UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
National Centers for Coastal Ocean Science
Silver Spring, Maryland 20910

MEMORANDUM FOR: The Record

FROM: Margo Schulze-Haugen
Deputy Director

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SUBJECT: Categorical Exclusion NCCOS Extramural HABs projects that are within the scope of the E3 Categorical Exclusion

Applicability and Process

NOAA Administrative Order (NAO) 216-6A, Environmental Review Procedures, requires all proposed projects be reviewed with respect to environmental consequences on the human environment. This memorandum addresses the determination that the activities described below for NCCOS extramural HABs projects qualifies to be categorically excluded from further National Environmental Policy Act review.

The intended use of this memorandum is as follows: Project level review for consistency with the scope of the memorandum is conducted by the program manager through the use of the accompanying Project Level Review checklist, found: https://sites.google.com/a/noaa.gov/nos-nccos-environmentalcompliance/ce-memos. This CE memorandum must be associated with the project level review checklist to be valid.

Categorical Exclusion Determination

This project's activities are within the scope of the E3 Categorical Exclusion. As defined in Appendix E of the NAO 216-6A Companion Manual, E3, describes activities to collect aquatic, terrestrial, and atmospheric data in a nondestructive manner. This memorandum describes activities such as water quality measurements, deployment of sensors and sample collections from stationary or mobile platforms. Standard equipment includes CTDs, gliders, sediment grabs, UAS, automated instruments etc. As such, project activities are categorically excluded from further National Environmental Policy Act (NEPA) review.

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1.0 Purpose and Need

NCCOS funds research to understand the causes and impacts of Harmful Algae Blooms (HABs) and their toxins, and builds capacity along our coasts for enhanced HAB monitoring and response (e.g. ECOHAB, MERHAB). These NCCOS grant programs are fundamental to successful management and mitigation of HABs and help NOAA and state partners identify when beaches, shellfisheries, and marine animals are at risk from harmful algae, and to make informed decisions that protect public health and safeguard our coastal economies.

NCCOS funds the highest quality science projects that:

1. Develop information and tools, predictive models and forecasts, and prevention strategies; and
2. Learn how toxins are transferred across and up the food chain, including biosynthesis and metabolism of toxins, and assess the impacts of toxins on higher trophic levels.
3. Enhance routine water quality and shellfish monitoring with better HAB detection methods, training, and strategies;
4. Add sensors to ocean observing systems for low-cost, long-term observations of HABs and related ocean conditions;
5. Demonstrate operational capabilities for forecast models to enhance HAB early warning capability;
6. Ensure trained and equipped personnel are able to mobilize quickly, conduct appropriate sampling and testing, and communicate effectively to foster improved response to HAB events.

Research results guide management of coastal resources to reduce HAB development, impacts, and future threats and will feed into other HAB programs for development of tools to improve HAB management and response.

2.0 Geographic and Temporal Scope

The geographic scope of NCCOS CRP program funded activities, within the E3 categorical exclusion includes the estuarine and coastal waters within the U.S. and its territories in the following regions: Northeast (NE), Southeast (SE), Gulf of Mexico (GOM), West Coast (WC), Alaska (AK), Pacific Islands (PI) and the Great Lakes region (Figure 1). Projects are generally funded from three (3) to five (5) years with variable frequency in sampling from daily, weekly, monthly to annually. Approximately 8 to 12 extramural HAB projects are funded each year that fit within the scope of this activity description. Each project is funded from one (1) to three (3) years. In addition, there may be from five (5) to ten (10) event response projects funded in any given year depending on the severity of the HAB outbreak. Therefore in any given year there are approximately 13 to 22 projects conducting E3 related activities, which refers to those activities employed to collect aquatic, terrestrial and atmospheric data in a nondestructive manner.

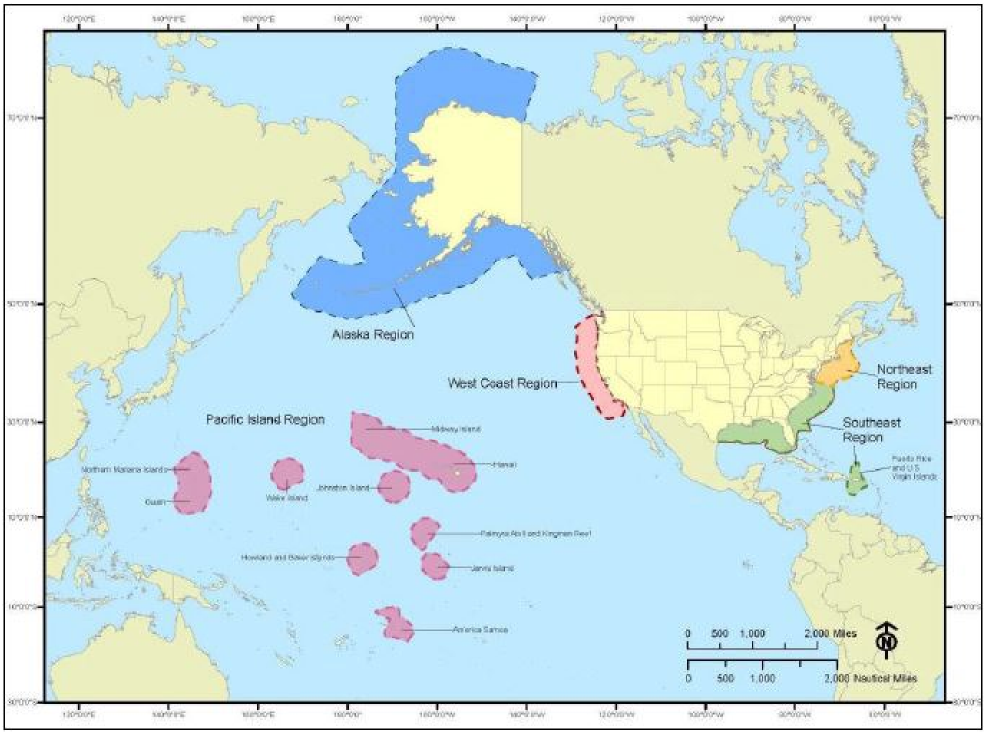

Figure 1. Map of geographic regions adapted from National Marine Fisheries Science Center Programmatic Environmental Assessments.

3.0 Activity Description

Projects generally include field, laboratory and office related activities. Activities employed to collect aquatic, terrestrial and atmospheric data in a nondestructive manner include the following activity types (Table 1).

Table 1. Activity Types covered under the E3 Programmatic Activity Description.

<table>
<tr><th>Activity Category</th><th>Activity Type</th></tr>
<tr><td rowspan="4">Collection of environmental data and samples from stationary or mobile platforms</td><td>Collections of water, sediment, phytoplankton or zooplankton samples for the purpose of characterizing water quality, and other physio-chemical and biological variables</td></tr>
<tr><td>Deployment and operation of non-destructive instrumentation and platforms to allow sampling with the use of cameras, Imaging Flow Cytobot (IFCB) Environmental Sample Processor (ESP), Conductivity-Temperature-Depth (CTD) to obtain visual data, water samples, water quality data from water column and benthic substrate and for integrated sampling- e.g. Phytoplankton Observing – Automated and Remote Management (PHYTO-ARM)</td></tr>
<tr><td>Remote sensing</td></tr>
<tr><td>Limited and non-destructive shellfish collections as part of ongoing shellfish monitoring programs</td></tr>
</table>

Field experiments	Caged shellfish deployment
	Deployment of benthic landers
	Use of microcosms, mesocosms and continuous flow systems
Use of Gliders, AUVs, ASVs, UASs, and Drifters	Gliders and autonomous underwater vehicles (AUVs) for continuous underway sampling and observations of air and water
	Drifters
	Autonomous Surface Vehicles (ASV)
	Uncrewed Aerial Systems (UAS)
Vessel Operations	Deployment of instrumentation
	Sample collections and transects
	Transit of personnel and equipment
Laboratory Analyses and Studies	Include but not limited to sample processing, cell cultures, incubation experiments, cellular, molecular, genetic assays, omic technologies, digital imaging and microscopy analyses, toxin studies, mass spectrometry and chromatography, isotopes, nutrient uptake, herbivory and growth experiments
	Laboratory mesocosm experiments
	Using samples received from third parties as part of other non-related sampling activities

3.1 Collection of environmental data and samples from stationary or mobile platforms:

3.1.1 Collections of water, sediment, phytoplankton or zooplankton samples

Collections of water, sediment, phytoplankton or zooplankton samples for the purpose of characterizing water quality, and other physio-chemical and biological variables. This typically involves the temporary and non-destructive deployment of submersible sampling devices and instrumentation. Water, sediment, phytoplankton or zooplankton sample collections may occur from a small or large vessel, or stationary platform such as a pier or from shore.

Water Sampling: Water samples may be collected via hand sampling, small pumps, a deployment rope, or other water samplers (Niskin bottles, tube samplers, pump profilers, ISCO samplers, etc.) that could be deployed from stationary or mobile platforms either by hand or by electric winch as appropriate.

Sediment sampling: Sediment collections may be carried out using small PONAR sampler, grab samplers (Van veen grab sampler), or sediment coring devices (PVC hand corers, tubes, etc.). Sediment grab samplers are attached to ropes or cable and are lowered vertically by hand or electric winch from the sampling platform (boat, bridge, etc.) to the substrate being sampled beneath the deployment point. Core samplers are used to sample vertical columns of sediment and may be collected from a stationary platform (e.g. bridge, dock) or a mobile platform (e.g.

boat) using different coring devices.

Plankton sampling: Phytoplankton and zooplankton may be sampled by a hand-held net deployed from the dock or boat side.

Water quality sensors: Water quality sensors such as YSI data sondes, CTDs, chlorophyll probes, etc. may be deployed for short-term or long-term continuous profiling of water quality parameters such as temperature, dissolved oxygen, conductivity, etc. in the aquatic environment. These instruments could also be deployed by hand or electric winch.

*Portable biosensor system (*Mbio*):* Mbio is a portable instrument used in the field that aids in the rapid and simultaneous detection of multiple cyanobacterial toxins in freshwater. The system utilizes a novel planar waveguide optical sensor that delivers quantitative fluorescent competitive immunoassay results in a disposable cartridge.

3.1.2 Deployment and Operation of Non-Destructive instruments

Scientific instruments may be deployed to collect physical, chemical, biological and visual measurements (manual, semi or fully automated). These sensors/samplers may be deployed from multiple platform types, including docks and piers, fixed moorings, and mobile platforms such as research vessels and autonomous underwater vehicles or other autonomous surface vehicles. All instruments, platform installations and new moorings must adhere to permits and conditions, as applicable, for the project location. The common types of instruments include but are not limited to:

The Environmental Sample Processor (ESP): ESP provides on-site (in situ) collection and analysis of water samples from the subsurface ocean. The instrument is an electromechanical/fluidic system designed to collect discrete water samples, concentrate microorganisms or particles, and automate application of molecular probes which identify microorganisms and their gene products. The ESP also archives samples so that further analyses may be done after the instrument is recovered. The second generation and third generation ESPs are fully autonomous devices and may be integrated with AUVs.

Installation of PHYTO-ARM: Phytoplankton Observing – Automated and Remote Management (PHYTO-ARM) is a portable, raft-based observing platform that enables automated vertical profiling of IFCBs, CTDs and other ocean sensors at strategic on-water locations.

Passive samplers: Solid phase adsorption toxin tracking (SPATT) devices use porous synthetic resin filled sachets to concentrate biotoxins from water samples. PTFE filter method are also used to obtain toxin samples from water. SPATT samplers can be deployed in multiple modes, including offshore waters on moorings, or 'SPATT buoys', in ship flow-through systems, from autonomous vehicles, and/or attached to human swimmers.

