engineering solutions, in collaboration with partners, to secure our Nation, energize our economy, and reduce disaster risk. The Corps also has a role in authorizing certain components of OSW projects through its implementation of section 10 of the Rivers and Harbors Act and section 404 of the Clean Water Act. (More information at [www.usace.army.mil/](http://www.usace.army.mil/))

**Federally Recognized Tribes** are critically important partners, and NOAA Fisheries and BOEM will work to ensure timely and meaningful government-to-government consultation on this Strategy and other engagement with Tribes on wind-related actions affecting NARW, including follow-up and appropriate action. The agencies recognize the particular importance of NARWs to Tribal history, culture, and ancestry.

**States** set renewable energy goals and facilitate agreements for the purchase of OSW. States (individually and through the Atlantic States Marine Fisheries Commission) are also important partners in living marine resource management, working closely with NOAA on sustainable fisheries, wildlife conservation, aquaculture development, and habitat conservation. Some States have been proactive in establishing developer-supported funds that support data collection priorities and communication mechanisms (including the Responsible Offshore Science Alliance). States may review OSW lease sales and projects in Federal waters under Section 307 of the Coastal Zone Management Act (CZMA). However, state CZMA review of OSW projects is not automatic; it depends on whether state review is authorized pursuant to NOAA's CZMA regulations at 15 C.F.R. Part 930.

**Fisheries Management Organizations** (including the South Atlantic, Mid-Atlantic and New England Fisheries Management Councils and Atlantic States Marine Fisheries Commission) are composed of fisheries stakeholders along the East Coast and are responsible for the sustainable management of our nation’s fisheries under the Magnuson-Stevens Fisheries Management and Conservation Act, the Atlantic Coastal Fisheries Cooperative Management Act, and various state laws. These organizations have been working with NOAA Fisheries for years to reduce the impact of fisheries on marine mammals and endangered and threatened species.

**Northeast Regional Ocean Council and Mid-Atlantic Regional Council on the Ocean** are state and Federal partnerships that address ocean and coastal issues from a regional perspective. Both councils augment existing governance structures to generate new information and facilitate communication to advance resource management priorities. (More information at [www.northeastoceancouncil.org/](http://www.northeastoceancouncil.org/) and [www.midatlanticocean.org/](http://www.midatlanticocean.org/))

**Fisheries and Oceans Canada** is responsible for safeguarding Canadian waters and managing Canada's fisheries and oceans resources. The agency conducts science and develops regulations to promote the protection and recovery of NARW in Canadian waters and collaborates on transboundary research and management efforts with NOAA Fisheries through discussions from leadership to staff levels. (More information at [www.dfo-mpo.gc.ca/index-eng.html](http://www.dfo-mpo.gc.ca/index-eng.html))

## 4.2 Industries

**OSW energy leaseholders, grantees, and operators** hold leases and authorizations to construct, operate, and maintain OSW facilities. Industry is responsible for implementing conditions of those authorizations to avoid and minimize the impacts of OSW development on NARWs. Proactive engagement of industry to implement approaches to OSW development beyond regulatory requirements is an important component of this Strategy.

**Commercial and recreational fishing industries** comprises a highly diverse group (fishermen, dealers, processors, retailers, restaurants, and suppliers) involved in catching fish and shellfish, and includes the communities that depend on these industries. The fishing industry will be affected by the development of OSW. NOAA Fisheries engages with this community to protect and recover marine mammals and endangered and threatened species. Many members of this community are participating in modifying gear to reduce risk to NARWs, including participation in the development of Ropeless or On-Demand Fishing to reduce entanglement risk.

**Other industries** relevant to this Strategy include commercial shipping, whale watching, aquaculture, and ecotourism. We will work with these entities on relevant aspects of this Strategy.

## 4.3 Academia/Research Organizations

The **North Atlantic Right Whale Consortium** includes stakeholders from a variety of research and non-governmental groups who share a common interest—research and using the results of that research to formulate science-based conservation measures to protect NARW. (More information at [www.narwc.org/](http://www.narwc.org/))

The **Regional Wildlife Science Collaborative for Offshore Wind** (RWSC) was cooperatively established and is led by four sectors: Federal agencies, states, eNGOs, and the OSW industry. The RWSC supports research and monitoring on wildlife and OSW by identifying priorities for scientific research and monitoring at the project, regional and ecosystem-wide scales; coordinating and aligning funding to meet those priorities; and ensuring appropriate data and standards are in place to support science priorities. (More information at [neooceanplanning.org/rwse/](https://neooceanplanning.org/rwse/))

The **Atlantic Scientific Review Group** (ASRG) advises NOAA Fisheries on the status of marine mammal stocks under Section 117 of the MMPA. The ASRG is a representation of marine mammal and fishery scientists and members of the commercial fishing industry mandated to review the marine mammal stock assessments and provide advice to the NOAA Assistant Administrator for Fisheries. (More information at [www.fisheries.noaa.gov/national/marine-mammal-protection/scientific-review-groups#atlantic-scientific-review-group](https://www.fisheries.noaa.gov/national/marine-mammal-protection/scientific-review-groups#atlantic-scientific-review-group))

**Scientists** from academia and other public and private institutions are actively researching topics related to NARWs and OSW. Collaboration with scientists is needed to identify efficiencies and integrate relevant data, as appropriate, in analyses to fulfill the goals and priorities of this Strategy. Examples include, but are not limited to, the Anderson Cabot Center for Ocean Life at the New England Aquarium and the Center for Coastal Studies.

#### 4.4 Non-Governmental Organizations

**Environmental Organizations** in general have a mission to protect the environment, and many are specifically interested in NARW. Each particular organization has different focal areas and approaches, and different working relationships with BOEM and NOAA Fisheries.

## 5 Financial Resources

The effort to investigate, monitor, and mitigate the impact of OSW development on NARWs is complex and will require extensive resources. The scale of OSW development along the Atlantic Coast continues to increase; thus, the scale needed for research and monitoring, mitigation and decision-support tools, and coordination also increases. The complexity and cost of this effort means that multiple funding sources will be needed to meet the goals of this Strategy. Listed below are some of the potential funding sources.

**NOAA Fisheries Programs**—As supported through congressional appropriations, NOAA Fisheries conducts science related to NARWs, provides scientific support for the regulatory process, has regulatory responsibilities related to NARW status under MMPA and ESA, and is involved in the review and approval of OSW development activities. This Strategy can be used to help identify funding needs for NOAA Fisheries to meet the shared vision to *protect and promote the recovery of North Atlantic right whales while responsibly developing offshore wind energy*.

**BOEM Environmental Studies Program**—BOEM's [Environmental Studies Program](#) (ESP)<sup>18</sup> develops, funds, and manages rigorous scientific research specifically to inform policy decisions on the development of energy (both traditional and renewable), mineral resources, and carbon sequestration on the OCS. BOEM's ESP has an annual budget (of about \$30 million) to support new and ongoing projects. Its research covers physical oceanography, atmospheric sciences, biology, protected species, social sciences and economics, submerged cultural resources, environmental fates and effects, climate science and conservation, and more. The ESP also supports research needs of BOEM's [Center for Marine Acoustics](#).<sup>19</sup> Given the large OCS area under BOEM jurisdiction (almost 2.5 billion acres),<sup>20</sup> leveraging partnerships to satisfy common scientific needs is a central component of BOEM's approach.

**Bureau of Safety and Environmental Enforcement (BSEE)**—BSEE receives funding to support BOEM's environmental compliance and enforcement needs for joint OCS operations. However, BSEE's Environmental Compliance Program will need to dedicate additional staff and operational funding to support the tasks identified in this Strategy.

**OSW Developer Support**—Developers can support this effort through complying with requirements of project approvals and authorizations or through voluntary efforts to fund or carry out actions related to this Strategy. As part of this Strategy, BOEM and NOAA Fisheries will continue to identify the impacts of OSW development on NARWs and ways for developers to mitigate and monitor these impacts. To aid in this effort, **Appendix A** includes development of measures that could be implemented as lease terms, plan conditions, or other mechanisms. BOEM and NOAA Fisheries highly encourage developers to coordinate and share plans, results, and data to help improve the efforts and monitor progress on addressing the information needs under this Strategy.

**Other Support**—There are elements of this Strategy that could be supported by other entities. Such support should fit into the overall goals of the Strategy.

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<sup>18</sup> [www.boem.gov/environmental-studies](http://www.boem.gov/environmental-studies)

<sup>19</sup> [www.boem.gov/center-marine-acoustics](http://www.boem.gov/center-marine-acoustics)

<sup>20</sup> The Inflation Reduction Act provisions regarding the territories will result in a larger number going forward.

- **Other Federal Agencies**—Other Federal agencies, such as the Department of Energy, have funded environmental and technology improvements related to OSW development.
- **States**—States are establishing programs to examine and mitigate the effects of OSW development on state resources. This Strategy will include coordinating with States to understand and integrate their efforts with Strategy implementation.
- **Non-Governmental Organizations (NGOs)**—Various NGOs, foundations, and philanthropic interests have interests related to marine ecosystem science, the conservation of protected species, and the management of OSW development. We expect that some components of this Strategy could be supported by NGOs.
- **Academic Researchers and Institutions**—Academic researchers can align their work with this Strategy, working on priorities identified here and communicating results with NOAA Fisheries and BOEM.

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## APPENDIX A. NARW and OSW Strategy Action Plan Details

### GOAL 1: MITIGATION AND DECISION-SUPPORT TOOLS

**MITIGATION AND SUPPORT TOOLS 1.1:** *Refine and develop additional general mitigation and monitoring measures that are effective at avoiding or minimizing effects of OSW projects on NARWs, individually and cumulatively. Review and update these measures (on a case-by-case basis or programmatic basis) as more information becomes available.*

No.	Action
1.1.1	Periodically review, evaluate, and update preliminary avoidance and minimization measures that can be implemented or required during all phases of OSW development, both at project-specific and regional scales ( <b>Appendix B</b> ).
1.1.2	Work to ensure that all efforts to develop recommendations or requirements for avoidance, minimization, and monitoring measures are complementary (e.g., NY Bight programmatic EIS and programmatic ESA, and Essential Fish Habitat consultations for OSW).
1.1.3	Track evolving mitigation technologies and international mitigation strategies/or policies.
1.1.4	Support research to develop new avoidance and minimization technologies and incorporate advancement in NARW detection technologies as they occur (see also Goal 2: Research and Monitoring).

**MITIGATION AND DECISION-SUPPORT TOOLS 1.2:** *Prioritize research, development, and implementation of mitigation on quieting technology and methods for OSW.*

No.	Action
1.2.1	Develop and implement quieting performance standards for construction activities (e.g., pile driving and UXO detonation).
1.2.2	Advance quieting technologies and methods (e.g., foundation types).
1.2.3	Promote integration of quieting technologies into all OSW vessels (new and existing) by collaborating with the Department of Energy, Maritime Administration, and developers. Consider engaging with individual ports and port authorities in setting vessel quieting goals.