Imaging Flow Cytobot (IFCB): an in-situ automated submersible imaging flow cytometer that generates images of particles in-flow taken from the aquatic environment. The IFCB uses a combination of flow cytometric and video technology to capture high-resolution images of suspended particles. The instrument continuously samples at a rate of 15ml of seawater per hour.

3.1.3 Remote Sensing

Remote sensing refers to the use of satellite- or aircraft-based sensor technologies to detect and classify objects on Earth, including on the surface and in the atmosphere and oceans, based on propagated signals (e.g. electromagnetic radiation). For this memorandum, remote sensing specifically refers to obtaining existing satellite-based sensor technology such as from FluidCam and MiDAR instrumentation or other sources.

3.1.4 Limited non-destructive Shellfish Sampling

Shellfish may be non-destructively collected by hand or with tongs as part of existing State monitoring programs or shellfish collections occurring in farmed areas. Minimal collections of wild caught shellfish may be included as long as collection activities are non-destructive and adhere to terms and conditions of existing permits and/or permissions, as applicable.

3.2 Field Experiments

Field experiments involve the testing of scientific hypotheses through the longer term deployment of scientific gear/devices in-situ from days to months. Deployment of gear and/or sampling devices may include but are not be limited to caged shellfish deployment, mesocosms, deployment of benthic landers or similar gear types. Field experiments such as these are subject to the terms and conditions or all required permits and permissions relative to state and Federal regulatory requirements (e.g. Federal Consistency Provisions, Section 10 of the Rivers and Harbors Act, etc).

3.3 Use of Gliders, AUVs, ASVs, UASs, and Drifters

A glider is a type of unmanned and untethered underwater vehicle that navigates autonomously, without any physical connection to a research vessel at the surface, to monitor water currents, temperature, and water quality conditions that reveal effects from HABs, storms, impacts on fisheries, and water quality among others (IOOS PEA, 2016). Gliders use an onboard global positioning system to maintain their preprogrammed course and have two-way satellite communications with operators which allow them to report their locations and provide data when they surface. A powered AUV travels faster (~4-5 knots), but for a shorter duration than a glider (<4 knots). AUVs and gliders typically have onboard power, supplied by rechargeable batteries to operate a propeller or thrusters for propulsion (IOOS PEA, 2016).

Gliders/AUVs may be deployed from a mobile or stationary platform and are generally preprogrammed to operate for 24 hours a day for the duration of a project. Gliders/AUVs may be outfitted with an altimeter (170 kHz) or pinger (10-30 kHz) for navigation (OCS PEA 2013). Other sensors would vary depending on the research requirements (e.g. CTD, passive hydrophone, Table 1-1 IOOS PEA) but no sonar would be used during glider operation with the exception of altimeters, pingers or ultra-short baseline (USBL) telemetry (27-35kHz), standard equipment on underwater vehicles. Vehicles are generally pre-programmed with a set path which would be monitored continuously by the glider operators. Gliders and AUVs have navigation safety features that allow them to avoid striking the sea floor or other objects. They are also designed to pause and reverse or surface if they do strike an object.

Autonomous surface vehicles (ASV) may also be used for the purposes of environmental data collection. ASVs are lightweight vehicles that are restricted to surface waters and operated within the line of sight of the remote operators. They may also be outfitted with acoustic communication systems such as altimeters, pingers or USBL telemetry. These systems may use a variety of propulsion sources, including diesel, diesel/electric, battery, solar, buoyancy driven, and wave-gliding propulsion systems.

Research involves use of uncrewed aerial systems (UAS). Specific information about the systems such as the UAS model, size, and weight will be described in the accompanying project-specific checklist. Images will be collected over aquatic environments at heights ranging 30 to 400 feet above sea level (nominally 100 feet), within a 500-meter line-of-site radius, at approximately 14 miles per hour airspeed. The specific locations of the flights will be described in the accompanying project-level checklist. All flights and field work will be conducted during daylight hours. All flights will be conducted under FAA Part 107 by FAA Remote Pilot Certificate holders proficient in piloting the aircraft as well as launch and recovery, and in full compliance with applicable UAS policies, including those defined in the NOAA UAS Handbook, UAS acquisition and OCIO guidelines and policy, IT Security, and any other specific organization policies. Flights will be conducted from the surface to 400 ft above ground level, during the day (VFR conditions). The flight mission crew will maintain an aviation band radio. To mitigate fire risks due to use of LiPO batteries, a fire extinguisher will be maintained in proximity to the battery storage area. The mission crew will consist of, at a minimum, the pilot in command (PIC), and one visual observer. When possible, additional crew members will be assigned to assist in monitoring for nonparticipants and marine life. Best management practices (Section 8) will be followed to ensure no disturbance of native species or humans who may occur in the same area.

Drifters are floating ocean buoys equipped with meteorological and/or oceanographic sensing instruments linked to transmitting equipment for sending the observed data to collecting centers. Drifters are typically released from a vessel and flow with surface currents.

3.4 Vessel Operations

Field research activities may be supported by vessel operations for the purpose of sample collections (water, sediment), deployment of instruments for collection of physical, chemical and biological data and for transit of personnel and equipment to and from research/sampling locations (as described in more detail above). Vessels may range in size from small (~10 – 25ft) single engine outboards to a large University or NOAA-owned ship (~250ft). Vessels may be NOAA owned and operated, contracted or owned by fishers/partners. Grant recipients will ensure vessel operators are licensed, experienced and have local knowledge of the area. Vessel operations for the purposes of non-destructive sampling and associated activities as described in this memorandum would not represent an increase in vessel traffic, noise or pollution potential as they are routinely used for these purposes.

3.5 Laboratory Analyses and Studies

Activities covered by this categorical exclusion include laboratory analysis of existing samples and data (previously collected) from field studies and other surveys. Samples may also be provided by third parties and may include but not be limited to marine mammal tissue/blood samples, shellfish samples etc. when collected by third parties during ongoing activities and programs that are already occurring and are not funded by the NCCOS Competitive Research Program. In addition, samples may be received from programs such as the NMFS Marine Mammal Health and Stranding Response Program, Permitted Tribal subsistence hunting activities or state sponsored shellfish collection programs. Laboratory methods are routine and may include, but are not limited to; measurements of harmful algae bloom species growth and toxicity (e.g. cell toxin content measured with High Performance Liquid Chromatography (HPLC), High Nuclear Magnetic Resonance Spectroscopy (HNMRS), Mass Spectrometry (MS), other chromatography techniques, etc.), Chemostat experiments, assays (e.g. molecular, toxin production, receptor binding assays (RBA)), cell culturing (e.g. Brevetoxins, Gambierdiscus, Microcystis, Alexandrium, Copepods, Psuedo-nitzschia etc.), digital imaging and microscopy analysis, nutrient analyses, growth and nutrient uptake experiments, herbivory and grazing rate experiments, isotope analysis, mammalian blood toxin analysis (from archived samples), cellular, molecular and genetics analyses (e.g. using Polymerase chain reaction, etc.), mesocosm experiments, and in-situ experimental studies using samples previously collected. Laboratory research may involve the use of chemicals and small amounts radioactive elements (e.g. RBA, productivity measurements). All laboratory activities described above would be conducted in licensed facilities with standard operating procedures in place to ensure no adverse environmental impacts are possible.

Results of laboratory analysis and office-based data analysis will be used to create synthesis reports and peer-reviewed journal articles, support development of interactive decision support tools, predictive models, forecasts and provide information to coastal managers. In addition, resulting model forecasts, products and tools may be used in training workshops to fill data gaps and meet stakeholders and regulators data and information needs. The existing data and products utilize information from estuaries, along the coasts, marine ecosystems and marine protected areas wherever they occur, nationwide.

4.0 Environmental Impacts

This section analyses the environmental impacts of the HABs E3 non-destructive sampling activities on natural resources. These activities fall into five main categories (Table 1): 1. Collection of environmental data and samples from stationary or mobile platforms (hereafter Data and Sample Collection) 2. Field Experiments, 3. Use of Gliders, AUVs, ASVs, UASs, and Drifters, 4. Vessel Operations, and 5. Laboratory Analyses and Studies. Activities that fall within the Laboratory Analyses and Studies category are determined to have no effect on natural resources as long as they occur in licensed/certified laboratories and all appropriate best practices are followed (e.g. hazardous waste disposal, effluent) to ensure no environmental impact. Each project will be analyzed with a site-specific checklist as confirmation. Therefore, this activity category will not be considered further in this memorandum.

4.1 Endangered Species

Section 7(a)(2) of the Endangered Species Act (ESA) states that each federal agency shall, in consultation with the Secretary, ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. In fulfilling these requirements, each agency must use the best scientific and commercial data available.

Listed in this section are the marine and anadromous species that may co-occur within proximity to the geographic scope of the activities described in this memorandum. Effects determinations for each group are listed by section. Other ESA listed species/groups that not listed such as, terrestrial mammals, terrestrial reptiles, amphibians, freshwater invertebrates, insects etc. NCCOS has determined that activities would not co-occur within proximity to these organisms and thus there is no potential for impact. Therefore, these groups are not considered further.

Marine Mammals

All marine mammals are protected under the Marine Mammal Protection Act (MMPA). Sections 101 (a)(5)(A) and (D) allow the incidental take of marine mammals only under special circumstances, where "take" is defined as "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 U.S.C. §§ 1361-1421h). Harassment includes any annoyance which has the potential to injure a marine mammal or stock (Level A) or disrupt its behavioral patterns (Level B). This document specifically lists species protected under the ESA, however, there are many species of marine mammals such as dolphins, porpoises, walruses etc. which are afforded protections under the MMPA but are not listed specifically in this document. However, the NCCOS analysis applies to all marine mammals not listed herein.

Cetaceans

There are thirteen (13) species of threatened and endangered Cetaceans within US waters. Cetaceans listed on the ESA are found in all US and territorial waters (Table 2).

Table 2. There are thirteen (13) species of threatened, endangered or proposed endangered Cetaceans within US waters.

Marine Mammals - Cetaceans	SE	NE	GOM	West	AK	PI	ESA Status	Crit. Hab.
Beluga Whale, (*Delphinapterus leucas*)	--	--	--	--	X Cook Inlet DPS	--	E – 73 FR 62919	76 FR 20179

Blue Whale (*Balaenoptera musculus)*	X	X	X	X	X	X	E – 35 FR 18319	--
Bowhead Whale (*Balaena mysticetes*)	--	--	--	--	X	--	E – 35 FR 18319	--
Bryde's Whale (*Balaenoptera edeni*) – Gulf of Mexico Subspecies	--	--	X	--	--	--	E – 84 FR 15446	--
False Killer Whale (*Pseudorca crassidens*)	--	--	--	--	--	X Main Hawaiian Islands Insular DPS	E – 77 FR 70915	83 FR 35062
Fin Whale (*Balaenoptera physalus)*	X	X	X	X	X	X	E – 35 FR 18319	-- --
Gray Whale (*Eschrichtius robustus*) Western North Pacific Population				X	X		E – 35 FR 18319	-- --
Humpback Whale (*Megaptera novaeangliae*) –	--	--	--	X Central America& Mexico DPS	X Western North Pacific & Mexico DPS	--	T&E – 81 FR 62259	-- --
North Atlantic Right Whale (*Eubalaena glacialis*)	X	X	--	--	--	--	E – 73 FR 12024	59 FR 28805 and 81 FR 4837
North Pacific Right Whale (*Eubalaena japonica*)	--	--	--	X	X	--	E – 73 FR 12024	73 FR 19000
Sei Whale (*Balaenoptera borealis*)	X	X	X	X	X	X	E – 35 FR 18319	-- --
Sperm Whale (*Physeter macrocephalus*)	X	X	X	X	X	X	E – 35 FR 18319	-- --
Killer Whale, (*Orcinus orca*)	--	--	--	X Southern Resident DPS	--	--	E – 70 FR 69903	

Critical Habitat and/or Seasonal Management Areas

Cook Inlet Beluga

Beluga whales are found in the United States in Alaska and globally throughout the Arctic Ocean. They may also occur in large rivers and can move between salt and fresh water (https://www.fisheries.noaa.gov/species/beluga-whale). While all Beluga whale populations are protected under the MMPA, only the Cook Inlet DPS is protected under the ESA.

There is critical habitat designated for the Cook-Inlet beluga at the southern end of Cook Inlet and also Kachmak Bay (Figure 2). The primary constituent elements (PCEs) essential to the conservation of the Cook-Inlet beluga are:

1. Intertidal and subtidal waters of Cook Inlet with depths <30 feet (MLLW) and within 5 miles of high and medium flow anadromous fish streams.
2. Primary prey species consisting of four species of Pacific salmon (Chinook, sockeye, chum, and coho), Pacific eulachon, Pacific cod, walleye pollock, saffron cod, and yellowfin sole.
3. Waters free of toxins or other agents of a type and amount harmful to Cook Inlet beluga whales.
4. Unrestricted passage within or between the critical habitat areas.
5. Waters with in-water noise below levels resulting in the abandonment of critical habitat areas by Cook Inlet beluga whales.

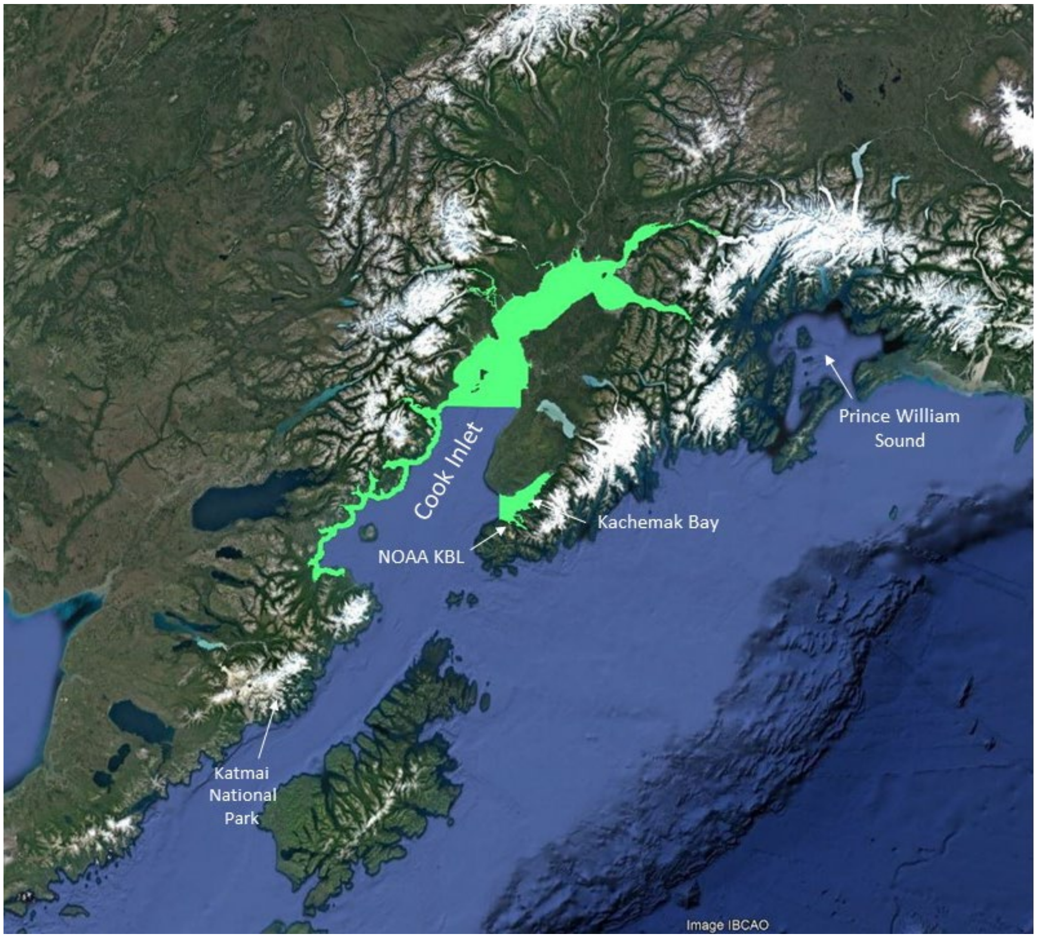

Figure 2. Map of Beluga whale (Cook Inlet DPS) designated critical habitat shown in bright green. KBL – indicates the Kasitsna Bay Laboratory.

False Killer Whale

False killer whales are social animals found globally in all tropical and subtropical oceans and generally in deep offshore waters. While all false killer whales are protected under the MMPA only the Hawaiian Islands DPS is listed on the ESA (https://www.fisheries.noaa.gov/species/false-killer-whale#population).

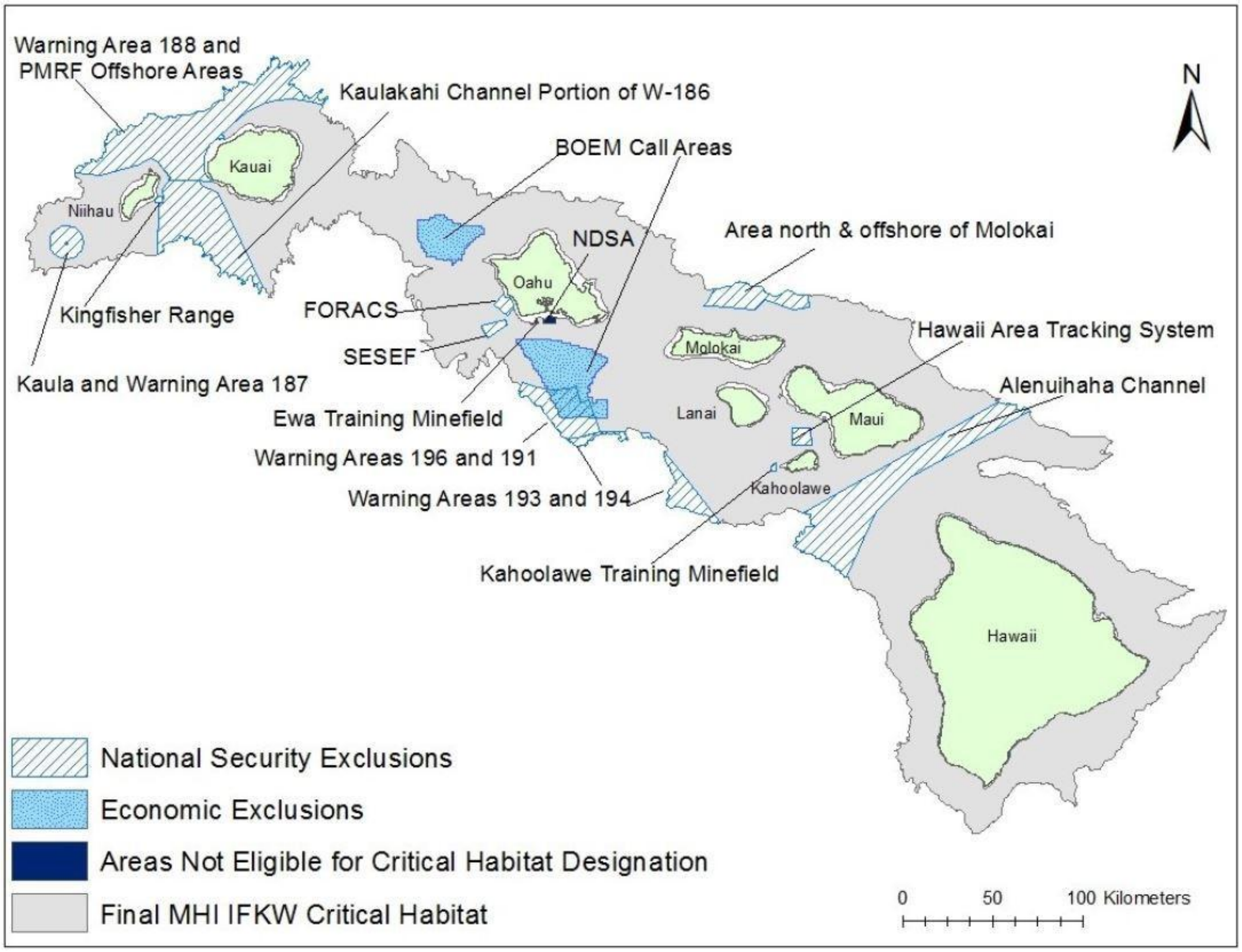

Figure 3. From Pacific Island Region NOAA fisheries this website: https://media.fisheries.noaa.gov/dam-migration/ifkw_ch_map_final.pdf

There is critical habitat designated for the false killer whale Hawaiian Island DPS (Figure 3). The four characteristics of false killer whale critical habitat include (83 FR 35062):

1. adequate space for movement and use within shelf and slope habitat;
2. prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth;
3. waters free of pollutants of a type and amount harmful to MHI IFKWs; and
4. sound levels that will not significantly impair false killer whales' use or occupancy

North Atlantic Right Whales

North Atlantic right whales primarily occur in Atlantic coastal waters or close to the continental shelf, although movements over deep waters are known. Most known right whale nursery areas are in shallow, coastal waters. Each Fall, some right whales travel more than 1,000 miles from their feeding grounds off the Canadian Maritimes and New England to the warm coastal waters of South Carolina, Georgia, and northeastern Florida. These southern waters are the only known calving area for the species—an area where they regularly give birth and nurse their young. NOAA Fisheries has designated two critical habitat areas determined to provide important feeding, nursery, and calving habitat for the North Atlantic population of right whales (https://www.fisheries.noaa.gov/species/north-atlantic-right-whale):

1. Off the coast of New England (foraging area) (Figure 4) this area has been designated as essential for the reproduction, rest and refuge, health, continued survival, conservation and recovery of the northern right whale population (https://www.gpo.gov/fdsys/pkg/FR-1994-06-03/html/94-13500.htm).

2. Off the southeast U.S. coast from Cape Fear, North Carolina, to below Cape Canaveral, Florida (calving area) (Figure 5). Calving is essential to the species' conservation and the physical features that are essential to successful calving include:

a. Calm sea surface conditions associated with Force 4 or less on the Beaufort Scale,

b. sea surface temperatures from 7 °C through 17 °C, and

c. water depths of 6 to 28 meters where these features simultaneously co-occur over contiguous areas of at least 231 km 2 during the months of November through April.