**MITIGATION AND DECISION-SUPPORT TOOLS 1.3:** *Develop risk-analysis and decision-support tools to improve how project-specific and cumulative environmental effects from OSW are evaluated for NARWs and their habitat considering each primary threat to NARW recovery related to OSW, including entanglement, vessel strike, acoustics/noise, changes in habitat and habitat use (including prey).*

No.	Action
1.3.1	<p><b>Cumulative</b> Consider Population Viability Analysis &amp; Cumulative Effects modeling. Multipath processes underway and when available, for example</p> <ul style="list-style-type: none"> <li>• NOAA Fisheries Population Evaluation Tool (PET) Subgroup’s analysis</li> <li>• Sea Mammal Research Unit – Interim Population Consequences of Disturbance model (iPCoD) with NARW case study</li> </ul>
1.3.2	<p><b>Cumulative</b> Develop an approach for improving the assessment of cumulative impacts of all phases of all OSW on NARWs considering existing and future multiple stressors and cumulative effects, including those related and unrelated to OSW (e.g., fishing, climate change).</p>
1.3.3	<p><b>Noise</b> Expand/modify Expert Relativistic Framework to address project-level and cumulative effects of noise and then noise plus other stressors.</p>
1.3.4	<p><b>Noise</b> BOEM fund NARW PCOMS (population consequences of multiple stressors) expert elicitation of noise/construction impacts on NARW behavior.</p>
1.3.5	<p><b>Noise</b> Secure long-term modeling capacity for the purposes of assessing acute, chronic, and cumulative impacts of noise and scenario testing of mitigation strategies (to include incorporation of PAM data).</p>
1.3.6	<p><b>Vessel Strike</b> Investigate use of modeling options similar to the NOAA Fisheries Vessel Strike Risk Assessment Model developed for 2022 proposed Federal Vessel Speed Regulations to assess vessel strike risk from OSW development beyond what would be minimized by the finalized vessel speed rule modifications. Such analyses may inform whether additional mitigation measures are necessary in project-specific approvals to further reduce the risk of vessel strike from OSW vessel traffic.</p>
1.3.7	<p><b>Entanglement:</b> Evaluate entanglement risk from appurtenances (e.g., cables) associated with OSW development or biological monitoring activities associated with development of floating wind technology. Develop approaches to reduce entanglement risk.</p>
1.3.8	<p><b>Entanglement</b> Understand how changes in fishing effort resulting from OSW development changes the risk profile for NARW entanglement in fishing gear.</p>
1.3.9	<p><b>Habitat change</b> Explore adding a wind module to the <a href="#">NOAA Fisheries’ Large Whale Entanglement Decision Support Tool</a><sup>21</sup> to evaluate the relative impacts of OSW on NARW habitat with the understanding that impacts will be uncertain for many years.</p>

<sup>21</sup> <https://www.fisheries.noaa.gov/feature-story/decision-support-tool-helpful-those-finding-ways-reduce-whale-entanglement-fishing>

## GOAL 2: RESEARCH AND MONITORING

**RESEARCH AND MONITORING 2.1:** *Develop and disseminate a research plan that identifies key data gaps related to NARW and OSW development and details how to work with partners, stakeholders, and other ocean users to fill data gaps. The research plan will include a variety of research methods (e.g., acoustic and vessel surveys, aerial surveys, tagging, eDNA) appropriate to the question being addressed.*

No.	Action
2.1.1	Continue to update the baseline of relevant current and future NARW research related to OSW development.
2.1.2	Periodically review, evaluate, and update priority research questions.
2.1.3	Review resources available and perform funding gap analysis on the priority research questions identified in this Strategy.
2.1.4	Complete scoping phase of the Standardizing Integrated Ecosystem Based Assessment: engaging stakeholders and establishing a "common" understanding of the issues using Conceptual Modeling in the ecosystem-based management (EBM) approach (a BOEM-funded project).
2.1.5	Develop processes to meet best science available standards, <sup>22</sup> as applicable (e.g., independent peer review of publicly available data and information, integration of new with existing data/products).
2.1.6	Disseminate results regularly to inform new lease areas and projects.
2.1.7	Coordinate with the RWSC and Federal and state partners to evaluate new data and emerging data gaps and to develop data access and sharing guidelines.

**RESEARCH AND MONITORING 2.2:** *Support the development of studies with sufficient statistical power to detect changes in NARW ecology and demographics resulting from OSW development (e.g., changes in foraging activity, residency in key habitats, displacement) at various scales (e.g., turbine, development, regional, ecosystem).*

No.	Action
2.2.1	Continue and improve efforts to track NARW abundance, distribution, health, reproduction, survival, and habitat use.
2.2.2	Continue and expand long-term aerial and vessel-based survey efforts of NARWs (including NARW Catalog and University of Rhode Island sightings database).
2.2.3	Evaluate, design, and implement regional and project-based aerial and vessel surveys to understand the impact of OSW development on NARW distribution and habitat use.

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<sup>22</sup> <https://www.ecfr.gov/current/title-50/chapter-VI/part-600/subpart-D/section-600.315>

No.	Action
2.2.4	<p>Develop a long-term PAM network to strategically collect baseline and soundscape data.</p> <ul style="list-style-type: none"> <li>• Measure the short and long-term changes in local and regional soundscapes during wind farm construction and operations.</li> <li>• Quantify spatial and temporal masking and potential loss of communication space for NARWs.</li> <li>• Quantify NARW detection rates before, during and after construction and during operation.</li> <li>• Monitor for shifting baseline potential associated with climate change.</li> <li>• Establish a NARW acoustic database catalog.</li> <li>• Establish and maintain a PAM webportal of historical data and work to incorporate Before-After-Gradient surveys with NOAA’s National Centers for Environmental Information to streamline long-term storage of data and data products.</li> <li>• Inform spatial scales for future monitoring of the operational noise of larger, direct drive turbines that may be installed at Atlantic Coast projects.</li> </ul>
2.2.5	<p>Explore and expand the use of satellite data, unmanned systems (gliders or autonomous underwater vehicles [AUVs]) and emerging technologies (e.g., eDNA) for NARW distribution and habitat use.</p>
2.2.6	<p>Develop and deploy safe long duration satellite tagging telemetry technology for tracking high-resolution movements of NARW in and around OSW.</p>
2.2.7	<p>Coordinate activities conducted as part of this Strategy with NOAA Fisheries and Fisheries and Oceans Canada’s NARW monitoring plans.</p>
2.2.8	<p>Support continued development of NARW habitat models focused on predictive habitat use (including results from 1.3 above).</p>
2.2.9	<p>Continue development and sampling of stress and health indicators (e.g., hormones, microbiome, new biomarker studies, baleen) blended with other Visual Health Assessments.</p>
2.2.10	<p>Improve analysis of monitoring data through artificial intelligence, automated acoustic and image processing, and near real-time data availability.</p>

**RESEARCH AND MONITORING 2.3:** *Develop and support efforts to improve understanding of OSW impacts on oceanographic and lower trophic level ecosystem processes for all foundation, turbine, mooring, and layout types, with a particular focus on understanding impacts on the distribution and abundance of NARW zooplankton prey.*

No.	Action
2.3.1	Collect priority data and other information from field surveys to understand NARW habitat use in and around OSW developments.
a	Collect oceanographic, zooplankton, and benthic data in areas with and without NARWs.
b	Support quantification of existing zooplankton data in OSW energy areas.
c	Support research on the plankton species abundance and distribution in southern New England (Gulf of Maine vs offshore) and continue to evaluate any climate change influenced effects.
d	Assess energy density of potential prey resources.
e	Quantify NARW feeding preferences using DNA analysis of scat.
f	Link prey resources and oceanography with tagged NARWs.
g	Conduct dedicated process study in Nantucket Shoals frontal region (for an example, see White and Veit (2020)) to better understand mechanisms linking bathymetry, tides, fronts, zooplankton, and NARW.
h	Explore use of CODAR (HF radar) to assess oceanographic drivers of distribution of NARWs and their prey.
i	Explore and expand the use of satellite data, unmanned systems (gliders or AUVs), and emerging technologies for routine physical and biological oceanographic monitoring.
2.3.2	Align current oceanographic modeling efforts to evaluate potential impacts to oceanographic processes from OSW, with an initial focus on the southern New England project areas and subsequent focus on other OSW development areas.
2.3.3	<p>Hold a technical workshop to compare oceanographic model approaches and the benefits and drawbacks of each one. Workshop should focus on the models' ability to predict the</p> <ul style="list-style-type: none"> <li>• Likelihood of conditions that may aggregate zooplankton</li> <li>• Likely changes in copepod distribution between pre- and post-OSW construction</li> </ul> <p>This workshop should aim to make recommendations on</p> <ul style="list-style-type: none"> <li>• Best metrics to use to assess model fit for these purposes</li> <li>• Best current model or model ensemble prediction given available models (perhaps an ensemble approach)</li> <li>• Best practices moving forward</li> </ul>
2.3.4	Synthesize and report on observed changes in oceanographic processes after several years of OSW operation.
2.3.5	Conduct a risk assessment and improve understanding of how OSW development will impact features of NARW critical habitat—as well as “high-value habitat” per NOAA’s Mitigation Policy—and policy; develop strategies for how these impacts can be avoided or minimized.



## GOAL 3: COLLABORATION, COMMUNICATION, AND OUTREACH

**COLLABORATION, COMMUNICATION, AND OUTREACH 3.1:** *Develop long-term and proactive coordination strategies, including establishing a NOAA and BOEM NARW and OSW strategy implementation group, and share outreach and communications plans.*

No.	Action
3.1.1	Form a joint Agency implementation group to fulfill the goals of this Strategy.
3.1.2	Develop an outreach and communications plan that includes schedules for soliciting and vetting adjustments periodically.
3.1.3	Conduct meetings with partners to provide periodically updates and receive feedback, as needed.
3.1.4	Coordinate closely with the RWSC.
3.1.5	Develop a “NARWs and Offshore Wind” web page that describes the current state of the science, ongoing research and management efforts, and other outreach materials.
3.1.6	Identify similar activities and coordinate on or share progress of this Strategy to help inform other NARW recovery efforts (e.g., NOAA Fisheries <i>Road to Recovery</i> ).

## APPENDIX B. Avoidance and Minimization Measures

This appendix provides a general description of preliminary measures that BOEM and NOAA Fisheries consider having potential to avoid and minimize impacts to NARWs from OSW activities. The agencies are sharing these measures to communicate the types of requirements that regulatory agencies and project proponents have, and will continue, to consider for individual projects.