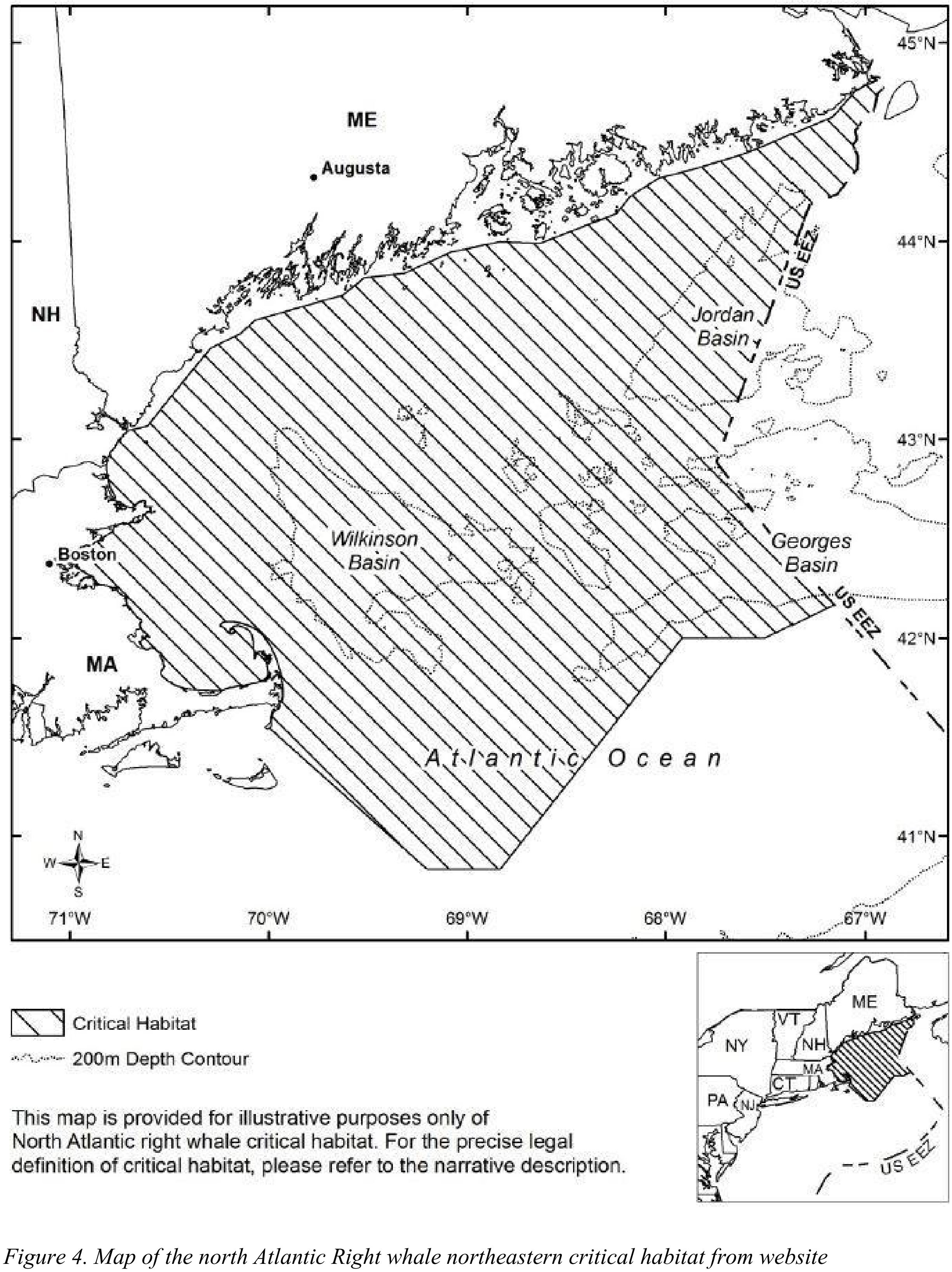

Figure 4. Map of the north Atlantic Right whale northeastern critical habitat from website - https://www.fisheries.noaa.gov/resource/map/north-atlantic-right-whale-northeastern-critical-habitat-map

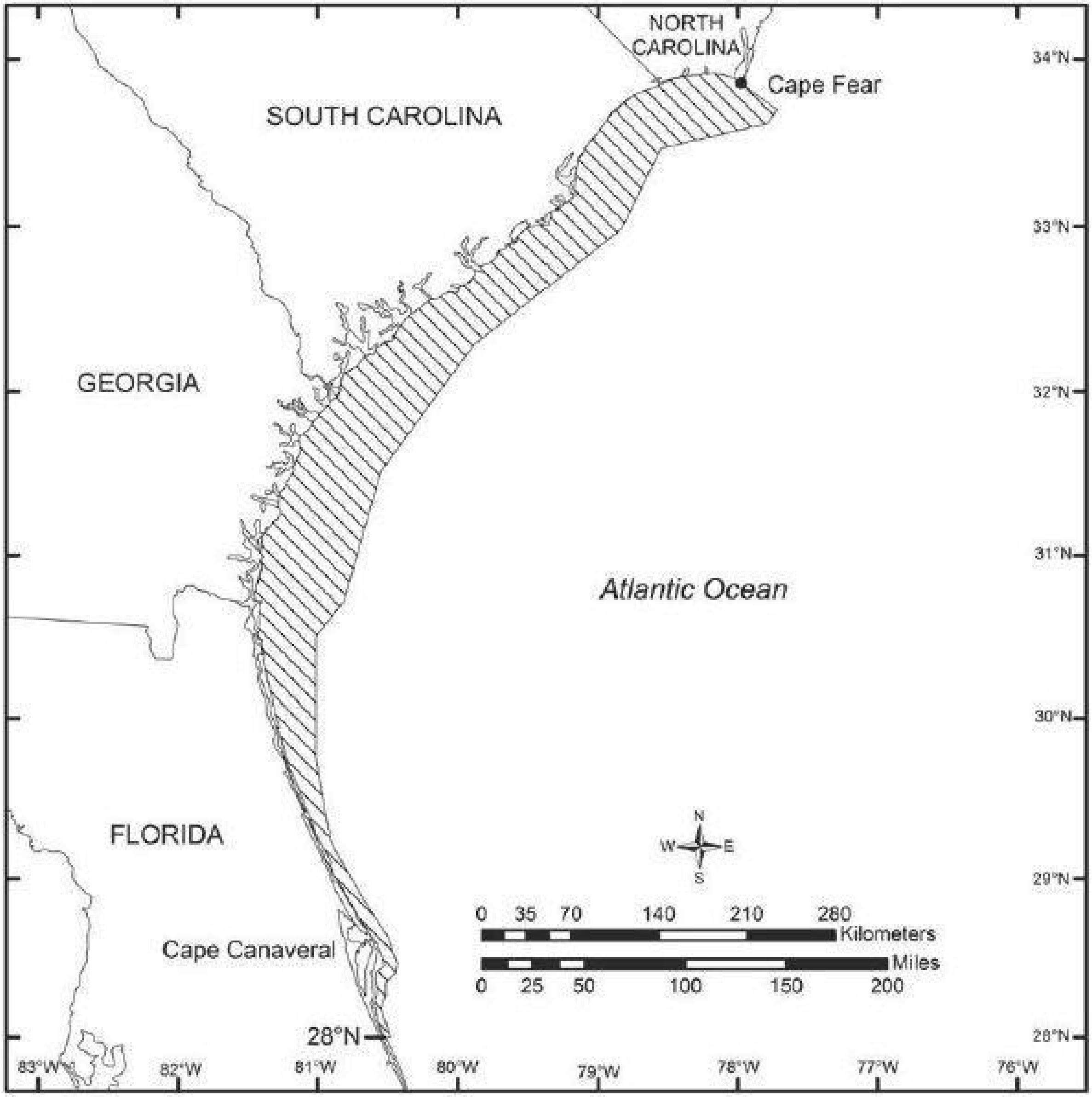

Figure 5. Map of North Atlantic right whale critical habitat in hatched area in the southeastern region, from website, https://www.fisheries.noaa.gov/resource/map/north-atlantic-right-whale-critical-habitat-map-and-gis-data

Seasonal Management and Dynamic Management Areas - All vessels 65 feet (19.8 meters) or longer must travel at 10 knots or less in certain locations (Seasonal Management Areas) along the U.S. east coast at certain times of the year to reduce the threat of ship collisions with endangered North Atlantic right whales. The purpose of this regulation is to reduce the likelihood of deaths and serious injuries to these endangered whales that result from collisions with ships (https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducing-ship-strikes-north-atlantic-right-whales). Voluntary Dynamic Management Areas (DMAs) may also be established by NOAA Fisheries. Mariners are encouraged to avoid these areas or reduce speeds to 10 knots or less while transiting through these areas. NOAA Fisheries will announce

DMAs to mariners through its customary maritime communication media and display any active ones below, with the most recent designation first (https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducing-ship-strikes-north-atlantic-right-whales#dynamic-management-areas).

Northeast Seasonal Management Areas (Figure 6)

1. Cape Cod Bay January 1 - May 15
2. Off Race Point March 1 - April 30
3. Great South Channel April 1 - July 31

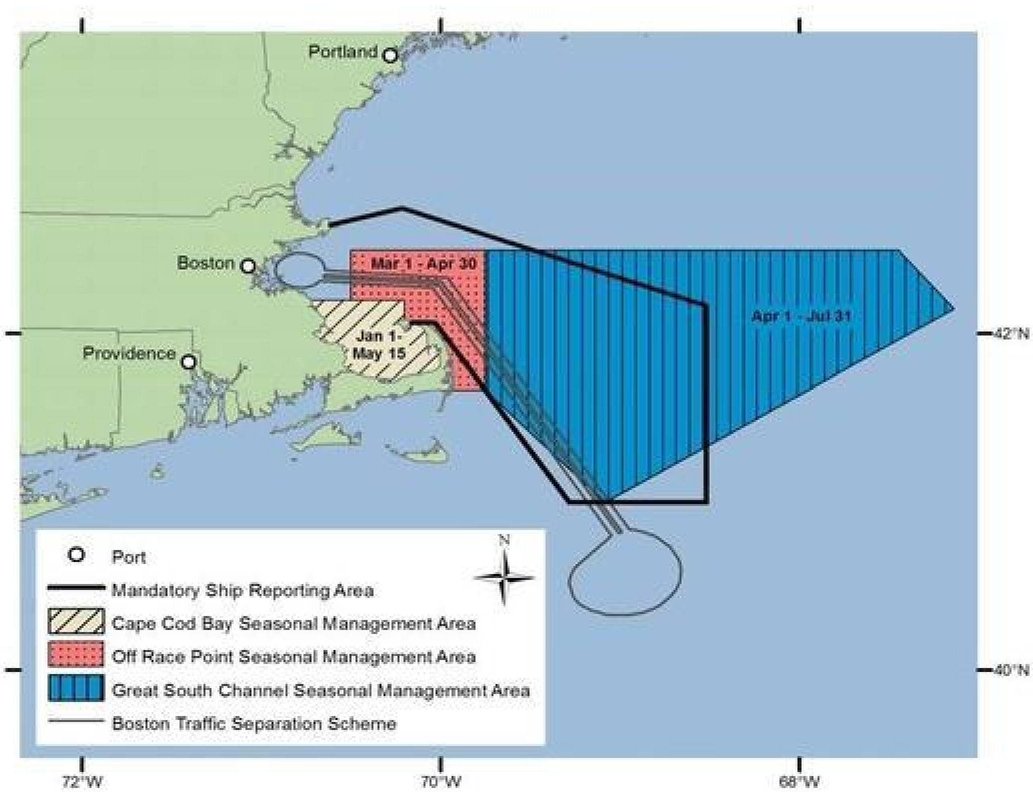

Figure 6. Northeast Seasonal Management Areas for the North Atlantic Right Whale from website - https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducing-ship-strikes-north-atlantic-right-whales#seasonal-management-areas---northeast.