Implementation of some measures should be done at a project-specific scale, with details being provided in project-specific consultations, authorizations, or approvals. Other measures should be implemented at a regional scale and will require implementation by BOEM or NOAA Fisheries. Note that this list of measures is not comprehensive and does not supersede measures that may be required by the agencies during regulatory processes, such as COP approvals, ESA consultations, or processing of MMPA incidental take authorizations. Note also that commitments by developers to implement any or all of these measures in proposed plans or other documents seeking authorization from BOEM or NOAA Fisheries does not ensure approval of projects or other authorizations, as those decisions are made on a case-by-case basis.

The measures identified here will be updated as new information becomes available. As described above, NOAA Fisheries and BOEM are currently engaging in efforts outside this Strategy to develop standard avoidance and minimization measures for OSW projects in the Atlantic OCS; the preliminary measures identified here will complement those efforts.

### Project Planning, Leasing, and Siting

#### Agency

NOAA Fisheries and BOEM will continue to collaborate on the identification of wind energy areas with consideration of best available information on NARW habitat use. NOAA Fisheries will provide BOEM information that BOEM will consider in identifying new wind energy areas and new leases. This information may include basic risk assessments (e.g., high risk, medium risk, low risk) based on the best available scientific data and uncertainty, including predictive data on NARW distribution over the potential duration of the lease, given anticipated changes in ocean conditions and the distribution and behavior of species due to climate change. In general, BOEM will consider recommendations from NOAA Fisheries and attempt to avoid issuing new leases in areas that may impact potential high-value habitat and/or high-density/use areas for important life history functions such as NARW foraging, migrating, mating, or calving. BOEM and NOAA Fisheries will include potential lessees in these conversations as early as possible to raise awareness of concerns over impacts to NARWs.

If issuing new leases in these areas is not avoidable, BOEM will work with NOAA Fisheries to minimize development that may impact such habitat and areas, and require measures to avoid and minimize impacts to NARW and their habitat from construction and operation such that the required permits and authorizations can be issued.

For existing leases, lessees will submit a COP. BOEM's regulations require that BOEM first analyze and evaluate the COP before approving, disapproving, or approving it with modifications (30 CFR 585.628(f)). If disapproved, BOEM will inform the lessee of the reasons and allow the lessee an opportunity to

resubmit a revised plan addressing the concerns identified. During the environmental review of the COP, BOEM will work with NOAA Fisheries to ensure environmental review under applicable statutes evaluate measures to avoid (primary goal) or minimize (secondary goal) impacts to NARW and high-value habitat and/or high-density/use areas for important life history functions such as NARW foraging, migrating, mating, or calving. The results of these environmental reviews will ultimately inform COP conditions of approval.

If new information becomes available indicating that activities previously authorized by BOEM through a plan approval (e.g., COP, Site Assessment Plan, General Activities Plan) are now resulting in an imminent threat of serious or irreparable harm or damage to NARWs, BOEM has the authority to suspend operations. Likewise, BOEM may require the lessee to submit a plan revision if activities previously authorized by BOEM are inadequate to protect NARWs under the relevant legal standards. The plan revision would detail new measures that will be taken to increase protection of NARWs impacted by the activities authorized under the plan approval. BOEM will determine if the new measures are adequate and, if warranted, could then reinstate section 7(a)(2) consultation under the ESA prior to approving any plan revision. BOEM will also use any new information to inform future project decisions and mitigation strategies. In addition, reinstatement under Section 7 of the ESA is required when certain conditions are met (50 CFR § 402.16), during which time operations may be suspended.

### **Developer**

Developers should avoid proposing development in areas that may impact high-value habitat and/or high-density/use areas used for important life history functions such as NARW foraging, migrating, mating, or calving. If avoidance is not possible, include measures to avoid and minimize impacts to NARW and their habitat.

Developers should evaluate multiple project design options such as the type, number, size (physical dimensions and power output), location, and orientation of wind turbines and offshore substations, with a focus on identifying design options that avoid and minimize impacts to NARWs and their habitat within and with adjacent projects; tradeoffs for other resources need to be evaluated during project planning.

### **Site Characterization and UXO Surveys**

- Do not use airguns and avoid unnecessary use of acoustic sources below 180kHz, specifically boomers and sparkers. Where boomers and sparkers cannot be avoided, implement project design criteria and best management practices such as those outlined in [NOAA Fisheries ESA programmatic consultation \(issued June 2021, as amended September 2021\)](#)<sup>23</sup> (Anderson 2021) (or any updated versions of this document or similar guidance issued by the agencies) for all geophysical and geotechnical surveys carried out over the life of the leases. Examples include use of lowest practicable sound source levels.
- Deactivate acoustic source when not acquiring data or preparing to acquire data, except as necessary for testing.

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<sup>23</sup> [media.fisheries.noaa.gov/2021-12/OSW%20surveys\\_NLAA%20programmatic\\_rev%201\\_2021-09-30%20%28508%29.pdf](https://media.fisheries.noaa.gov/2021-12/OSW%20surveys_NLAA%20programmatic_rev%201_2021-09-30%20%28508%29.pdf)

- Develop and implement standard protocols for addressing unexploded ordinances, including implementation of best available technology to avoid or minimize exposure of NARWs and their sensitive habitats to low order (e.g., deflagration) or high order detonations or chemical release.

## Construction and Operation

- **Foundation Installation Restrictions:** Develop and implement project schedules that avoid pile driving and high-vessel use activities during the time of year when NARWs are most likely to occur in the lease areas and along vessel routes. Avoid foundation installation, including, but not limited to, impact and vibratory pile driving, within identified time periods, and known areas of higher NARW density and persistence, including, but not limited to, Nantucket Shoals, Cape Cod Bay, calving grounds, and designated NARW critical habitat. Include extended seasonal restrictions for particular activities or restrictions on surface occupancy. Implement measures that prevent pile driving when monitoring of NARWs is not effective and NARWs are predicted to be present.
- **Clearance Zones:** Establish Clearance Zones that must be monitored to avoid exposure to noise or other conditions that could result in the mortality, serious injury, or non-auditory injury or auditory injury (i.e., permanent threshold shift) of individual NARWs and to minimize the amount and severity of behavioral disturbance. Clearance Zones typically cover visual sighting of any NARW or sighting of a large whale that could be a NARW and/or an acoustic detection at a distance identified in project-specific approvals. Treat any unidentified large whale detected as a NARW unless it can be confirmed it is not a NARW. This measure should apply to foundation installation activities (e.g., pile driving and drilling) and other activities such as UXO detonation.
- **Shutdown Zones:** Establish Shutdown Zones that must be monitored to avoid exposure to noise or other conditions that could result in the mortality, non-auditory injury, and auditory injury (i.e., permanent threshold shift) and to minimize the amount and severity of temporary threshold shift and/or behavioral disturbance. Shut down pile driving (or other activity) if a NARW is observed or acoustically detected in the shutdown zone. Treat any unidentified large whale detected as a NARW unless it can be confirmed it is not a NARW. This measure applies to foundation installation activities (e.g., pile driving and drilling) and other activities, including but not limited to, UXO detonation and cofferdam installation.
- **Protected Species Observers (PSOs):** Use trained, third-party PSOs with no duties other than to effectively implement mitigation and monitoring measures during construction and operations. Adopt standards for protected species monitoring (e.g., minimum visibility, PSO protocols, etc.). Use only independent, third-party PSOs (i.e., not construction personnel) that are approved by NOAA Fisheries. Locate PSOs safely at the best vantage point(s) to ensure coverage of the entire visual Clearance and Shutdown Zones, and as much of the behavioral harassment zones as possible. Ensure PSOs do not exceed 4 consecutive watch hours on duty at any time, have a two-hour (minimum) break between watches, and do not exceed a combined watch schedule of more than 12 hours in a 24-hour period.
- **Sound Field Measurement:** Carry out sound field verification of foundation installation activities, UXO detonations activities, and other activities the agencies deem necessary. BOEM requires the COP include a description on how the developer will comply with the criteria and best management practices outlined in *BOEM Nationwide Recommendations for Impact Pile*

*Driving Sound Exposure Modeling and Sound Field Measurement for Offshore Wind Construction and Operations Plans* (or any updated versions of this document) for all foundation impact pile driving during the installation of OCS facilities. This document outlines (1) a consistent approach to determine model inputs, assessment, and outputs to be included in a COP submission; and (2) how to validate the predicted impact distances from underwater noise levels using empirical measurements.

- **Vessel strike risk reduction:** Avoid vessel traffic in important NARW habitats, including active Seasonal Management Areas, Dynamic Management Areas, and Slow Zones, when possible (73 FR 60173). When avoidance is not possible, reduce vessel speeds to 10 knots or less in these areas during these times, and post lookouts or PSOs on vessels to search for and aid in avoiding whales. As required by regulation, do not approach NARWs within 500 yards (62 FR 6729). Follow all additional vessel strike reduction measures as specified in individual project approvals (e.g., NOAA Fisheries MMPA Incidental Take Authorizations and ESA Biological Opinions, and BOEM leases and conditions of COP approval, etc.), which may include but are not limited to PAM, vessel or aerial surveys, and additional areas to avoid operating vessels or reduce speeds. All OSW-related vessel activities must comply with the modifications to the NARW vessel speed rule when it is finalized (87 FR 46921), including any changes to seasonal and dynamic management restrictions. Follow any additional measures NOAA Fisheries and BOEM identify as necessary through project-specific approvals to reduce risk of vessel strikes from OSW development.
- **Quieter Foundations, Technology, and Methods:** Develop and implement quieting guidance and performance standards. Develop standards for determining where it would be preferred to use foundation designs that do not rely on pile driving (e.g., gravity-based foundations). Factors for consideration should include engineering feasibility, impacts of the foundation type on benthic resources and environmental conditions, and impacts of noise during construction. Use foundations that minimize impacts to NARWs and habitat if engineering considerations are met and in consideration of other sensitive resources and habitats. Where pile driving cannot be avoided, use the most effective methodologies available to reduce pile-driving noise to the maximum extent practicable, including, but not limited to, use of noise abatement systems (e.g., double big bubble curtains) and a hammer schedule that results in the lowest sound exposure level to NARWs as possible. BOEM intends to pursue development of a quieting performance standard for construction activities (e.g., foundation installation) in coordination with NOAA Fisheries, similar to standards developed in Europe (Koschinski and Lüdemann 2020).
- **Marine Debris and Gear:** Implement routine clean ups of ghost gear and/or other debris associated with OSW development within the lease areas. Implement measures designed to avoid and minimize interaction between protected species and any gear in the water that is related to OSW construction or operations, including but not limited to anchor and buoy lines.
- **Adaptive Planning:** Develop an adaptive framework to quickly resolve unanticipated issues so that impacts to NARWs are minimized quickly and efficiently.

## Project-Specific Preliminary Monitoring Measures

Pre-construction monitoring is essential to document and understand the baseline conditions in a project area. Long-term monitoring is also necessary to assess the environmental impact of projects throughout construction and operations. Data collected prior to and during the COP approval process will be used to evaluate the potential impacts of a project on NARWs and their habitat. The data generated by the monitoring measures listed below will assist in assessing the impacts of OSW development on NARWs, their habitat, and habitat use.

During construction and operations, long-term monitoring and targeted monitoring (e.g., during pile driving) will assist in evaluating the effectiveness of mitigation measures, whether additional measures are necessary to minimize unanticipated impacts, and the impacts of the project. Together with broader scale monitoring efforts, these project-specific monitoring measures will be used by BOEM and NOAA Fisheries to evaluate, track, and avoid and minimize impacts to NARWs. These monitoring studies should also contribute to cumulative impact analyses designed to assess the spatial and temporal accumulation of OSW development on NARWs, their habitat, and habitat use. BOEM and NOAA Fisheries also encourage coordination of research and monitoring studies through the Regional Wildlife Science Collaborative for Offshore Wind (RWSC) and the NOAA Fisheries and BOEM Federal Survey Mitigation Strategy to increase effectiveness, utility, and data sharing.

BOEM and NOAA Fisheries encourage scientifically rigorous monitoring studies that are standardized across OSW development projects within the region. All monitoring studies and research activities should be based on scientifically rigorous study designs. Regional experts should be consulted to develop robust monitoring and study designs with adequate sample sizes and appropriate spatial and temporal coverage to allow the detection of potential impacts of OSW developments on NARWs, their habitat, and habitat use. All monitoring study designs should be reviewed by BOEM and NOAA Fisheries and, where appropriate, independently peer-reviewed prior to initiation and then annually reviewed during the study period. These designs should include clearly stated goals and objectives for monitoring and use regionally standardized field and analytical methodologies.

To facilitate the application of data collected by developers, the agencies will develop robust reporting standards and standardized databases. A centralized, publicly accessible data portal will allow for data to be integrated across projects and queried to answer a range of scientific questions to inform management decisions. All monitoring data will be stored in standard format in an openly accessible repository to facilitate transparency, data analysis, and sharing of information.

None of the preliminary monitoring measures below supersede measures that are or may be required by the agencies during regulatory processes such as COP approvals, ESA consultations, or processing of MMPA incidental take authorizations. In addition, project-specific approvals may contain additional measures. Note the implementation of any or all of these measures by developers does not ensure project or permitting approval as those decisions are made on a case-by-case basis.

With reference to BOEM’s regulations on required information for plans ([30 CFR Part 585 Subpart F](#)),<sup>24</sup> and in line with [BOEM’s guidelines](#),<sup>25</sup> the following preliminary monitoring measures will be considered by BOEM and NOAA Fisheries during project environmental review processes:

- Ensure all environmental reviews are informed by robust baseline data on the use of the project area by NARWs, to include at least 3 years of baseline data. Implement continued monitoring during the construction period and for at least 3 years post-construction to assess impact of the project on NARWs and their habitat. Establish long-term monitoring for the duration of construction and operations to evaluate the potential impacts on key components of the ecosystem (e.g., NARWs and their prey). Conduct monitoring using rigorous scientific designs with the intent of measuring the impact of OSW development on NARWs, their habitat and habitat use, and the effectiveness of measures described above. Report data in a timely manner and make publicly available.
- Conduct monitoring to assess the impacts of the physical presence and operation of the turbines. Monitoring should assess changes in the atmospheric and oceanographic environment—including benthic and pelagic habitats and oceanographic features (e.g., stratification and fronts)—particularly as these environments relate to NARW feeding behavior and ecology.
- Conduct acoustic monitoring of construction and of operational noise and substrate vibrations with the goal of developing a robust database of construction and operational noise to inform the development of mitigation measures.
- Conduct monitoring for changes to fishing operations and displacement of fishing effort into other areas. Monitor changes in fishing activity to detect changes in bycatch or entanglement rates of protected species, particularly NARWs.
- Develop and implement plans for research and monitoring to address new and emerging issues and technology in a scientifically rigorous and systematic way. Include requirements that OSW infrastructure (e.g., turbine foundations, submarine cables, substations, and other equipment) be instrumented to meet project and regional monitoring objectives.
- Conduct aerial surveys for a minimum of 3 years prior to BOEM starting its environmental review process in the lease areas and surrounding waters to collect baseline data on the presence, abundance, distribution, and seasonality of NARWs, their habitat, and habitat use. Surveys should follow a similar protocol to the aerial surveys conducted in the Massachusetts/Rhode Island Wind Energy Areas and should be flown on a regular basis. Surveys should continue throughout construction and operational phases of OSW development and be used beyond monitoring purposes with the goal of assessing effects of OSW development on marine megafauna species.
- Conduct continuous archival PAM in and around lease areas to collect baseline information on the presence, distribution, and seasonality of NARWs (and other sound-producing marine animals) and to establish noise levels before and during construction and operation. Additionally, use both archival and real-time PAM to collect baseline information on the

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<sup>24</sup> [www.boem.gov/sites/default/files/uploadedFiles/30\\_CFR\\_585.pdf](http://www.boem.gov/sites/default/files/uploadedFiles/30_CFR_585.pdf)

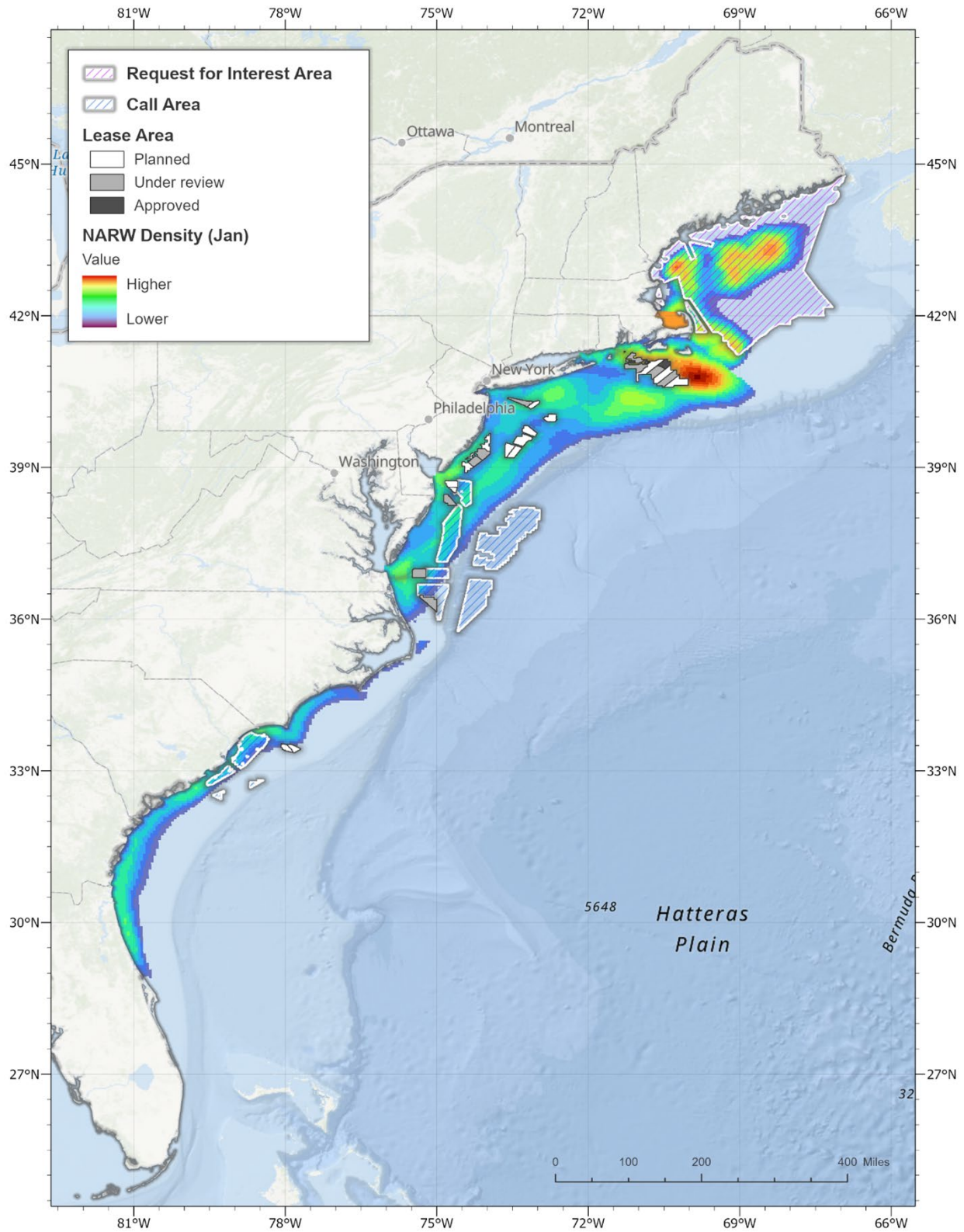
<sup>25</sup> [www.boem.gov/renewable-energy/national-and-regional-guidelines-renewable-energy-activities](http://www.boem.gov/renewable-energy/national-and-regional-guidelines-renewable-energy-activities)

presence, distribution, and seasonality of NARWs in transit routes and to minimize risk of vessel strike of transiting vessels. Plans should follow recommendations in Van Parijs et al. (2021), which suggests a minimum of 3 to 5 years of monitoring using continuous PAM archival recorders immediately prior to construction.