Mid-Atlantic Seasonal Management Area - Migratory Route and Calving Grounds SMAs (Figure 7) November 1 - April 30

1. Block Island Sound waters
2. Ports of New York/New Jersey:
3. Entrance to the Delaware Bay
4. Ports of Philadelphia and Wilmington:
5. Entrance to the Chesapeake Bay
6. Ports of Hampton Roads and Baltimore

7. Ports of Morehead City and Beaufort, NC

Figure 7. Mid-Atlantic Seasonal Management Areas for the North Atlantic Right Whale from website - [*https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducing-ship-strikes-north-atlantic-right-whales#seasonal-management-areas---mid-atlantic*](https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducing-ship-strikes-north-atlantic-right-whales#seasonal-management-areas---mid-atlantic).

Southeast Seasonal Management Area - Calving and Nursery Grounds November 15 through April 15 (Figure 8).

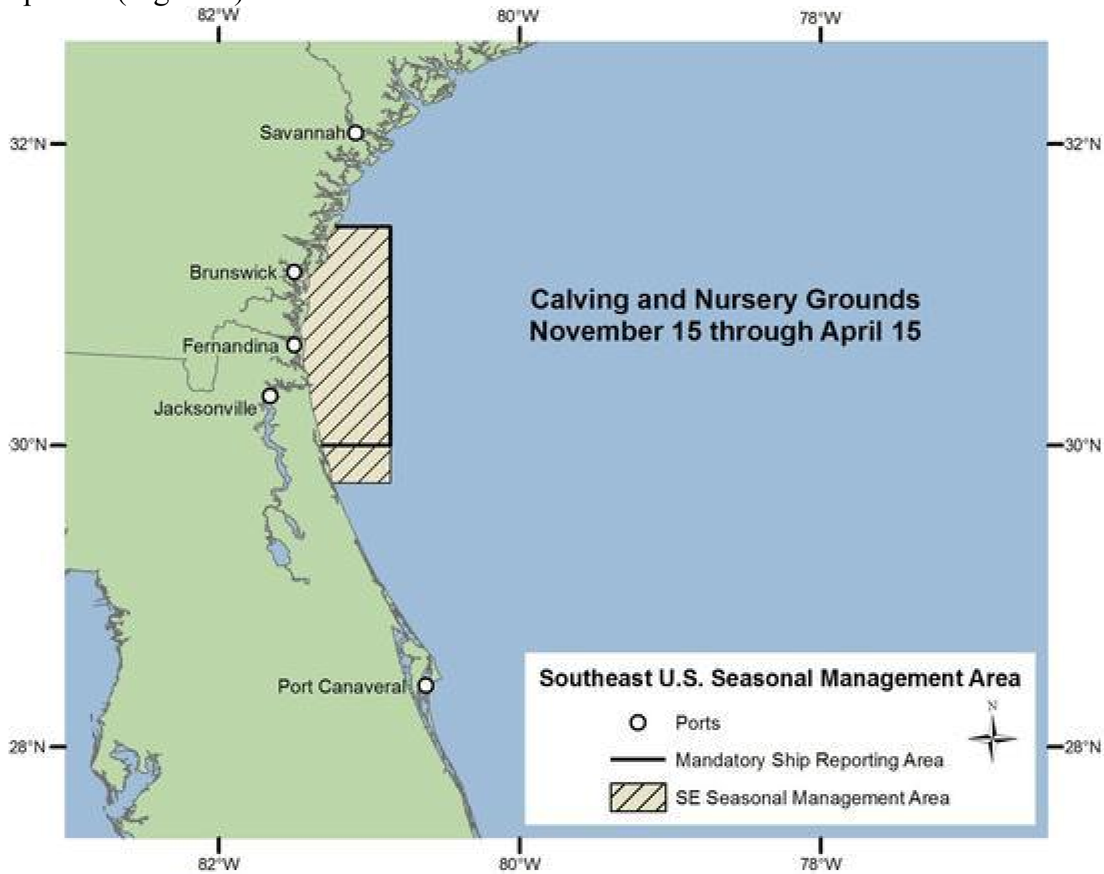

Figure 8. Southeast US Seasonal Management Area calving and nursery grounds for the North Atlantic Right Whale from website https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducing-ship-strikes-north-atlantic-right-whales#seasonal-management-area---southeast

North Pacific Right Whale

Right whales have occurred historically in all the world's oceans from temperate to subpolar latitudes. Contemporary sightings of right whales have mostly occurred in the central North Pacific and Bering Sea. Sightings have been reported as far south as central Baja California in the eastern North Pacific, as far south as Hawaii in the central North Pacific, and as far north as the sub-Arctic waters of the Bering Sea and sea of Okhotsk in the summer. North Pacific right whales are the rarest of all large whale species and among the rarest of all marine mammal species (https://www.fisheries.noaa.gov/species/north-pacific-right-whale).

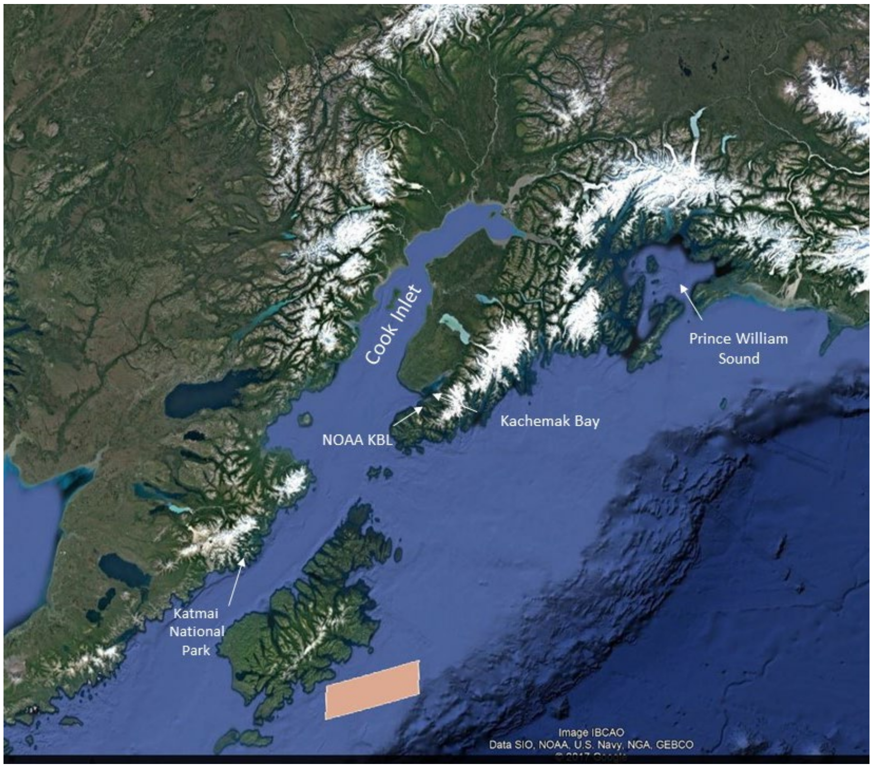

Figure 9. Map of North Pacific right whale designated critical habitat shown as a rose colored polygon.

The primary constituent elements important for North Pacific right whales have been determined to be the species of large zooplankton in areas where right whales are known or believed to feed. In particular, these are the copepods Calanus marshallae, Neocalanus cristatus, and N. plumchrus, and a euphausiid, Thysanoessa raschii, whose very large size, high lipid content, and occurrence in the region likely makes it a preferred prey item for right whales. There is designated critical habitat for north Pacific right whales in Alaska (Figure 9) (https://www.federalregister.gov/documents/2008/04/08/E8-7233/endangered-and-threatened-species-designation-of-critical-habitat-for-north-pacific-right-whale)

Killer Whales

Killer whales are found in all oceans. While they are most abundant in colder waters like Antarctica, Norway, and Alaska, they are also found in tropical and subtropical waters. The most well-studied killer whale populations occur in the eastern North Pacific Ocean. Resident killer whales have been seen from California to Russia. Transient killer whales occur throughout the eastern North Pacific, and are often seen in coastal waters (https://www.fisheries.noaa.gov/species/killer-whale).

Critical habitat is designated for killer whales in Puget Sound, Washington (Figure 10). The habitat requirements for killer whales include (https://www.fisheries.noaa.gov/action/critical-habitat-southern-resident-killer-whale):

1. Water quality to support growth and development;
2. Prey species of sufficient quantity, quality and availability to support individual grth, reproduction and development as well as overall population growth; and

3. Passage conditions to allow for migration, resting and foraging.

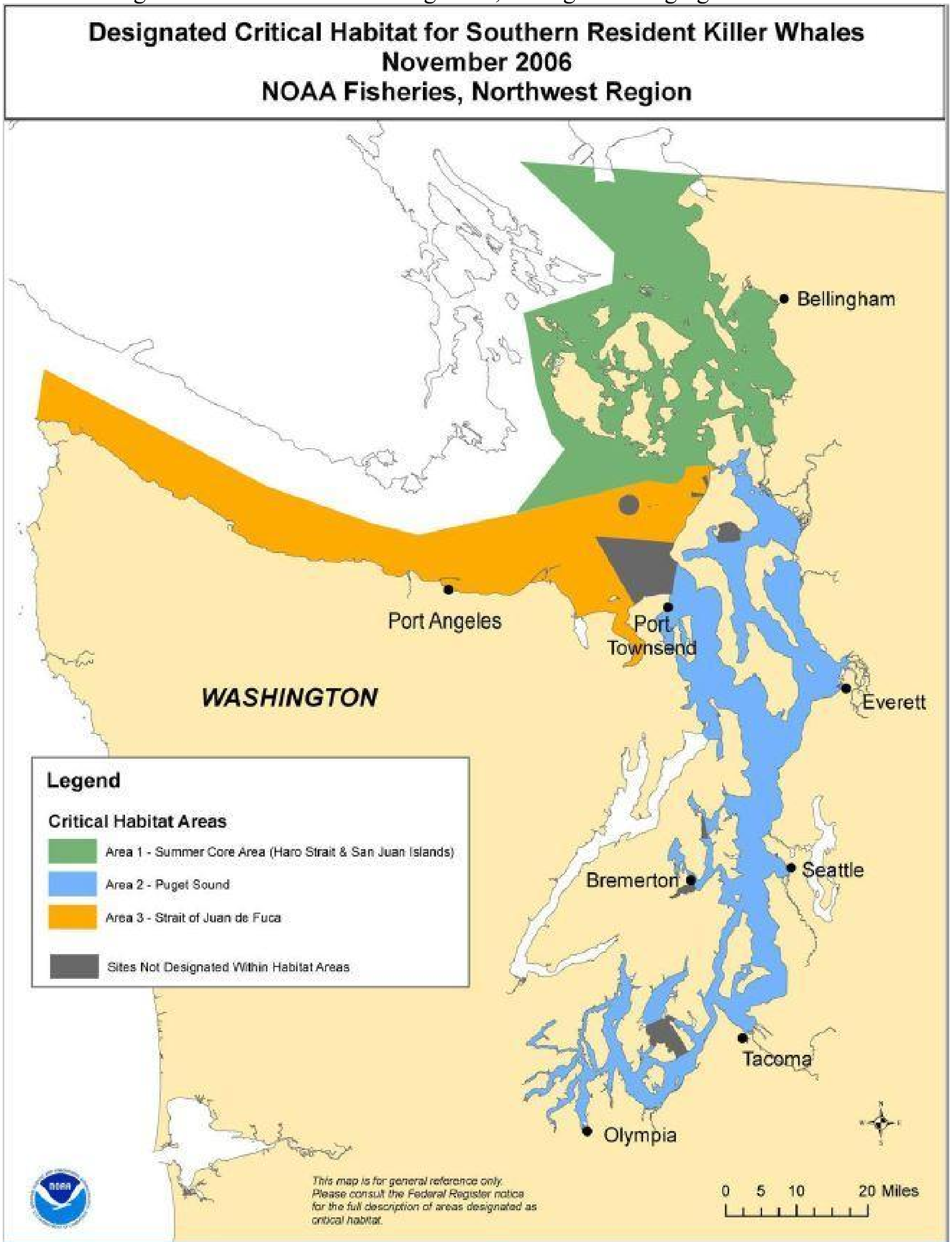

Figure 10. Map showing critical habitat for southern resident killer whales, from this website - [*https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html*](https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html)

Cetacean Effects Determination
Activities to be conducted fall into four main categories 1. Data and Sample Collection, 2. Field Experiments 3. Use of Gliders, AUVs, ASVs and Drifters, and 4. Vessel Operations.