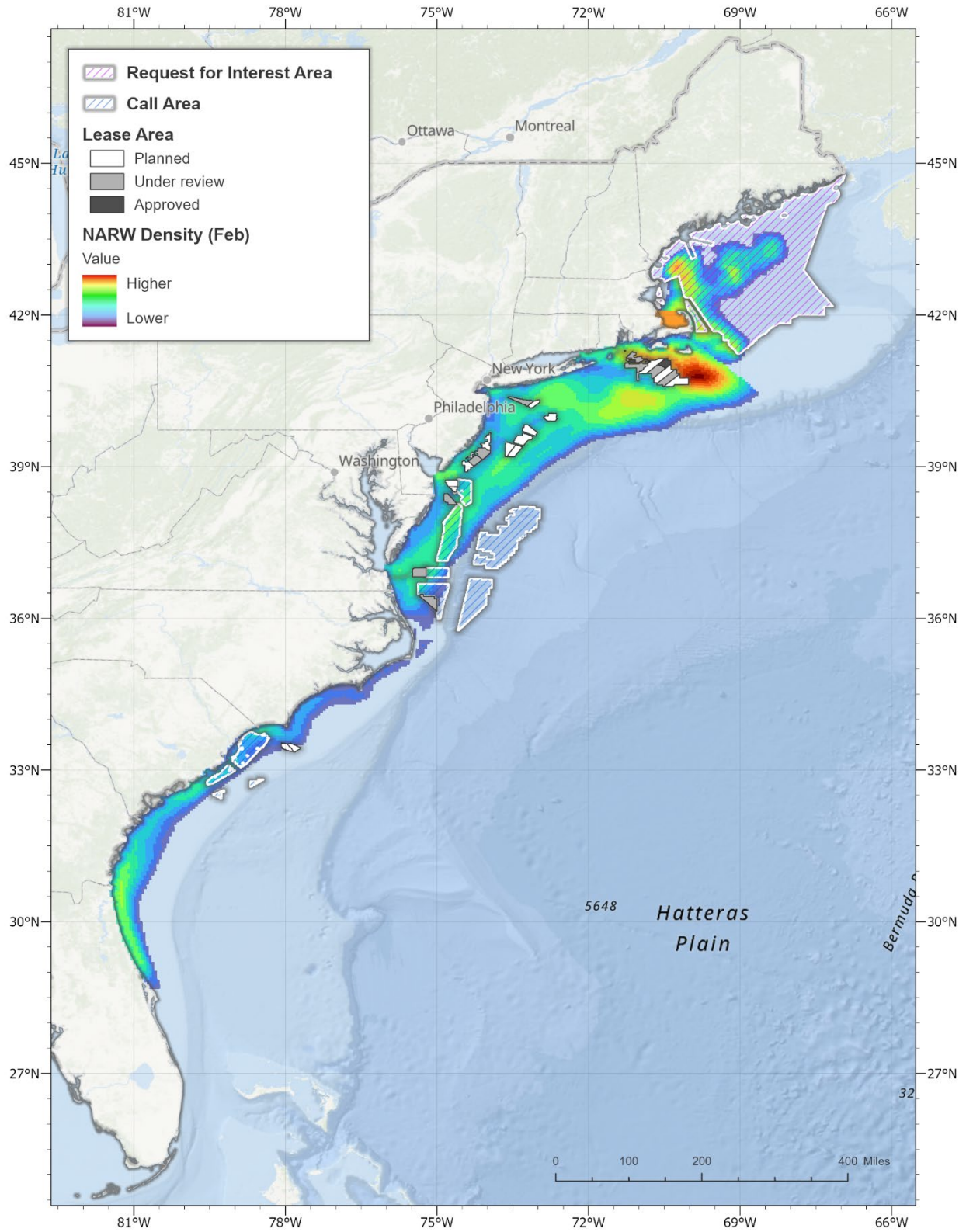
- Coordinate a regional PAM approach (in addition to project-specific PAM) that follows the recommendations in Van Parijs et al. (2021) and considers adequate array/hydrophone design, equipment, and data evaluation to understand changes over spatial scales relevant to NARWs for the duration of the projects, as well as the storage and dissemination of these data.
- Monitor to implement mitigation and identify the effectiveness of mitigation measures.



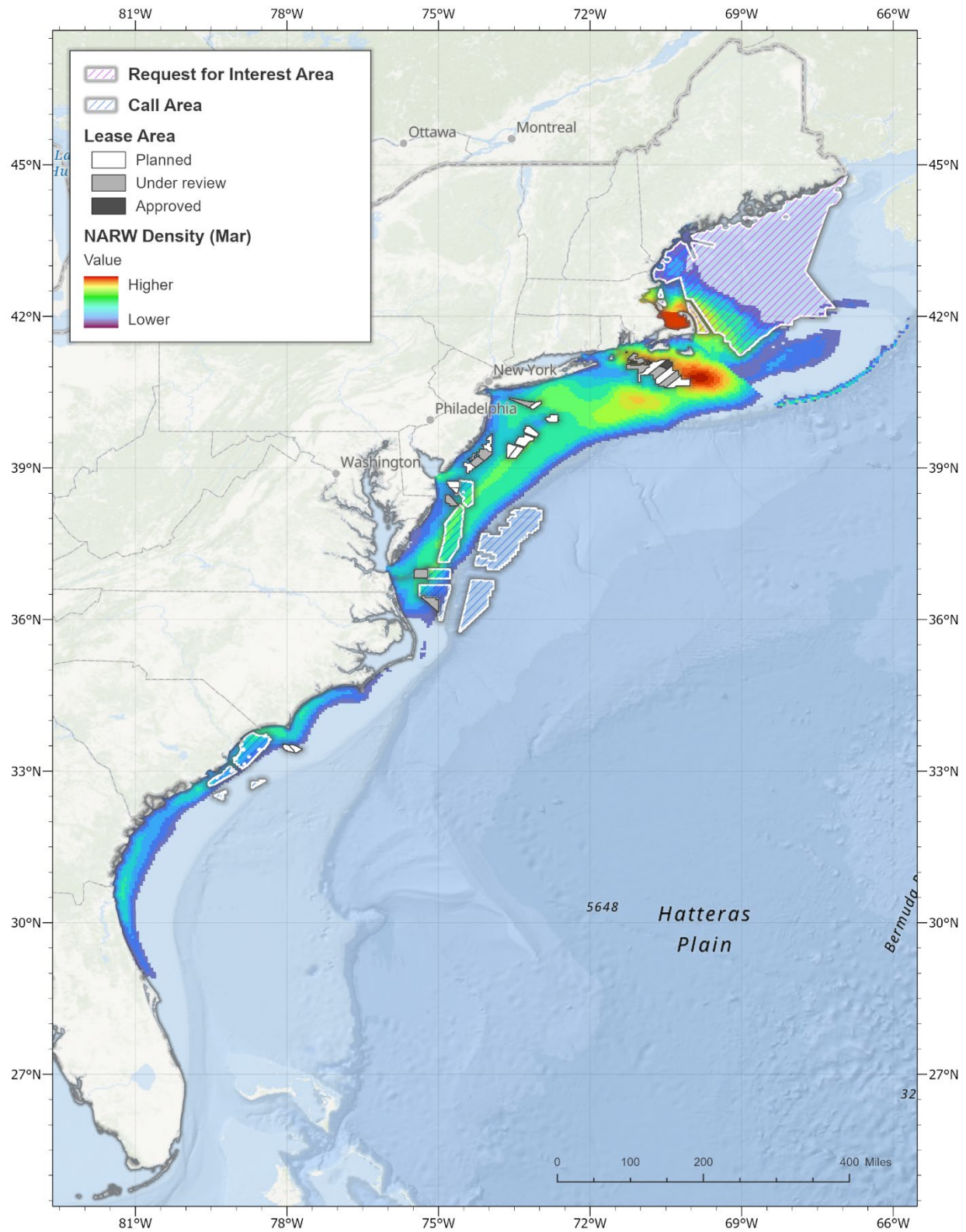
## **APPENDIX C. Monthly Densities of North Atlantic Right Whales in U.S. Waters (2010–2019)**



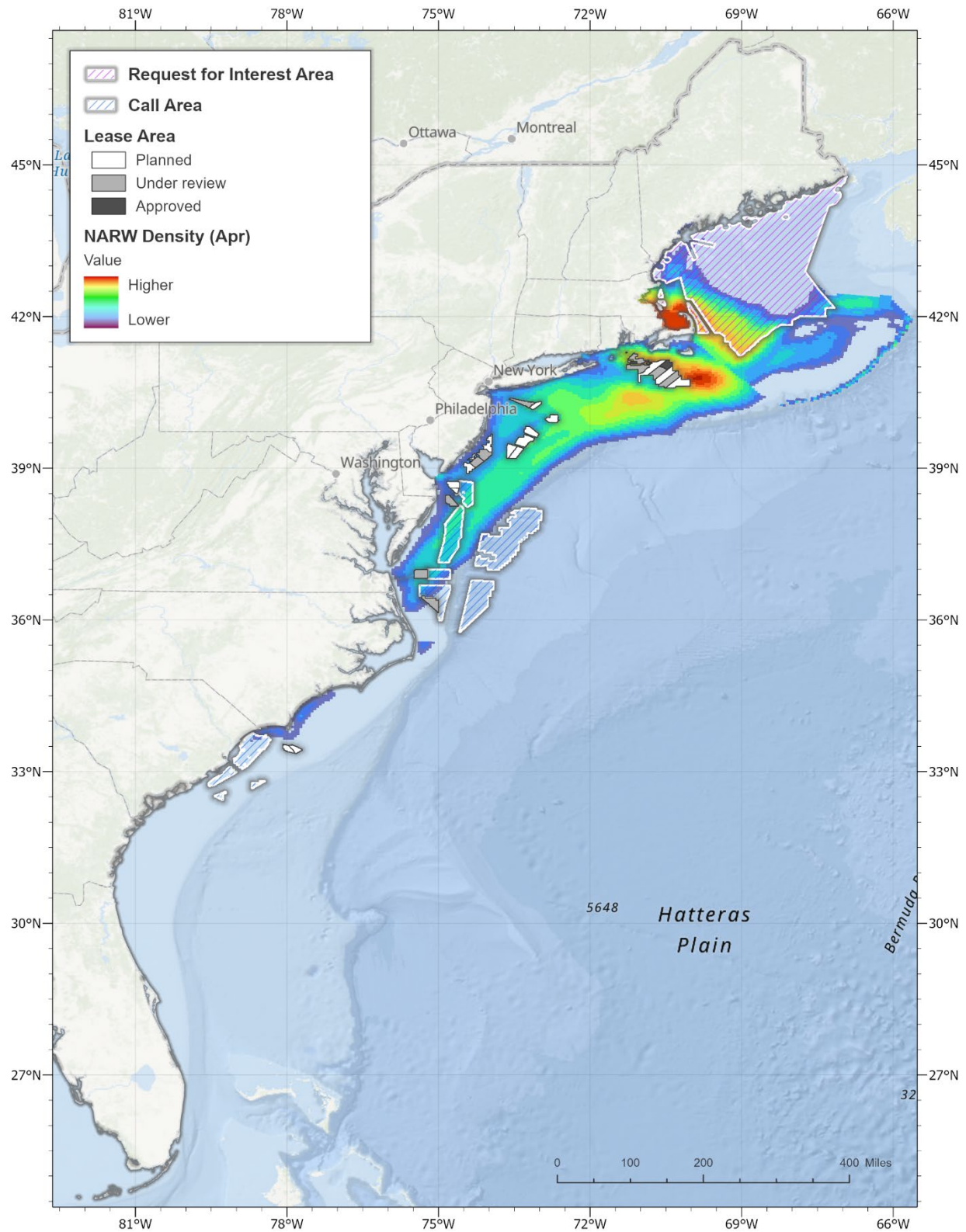
**Figure C-1. Density of NARWs in U.S. waters during the month of January (2010–2019) (Roberts et al. 2016; Roberts and Halpin 2022)**