Data and sample collection
Data and sample collection typically involves the temporary and non-destructive deployment of submersible sampling devices and instrumentation. Data and sample collection would have no effect on large whales as these activities are of limited size and magnitude, or occur in waters too shallow to support large whale species. No impacts would be expected from the operation of cameras, sensors etc. as they passively collect data from the water column. Deployment and operation of non-destructive instrumentation such as platforms or moorings would also have no potential to adversely affect Cetaceans as they are easily avoided by Cetaceans and would not be placed in nursery areas or migratory corridors. In addition, all efforts would be made to minimize entanglement of whales or other marine mammals, including not deploying the instruments in the presence of whales. Non-destructive shellfish harvests would also have no potential to adversely affect Cetaceans as these would be restricted to shallow water shellfish beds that are farmed or adjacent to farmed areas where Cetaceans would not inhabit. Further, non-destructive sampling activities have no potential to adversely affect ESA-listed critical habitat. Other BMPs to avoid entanglement include (see Pp. 84-87):

a. Use of stiffer line materials will be used during operations to reduce the potential for entanglement;
b. Reduce knots in the line as much as possible; and
c. Clearly mark lines in the event an animal does become entangled so that NMFS experts can identify the gear.

Field experiments
Field experiments using caged shellfish, use of mesocosms, benthic landers, etc. would not have any negative impact on any whale species as these activities are of limited size, situated on the substrate, or occur in waters too shallow to support large whale species. Entanglement of marine species with mooring lines (i.e., lines connecting the topside buoy to the anchor) in the water column is considered highly unlikely due to the ability of marine species to detect and avoid the mooring lines and because the mooring cables are sufficiently rigid to eliminate the slack that causes entanglement. This action would be conducted under the terms and conditions of all applicable permits. Field experiments would not be conducted in critical habitat. Therefore, there is no potential to adversely impact critical habitat.

Use of Gliders, AUVs, ASVs, UASs, and Drifters
The deployment of gliders, AUVs, UASs, and drifters would have no impact on Cetaceans, as the vehicles and instruments would move within the water column similar to a dolphin or whale, and drifters float on the sea surface, moving with ocean currents. Gliders generally move at very slow speeds (< 4 knots), minimizing the potential for collisions with marine mammals. ASVs are operated at the surface and are in line of sight of the operator and can avoid Cetaceans by maintaining minimum approach distances. ASVs are also slow moving (~4-5 knots) lightweight (~200 to 300 pounds) vehicles that could be easily avoided by Cetaceans. AUVs, ASVs and gliders may use a variety of propulsion sources, including diesel, diesel/electric, battery, solar,

buoyancy driven, and wave-gliding propulsion systems. However, most are powered by batteries that are sealed with little potential for leakage. AUVs also move at low speeds (approximately 3-5 knots) with little potential for collisions with marine species. Acoustic sources associated with the navigation and communications of these vehicles generally do not overlap with the hearing frequencies of Cetaceans (altimeters 170kHz) or the sound dissipates rapidly from the source (pingers 27-35kHz, USBL 27-35kHz). There is no entanglement hazard associated with the gliders, AUVs, ASVs or drifters. In the unlikely event of a glider, AUV, ASV or drifter malfunction, negligible adverse impacts on biological resources would be expected. For example, gliders would be programmed to avoid known obstructions, avoid striking the sea floor or other objects and to hover 1-2 meters above the benthos and to pause, reverse or surface in the unlikely event of a collision.

UAS used in NCCOS projects are small and lightweight and are used for the purposes of aerial observation of marine life, marine debris, and oceanographic characteristics. The UAS pilot will make sure to avoid flying directly over any sighted marine animals, and will fly no lower than 30ft (10m) over the surface of the water. Christiansen et al. (2016) conducted a detailed study on noise levels from multirotor UAS in marine environments and the impacts on marine mammals, with a goal of aiding wildlife managers in issuing permits establishing operational guidelines. The investigators determined that at a depth of 1m, the UAS noise levels could only be quantified above background noise levels when flying at altitudes of 5-10m (16-32 ft). The results led to the conclusion that "while UAS noise may be heard by some marine mammals under water… the underwater noise effect is small, even for animals close to the water surface" (Christensen et al., 2016). Based on this analysis, NCCOS determines these activities would not have adverse effects on Cetaceans, result in unauthorized take of any other marine mammal or adversely affect critical habitat.

Vessel Operations

Vessel operations may include transit of personnel and equipment, deployment of instrumentation and sample collections. For small vessels transit operations may occur from the closest boat launch or home port to the project site. Transit aboard ships could be over a much broader area. Regardless of size vessel operators would maintain 100% protected species observer coverage, maintain minimum approach distances for protected species (e.g. maintain 200 yards from large whales) and reduce speeds when protected species are observed (BMPs Pp. 84-87). Vessel operations are routine and do not represent an increase in vessel traffic, noise or pollution potential above baseline levels as vessels are used routinely for other purposes. Therefore, NCCOS determines that vessel operations would have no adverse impacts on Cetaceans or their critical habitat or other marine mammals not listed specifically in this document.

Pinnipeds

There are five (5) species of threatened or endangered Pinnipeds that occur within US and territorial waters (Table 3). All occur within the Pacific Ocean, West coast, Alaska and Pacific Islands region. All pinnipeds are also protected under the MMPA.

Table 3. There are five (5) species of threatened or endangered Pinnipeds within US waters.

Marine Mammals - Pinnipeds	SE	NE	GOM	West	AK	PI	ESA Status	Crit. Hab.
Bearded Seal (*Erignathus barbatus*)	--	--	--	--	X Beringia DPS	--	T – 77 FR 76739	-- --
Guadalupe Fur Seal (*Arctocephalus townsendi*)	--	--	--	--	X	--	T – 50 FR 51252	-- --
Hawaiian Monk Seal (*Neomonachus schauinslandi*)	--	--	--	--	--	X	E – 41 FR 51611	80 FR 50925
Ringed Seal (*Phoca hispida hispida*) –Arctic subspecies	--	--	--	--	X	--	T – 77 FR 76706 Currently vacated, but listing will be reinstated	79 FR 73010 (Proposed)
Steller Sea Lion (*Eumetopias jubatus*) – Western DPS	--	--	--	X	X	--	E – 55 FR 49204	58 FR 45269

Critical Habitat

Hawaiian Monk Seal

The Hawaiian monk seal is one of the most endangered seal species in the world. Hawaiian monk seals are found throughout the entire Hawaiian archipelago, a distance of 1,549 miles from Kure Atoll in the northwest to Hawai'i Island in the southeast. The majority of Hawaiian monk seals (about 1,100 individuals) live in the Northwestern Hawaiian Islands, and a much smaller population (about 300) lives in the main Hawaiian Islands. There have also been rare sightings of Hawaiian monk seals, as well as a single birth, at Johnston Atoll, the closest atoll southwest of the Hawaiian Islands.

Monk seals live in warm, subtropical waters and spend two-thirds of their time at sea. They use the waters surrounding atolls and islands and areas farther offshore on reefs and submerged banks; they also use deepwater coral beds as foraging habitat. When on land, monk seals breed and haul-out to rest, give birth, and molt on sand, corals, and volcanic rock shorelines. They prefer sandy, protected beaches surrounded by shallow waters for pupping (https://www.fisheries.noaa.gov/species/hawaiian-monk-seal).

Critical habitat is designated for Hawaiian monk seals at 16 different locations (Figure 11 or see individual island maps at: https://www.federalregister.gov/documents/2015/08/21/2015-20617/endangered-and-threatened-species-final-rulemaking-to-revise-critical-habitat-for-hawaiian-monk). These areas contain one or a combination of the features essential to Hawaiian monk seal conservation including (Figure 12; https://www.fpir.noaa.gov/PRD/prd_critical_habitat.html):

1. Preferred pupping and nursing areas

2. Significant haul-out areas
3. Marine foraging areas out to 200 m in depth

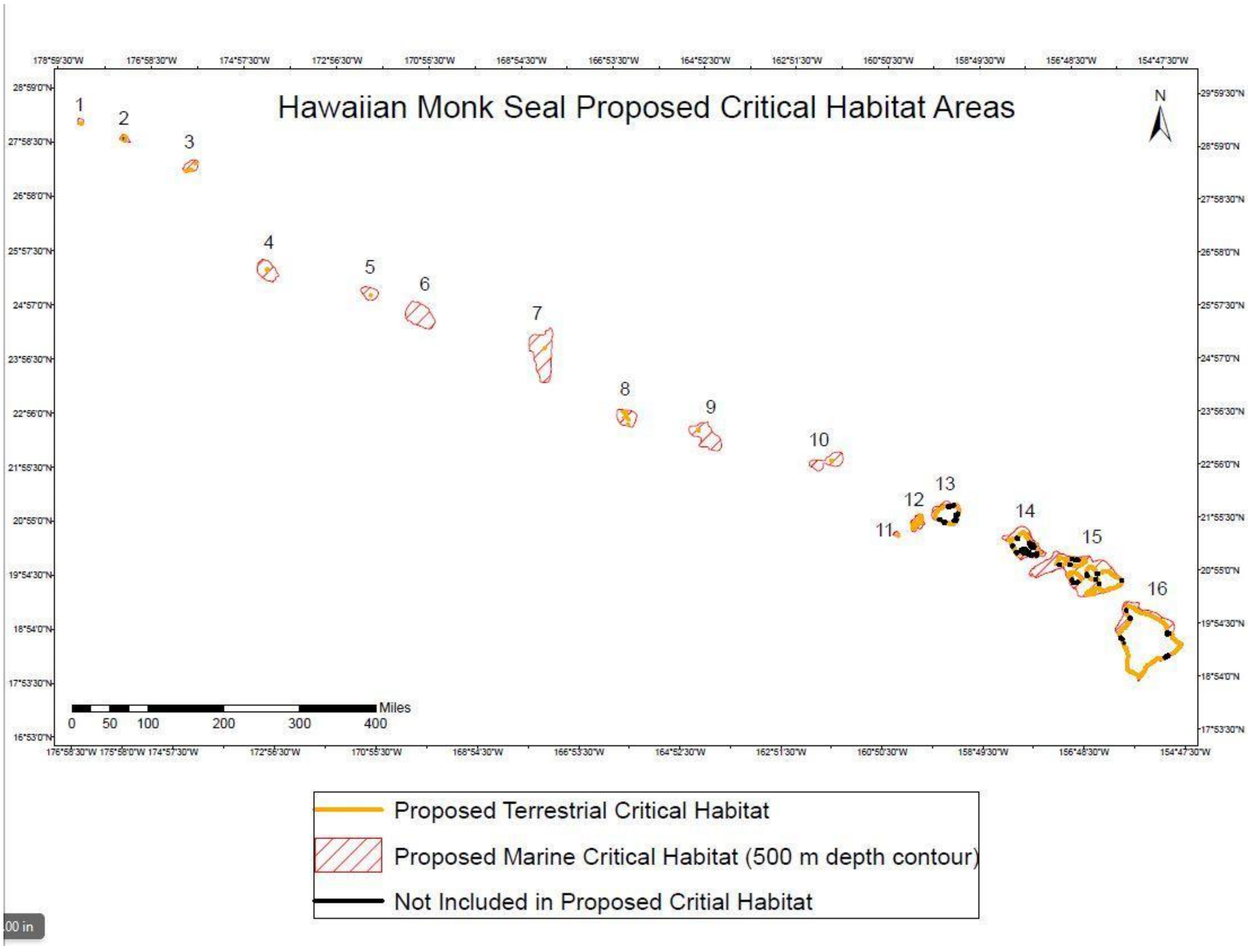

Figure 11. Hawaiian Monk Seal designated critical habitat, map is from this website: https://www.fisheries.noaa.gov/webdam/download/64399948. Note the map indicates this is proposed, but the critical habitat has been designated at the time of this writing (11/7/2018). Updated maps can be found at https://media.fisheries.noaa.gov/dam-migration/monk_seal_ch_maps.pdf