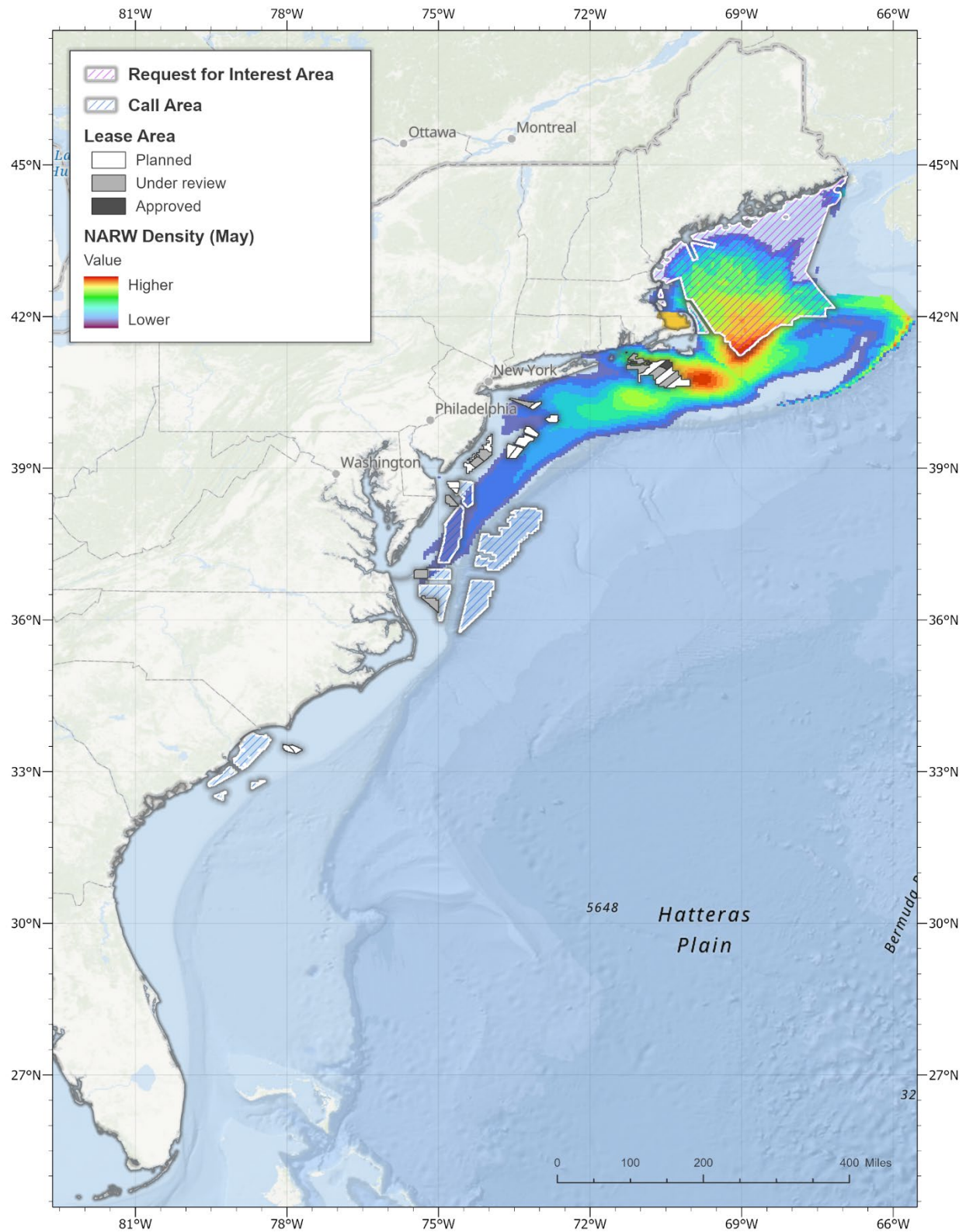
**Figure C-2. Density of NARWs in U.S. waters during the month of February (2010–2019) (Roberts et al. 2016; Roberts and Halpin 2022)**



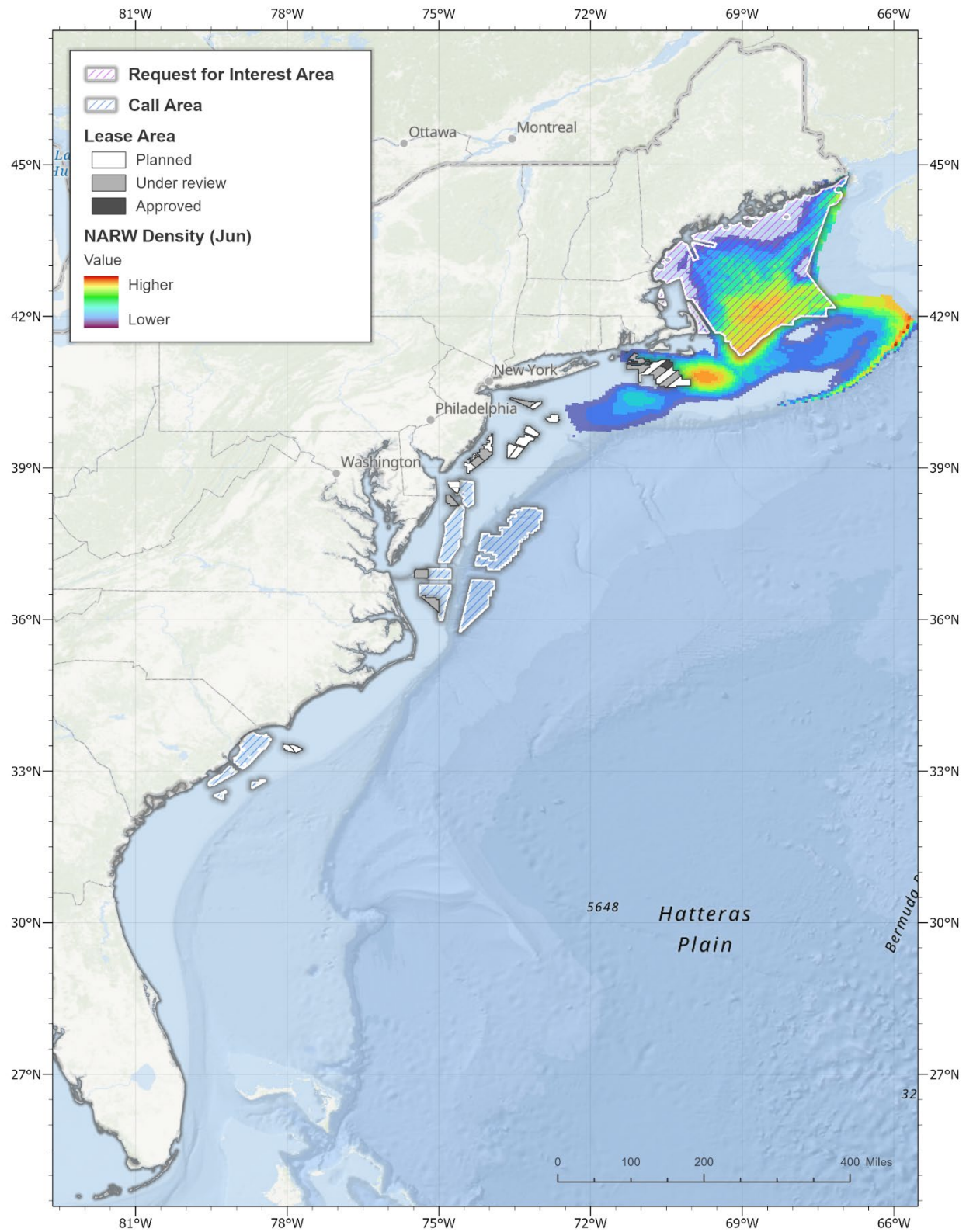
**Figure C-3. Density of NARWs in U.S. waters during the month of March (2010–2019) (Roberts et al. 2016; Roberts and Halpin 2022)**



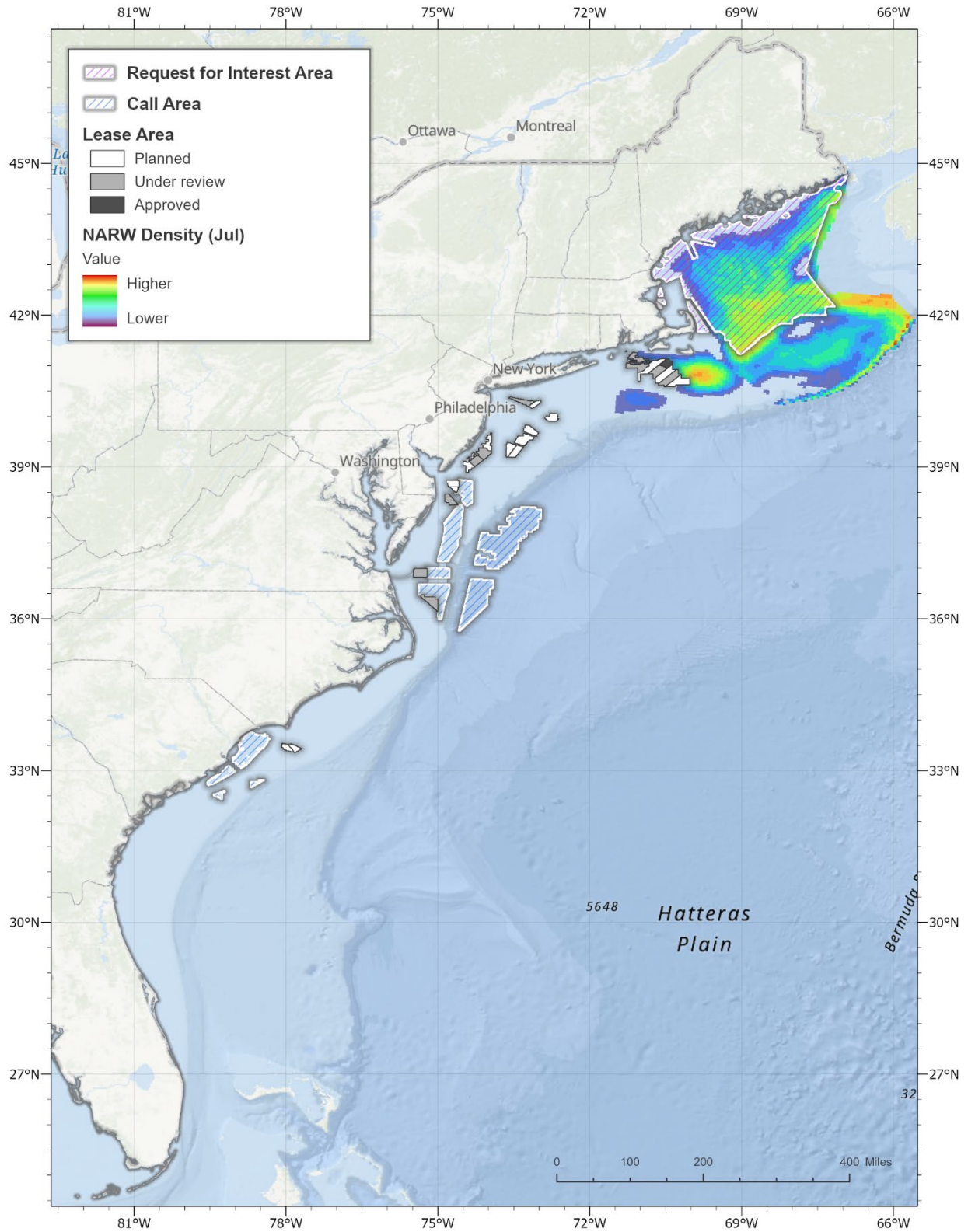
**Figure C-4. Density of NARWs in U.S. waters during the month of April (2010–2019) (Roberts et al. 2016; Roberts and Halpin 2022)**