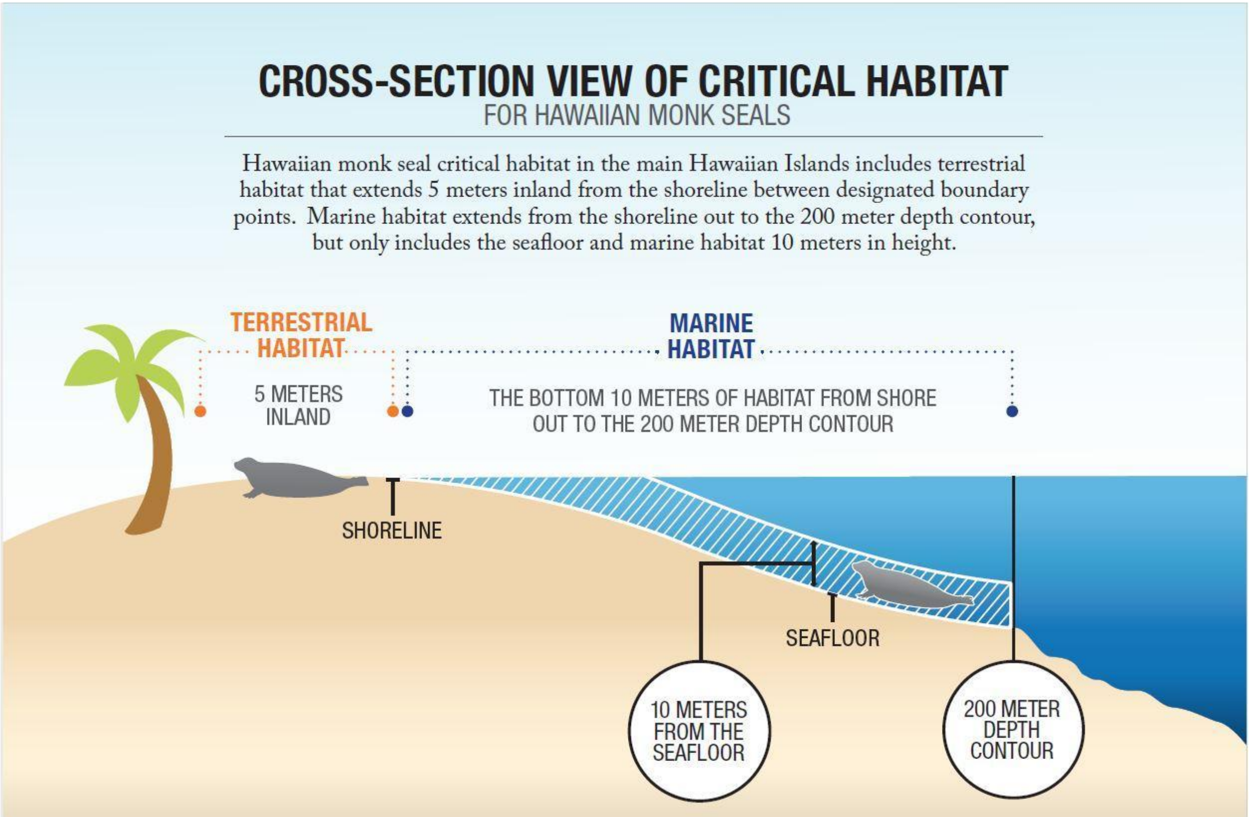

Figure 12. Hawaiian monk seal cross-section of critical habitat. *https://www.fpir.noaa.gov/PRD/prd_critical_habitat.html*

Steller Sea Lion

Steller sea lions prefer the colder temperate to subarctic waters of the North Pacific Ocean. They need both terrestrial and aquatic habitats. They mate and give birth on land, at traditional sites called rookeries. Haul-outs and rookeries usually consist of beaches (gravel, rocky, or sand), ledges, and rocky reefs. In the Bering Sea and Okhotsk Sea, sea lions may also haul out on sea ice.

Steller sea lions are distributed mainly around the coasts along the North Pacific Ocean rim from northern Hokkaido, Japan through the Kuril Islands and Okhotsk Sea, the Aleutian Islands and Bering Sea, the southern coast of Alaska, and south to central California. While they are most typically found in coastal waters on the continental shelf, they also occur and sometime forage in much deeper continental slope and pelagic waters, especially in the non-breeding season (https://www.fisheries.noaa.gov/species/steller-sea-lion).

The critical habitat of Steller sea lions includes a 20 nautical mile buffer around all major haul-out and rookeries with their associated terrestrial, air, and aquatic zones (Figure 13). Sea lions do not migrate, but do move their “central-place haulout,” the center of their foraging activity, to track seasonal concentrations of many types of prey. They breed on exposed, offshore rookeries during summer and generally move to more protected haulouts in winter, especially in southeastern Alaska (http://www.adfg.alaska.gov/index.cfm?adfg=stellersealion.uses).

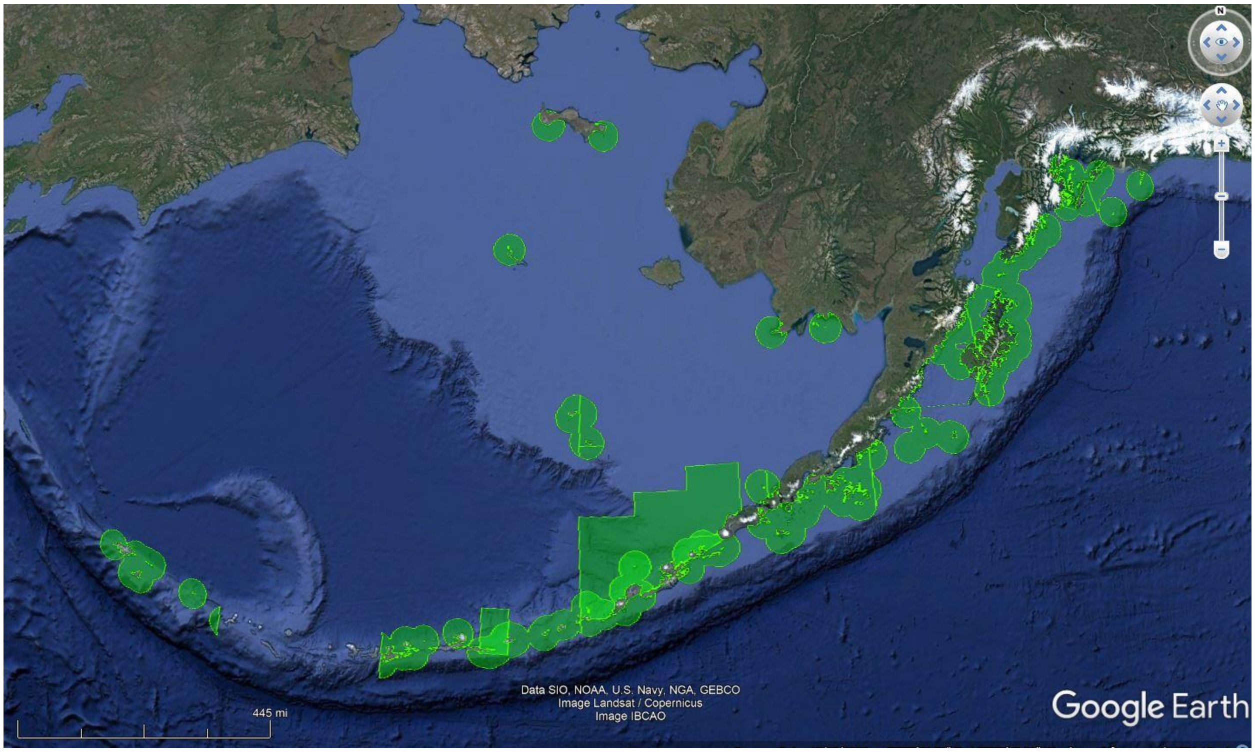

Figure 13. Map showing the extent of steller sea lion designated critical habitat in the green polygons. Data are from website - https://www.fisheries.noaa.gov/resource/map/critical-habitat-steller-sea-lion-western-dps

Sirenians - West Indian Manatee

The West Indian manatee is listed as threatened and occurs throughout the southeastern U.S. and is at the northern limit of their range (Table 4). They occur in freshwater, brackish, and marine environments that typically include coastal tidal rivers and streams, mangrove swamps, salt marshes, freshwater springs, and vegetated bottoms. Manatees use different habitats at different times of the year. During cold winter temperatures, they concentrate along peninsular Florida and many rely on warm water from natural springs, passive thermal basins, and power plant outfalls (Laist et al. 2013, USFWS 2001). During summer, they expand their range; manatees are occasionally seen as far north as Rhode Island on the Atlantic coast and as far west as Texas on the Gulf of Mexico coast (USFWS 2001).

Table 4. The West Indian manatee may be found in the southeast and Gulf of Mexico

Marine Mammals - Sirenian	SE	NE	GOM	West	AK	PI	ESA Status	Crit. Hab.
West Indian Manatee (*Trichechus manatus*)	X	--	X	--	--	--	T -82 FR 16668	41 FR 41914 74 FR 49842

Critical Habitat

Critical habitat is designated for manatees in Florida (Figure 14). The current critical habitat designation for the Florida manatee was described before critical habitat regulations and guidance were developed; it does not identify specific physical and biological features essential to the conservation of the manatee for this species' habitat. Since the original designation, USFWS has more information on the specific habitat needs of the Florida manatee, including the use of warm-water sites, adequate forage within dispersal distance of a warm-water refuge, areas needed for calving and nursing, and important travel corridors for movements throughout Florida and beyond (74 FR 49842).

Figure 14. Map of the West Indian manatee critical habitat (in orange). Map from website - https://www.fws.gov/southeast/wildlife/mammals/manatee/#designated-critical-habitat-section

Northern Sea Otters

The northern sea otter is listed as threatened in southwest Alaska (Table 5). However, they may be found in shallow nearshore rocky, kelp forest habitats along the West coast from California to Washington State (https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=A0HK)Sea otters like all marine mammals are protected under the MMPA.

Table 5. The sea otter may be found along the west coast and Alaska. However only the Alaska population is listed under the ESA

Marine Mammal -	SE	NE	GOM	West	AK	PI	ESA Status	Crit. Hab.
Sea Otter (*Enhydras lutis kenyoni*)	--	--	--	X	X	--	T- 70 FR 46366	74 FR 51988 52012

Critical Habitat

The physical and biological features believed to be essential to sea otter conservation are those that provide cover and shelter from marine predators, especially killer whales. These areas primarily consist of shallow (less than 20 meters deep), nearshore (within 100 meters of the mean tide line) waters. The critical habitat designation (Figure 15) was based largely on the presence of shallow, rocky areas, the presence of nearshore waters to serve as refuge, the presence of kelp forests, and sufficient prey resources to support sea otter populations (http://www.adfg.alaska.gov/index.cfm?adfg=specialstatus.fedhabitat&species=northernseaotter).