**Figure C-5. Density of NARWs in U.S. waters during the month of May (2010–2019) (Roberts et al. 2016; Roberts and Halpin 2022)**

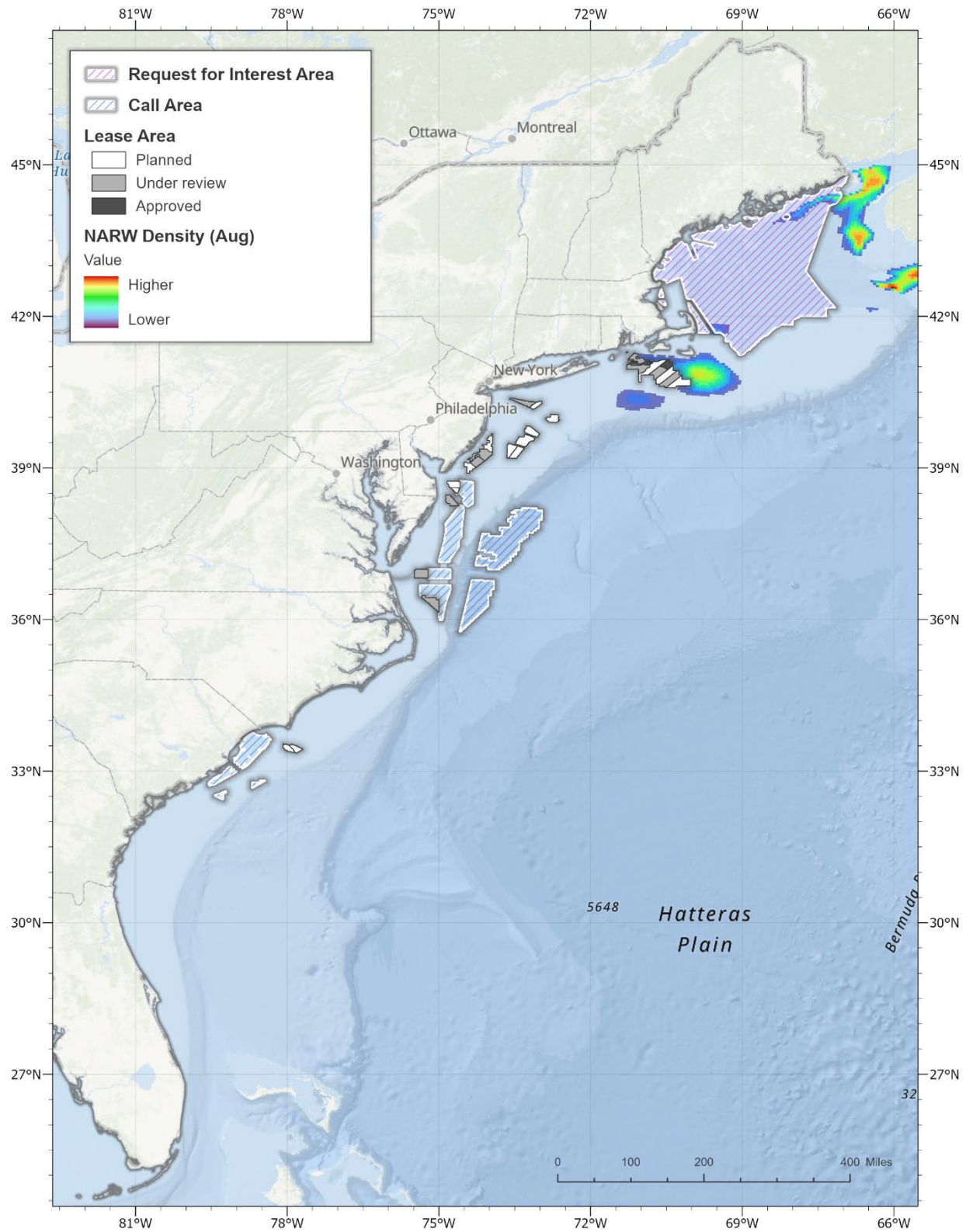


**Figure C-6. Density of NARWs in U.S. waters during the month of June (2010–2019) (Roberts et al. 2016; Roberts and Halpin 2022)**

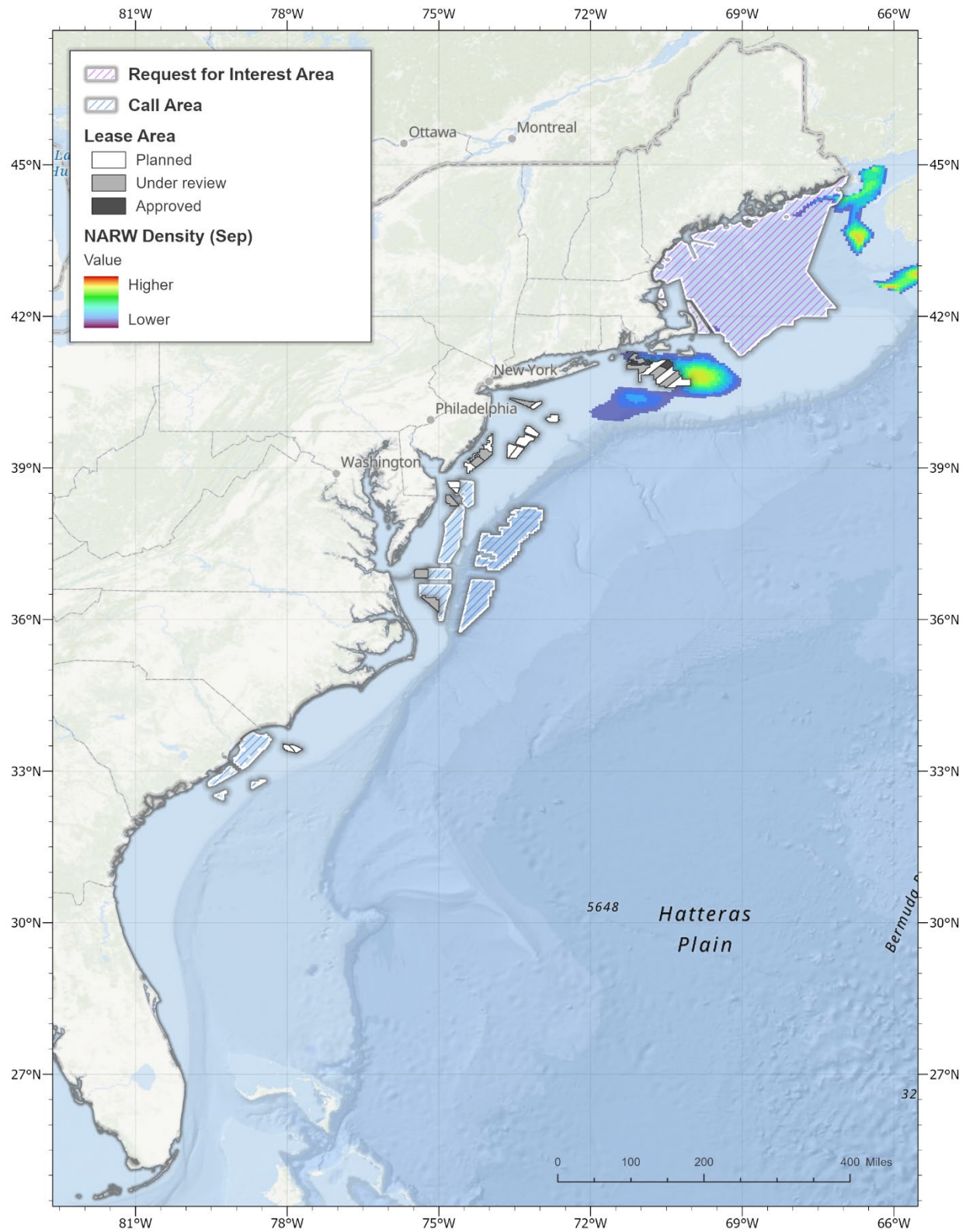


**Figure C-7. Density of NARWs in U.S. waters during the month of July (2010–2019) (Roberts et al. 2016; Roberts and Halpin 2022)**

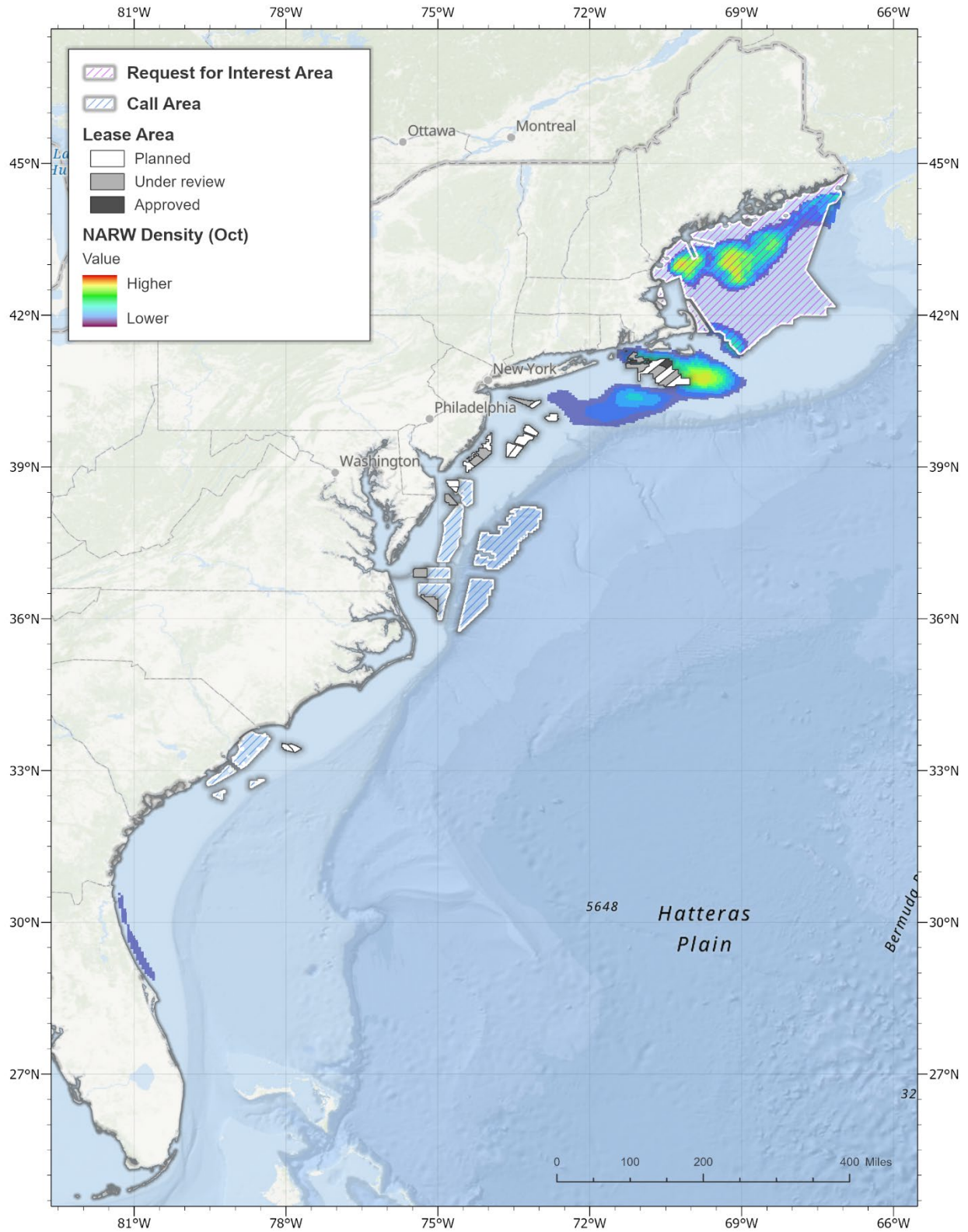




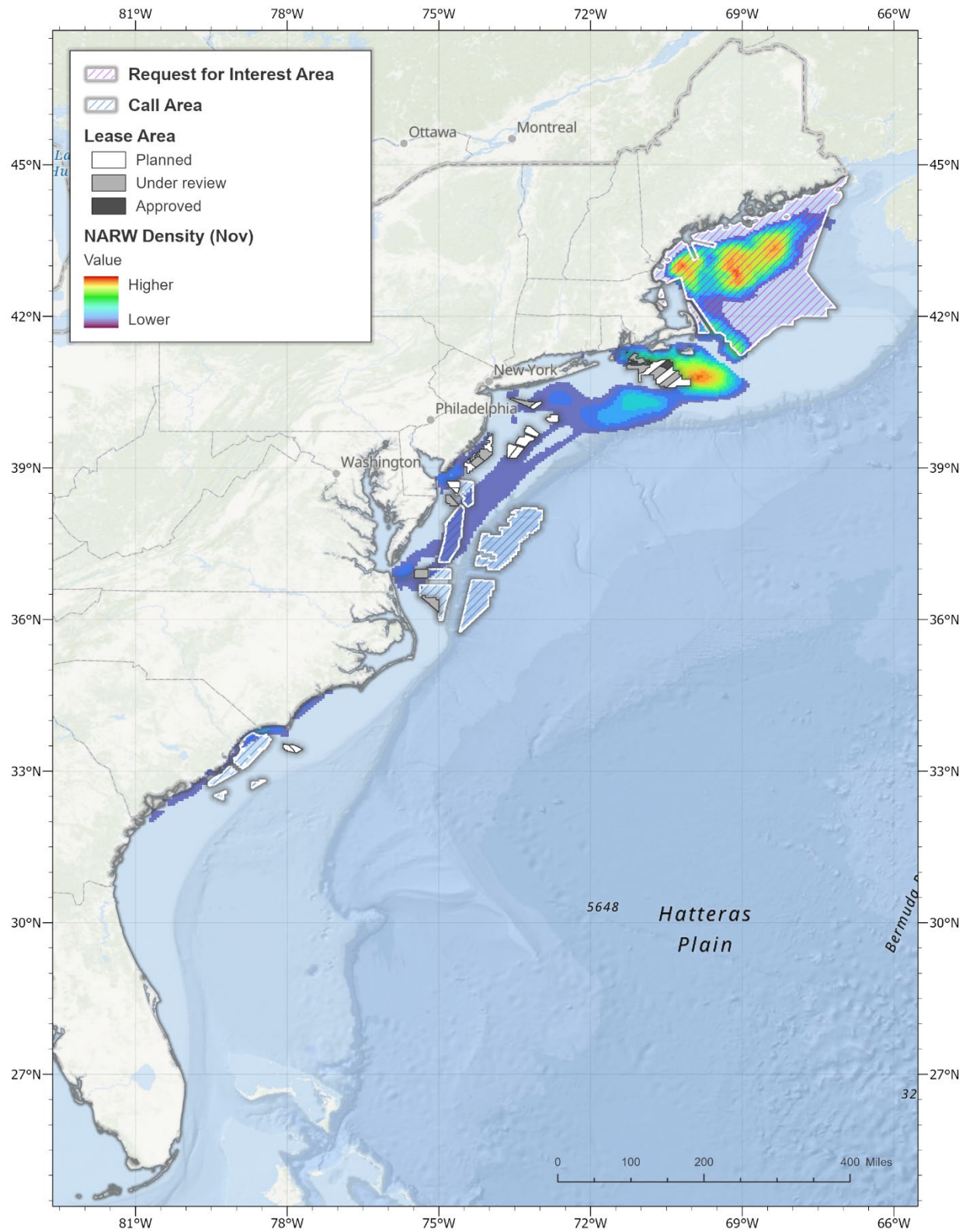
**Figure C-8. Density of NARWs in U.S. waters during the month of August (2010–2019) (Roberts et al. 2016; Roberts and Halpin 2022)**



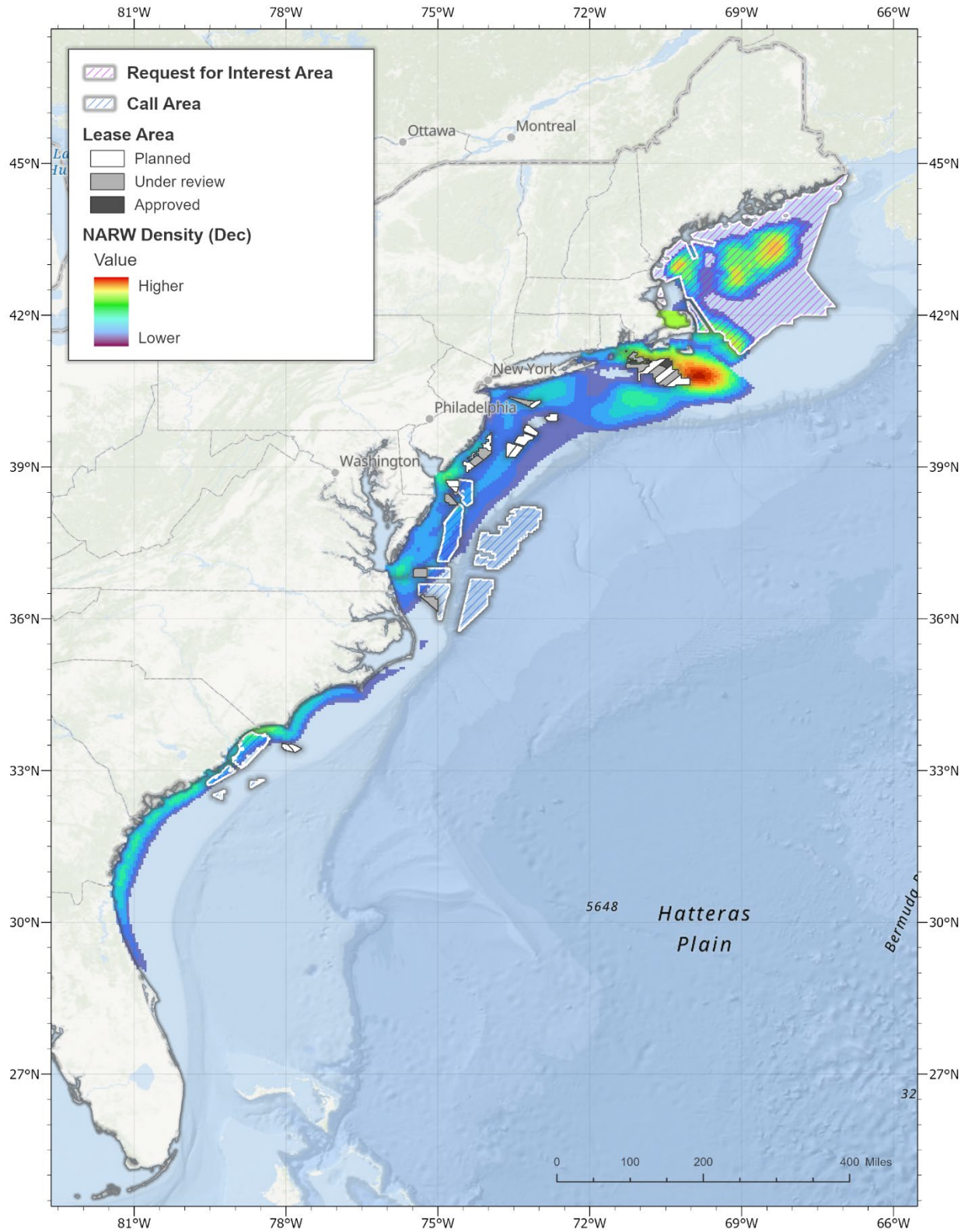
**Figure C-9. Density of NARWs in U.S. waters during the month of September (2010–2019) (Roberts et al. 2016; Roberts and Halpin 2022)**



**Figure C-10. Density of NARWs in U.S. waters during the month of October (2010–2019) (Roberts et al. 2016; Roberts and Halpin 2022)**



**Figure C-11. Density of NARWs in U.S. waters during the month of November (2010–2019) (Roberts et al. 2016; Roberts and Halpin 2022)**



**Figure C-12. Density of NARWs in U.S. waters during the month of December (2010–2019) (Roberts et al. 2016; Roberts and Halpin 2022)**

# BOEM

The Mission of the Bureau of Ocean Energy Management is to manage development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way.



The mission of NOAA Fisheries is the stewardship of the nation's ocean resources and their habitat. We provide science-based conservation and management for sustainable fisheries and aquaculture, marine mammals, endangered species and their habitats.