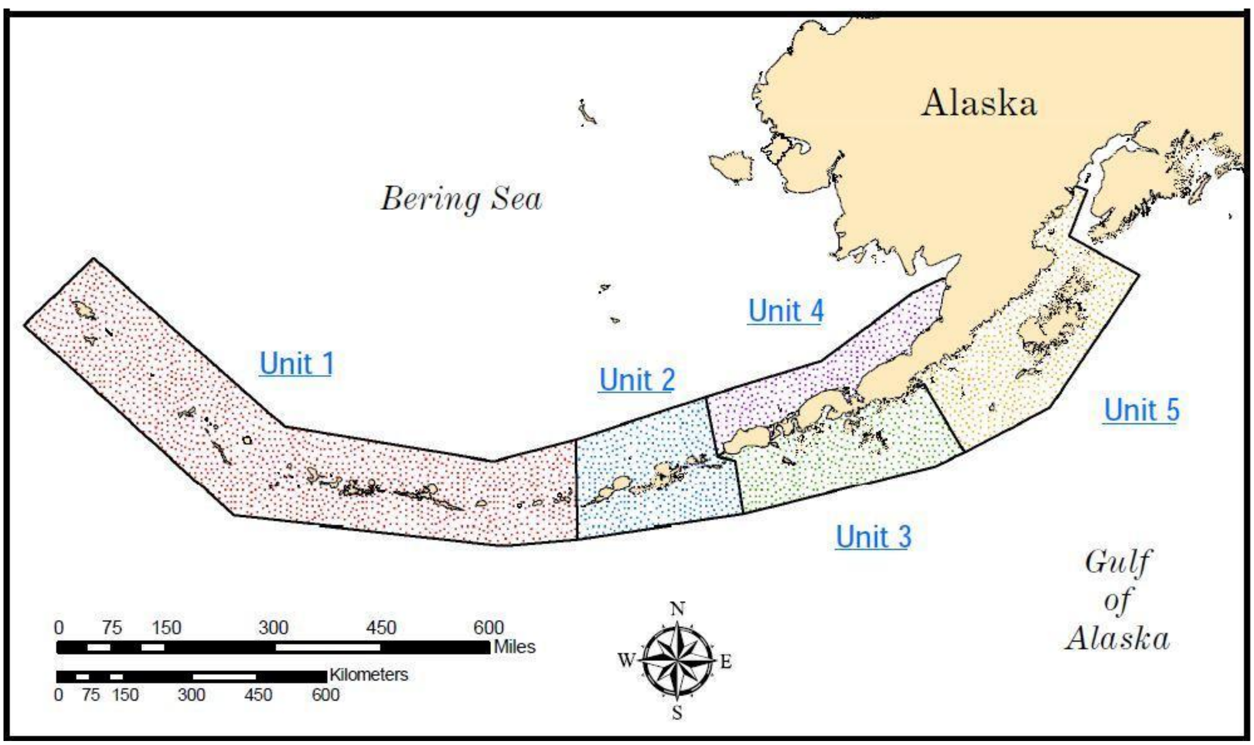

Figure 15. Map showing locations of designated sea otter critical habitat, unit 1 – western Aleutian, unit 2 – eastern Aleutian, unit 3 – south Alaska Peninsula, unit 4 – Bristol Bay, unit 5 – Kodiak, Kamishak, Alaska Peninsula. Map is from website http://www.adfg.alaska.gov/index.cfm?adfg=specialstatus.fedhabitat&species=northernseaotter and can be found at https://www.fws.gov/r7/fisheries/mmm/seaotters/pdf/SeaOtterCriticalHabitatMaps.pdf

Pinniped, West Indian Manatee and Northern Sea Otter Effects Determination
Activities to be conducted fall into five main categories 1. Data and Sample Collection, 2. Field Experiments 3. Use of Gliders, AUVs, ASVs, UASs, and Drifters, and 4. Vessel Operations.

<u>Data and sample collection</u>
Data and sample collections would have no effect on Pinnipeds, manatees or sea otters as these activities are of limited temporal and geographic scope with a small spatial footprint (e.g. near vessel, platform or shorebased). No impacts would be expected from the operation of cameras, sensors etc. as they passively collect data from the water column. No direct or indirect adverse effects to Pinnipeds, manatees or sea otters from instrument deployment is expected as the frequency and duration of the instrument casts are minimal. Instruments would not be lowered in the presence of Pinnipeds, manatees or sea otters and all necessary measures for avoiding habitat impact and animal entanglement would be employed. Deployment and operation of non-destructive instrumentation such as platforms or moorings would also have no potential to adversely affect Pinnipeds, manatees or sea otters as these would be easily avoided by the animals and would not be placed in nursery habitat, near haul outs, or in primary migratory corridors. Non-destructive shellfish harvests would also have no potential to adversely affect Pinnipeds, manatees and sea otters. Further, non-destructive sampling activities have no potential to adversely affect ESA-listed critical habitat. Other BMPs to avoid entanglement include (also see Pp. 84-87):

a. Use of stiffer line materials will be used during operations to reduce the potential for entanglement;
b. Reduce knots in the line as much as possible; and
c. Clearly mark lines in the event an animal does become entangled so that NMFS experts can identify the gear.

<u>Field experiments</u>

Field experiments using caged shellfish, use of mesocosms, benthic landers, etc. would not have any adverse impacts to Pinnipeds, manatees or sea otters as these activities are of limited size and would not be deployed in critical habitat or areas where Pinnipeds, manatees or sea otters frequent, such as nursery areas, warm water refuges or haul out areas. Entanglement with mooring lines (i.e., lines connecting the topside buoy to the anchor) in the water column is considered highly unlikely due to the ability of marine species to detect and avoid the mooring lines and because the mooring cables are sufficiently rigid to eliminate the slack that causes entanglement. This action would be conducted under the terms and conditions of all applicable permits. Field experiments would not be conducted in critical habitat. Therefore, there is no potential to adversely impact critical habitat.

<u>Use of Gliders, AUVs, ASVs, UASs and drifters</u>

The deployment of gliders, AUVs, and drifters would have no impact on Pinnipeds, manatees or sea otters as the AUVs and gliders would move within the water column similar to a dolphin or whale, only at much slower velocities (~4 knots) and drifters float on the sea surface, moving with ocean currents and would not represent an entanglement hazard. ASVs are operated at the surface and are in line of sight of the operator and can avoid Pinnipeds, manatees and sea otters by maintaining minimum approach distances. ASVs are also slow moving (~4-5 knots) lightweight (~200 to 300 pounds) vehicles that could be easily avoided by Pinnipeds, manatees and sea otters. AUVs, ASVs and gliders may use a variety of propulsion sources, including diesel, diesel/electric, battery, solar, buoyancy driven, and wave-gliding propulsion systems. However, most are powered by batteries that are sealed with little potential for leakage. Acoustic sources associated with the navigation and communications of these vehicles generally do not overlap with the hearing frequencies of Pinnipeds, manatees or sea otters (altimeters 170kHz) or the sound dissipates rapidly from source (pingers 27-35kHz, USBL 27-35kHz). There is no entanglement hazard associated with the gliders, AUVs, ASVs or drifters. In the unlikely event of a glider, AUV, or drifter malfunction, negligible adverse impacts on biological resources would be expected. For example, gliders would be programmed to avoid known obstructions, avoid striking the sea floor or other objects and to hover 1-2 meters above the benthos and to pause, reverse or surface in the unlikely event of a collision. UAS used in NCCOS projects are small and lightweight and are used for the purposes of aerial observation of marine life, marine debris, and oceanographic characteristics. The UAS pilot will make sure to avoid flying directly over any sighted marine animals, and will fly no lower than 30ft over the surface of the water and will not be operated in proximity to hauled out marine mammals. The pilot and observers will maintain a 500-meter line of sight during the entire operation which will allow researchers to avoid all marine mammals during UAS flight operations. Based on this analysis NCCOS determines that the use of gliders, AUVs, ASVs, UASs, and drifters would have no adverse impacts to Pinnipeds, manatees or sea otters.

Vessel Operations

Vessel operations may include transit of personnel and equipment, deployment of instrumentation and sample collections from a stationary or moving vessel. For small vessels, transit operations may occur from the closest boat launch or home port to the project site. Transit aboard ships could be over a much broader area. Regardless of size, vessel operators would maintain 100% protected species observer coverage, maintain minimum approach distances for protected species (e.g. 50 yards Manatees) and reduce speeds when protected species are observed (BMPs Pp. 84-87). Vessel operations are routine and do not represent an increase in vessel traffic, noise or pollution potential above baseline levels as vessels are used routinely for other purposes. Therefore, NCCOS determines that vessel operations would have no adverse impacts on Pinnipeds, manatees or sea otters or their critical habitat.

Marine Reptiles – Sea Turtles

There are six (6) sea turtle species that are listed as threatened or endangered under the ESA (Table 6). They are primarily found within the northeast, southeast, Gulf of Mexico, along the west coast and in the Pacific Islands. One species, the leatherback sea turtle may also occur in Alaskan waters.

Table 6. There are six (6) species of threatened or endangered sea turtles within US waters.

Marine Reptiles	SE	NE	GOM	West	AK	PI	ESA Status	Crit. Hab.
Green Turtle (*Chelonia mydas*)	X North Atlantic DPS	X North Atlantic DPS	X North Atlantic DPS	X East Pacific DPS	--	X Central West Pacific DPS, Central North Pacific DPS,	T & E – 81 FR 20057	63 FR 46693
Hawksbill Turtle (*Eretmochelys imbricata)*	X	X	X	X	--	X	E – 35 FR 8491	63 FR 46693
Kemp's Ridley Turtle (*Lepidochelys kempii*)	X	X	X	--	--	--	E – 35 FR 18319	-- --
Leatherback Turtle (*Dermochelys coriacea*)	X	X	X	X	X	X	E – 35 FR 8491	44 FR 17710 and 77 FR 4170
Loggerhead Turtle (*Caretta caretta*)	X NW Atlantic Ocean DPS	X NW Atlantic Ocean DPS	X NW Atlantic Ocean DPS	--	--	X North & South Pacific DPS	E – 76 FR 58868	79 FR 39856
Olive Ridley Turtle (*Lepidochelys olivacea*)	X	X	X	X	--	X	T – 43 FR 32800	63 FR 28359 Mexico's Pacific Coast Breeding Colonies only

Critical Habitat

Green Sea Turtle

Green turtles are primarily restricted to tropical and subtropical waters. In U.S. Atlantic and Gulf of Mexico waters, green turtles are found from Massachusetts to Texas and in the U.S. Virgin Islands and Puerto Rico. The Adult and juvenile green turtles are generally found nearshore as well as in bays and lagoons, on reefs, and especially in areas with seagrass beds.

Adults migrate from foraging areas to nesting beaches and may travel hundreds or thousands of kilometers each way. After emerging from the nest, hatchlings swim to offshore areas, where they live for several years. Once the juveniles reach a certain age/size range, they leave the open ocean habitat and travel to nearshore foraging grounds (https://www.fisheries.noaa.gov/species/green-turtle).

Critical habitat for green turtles has been designated in the coast waters surrounding Culebra Island in Puerto Rico (Figure 16) where the extensive seagrass beds provide food and adjacent reefs provide shelter from predation (63 FR 46693).

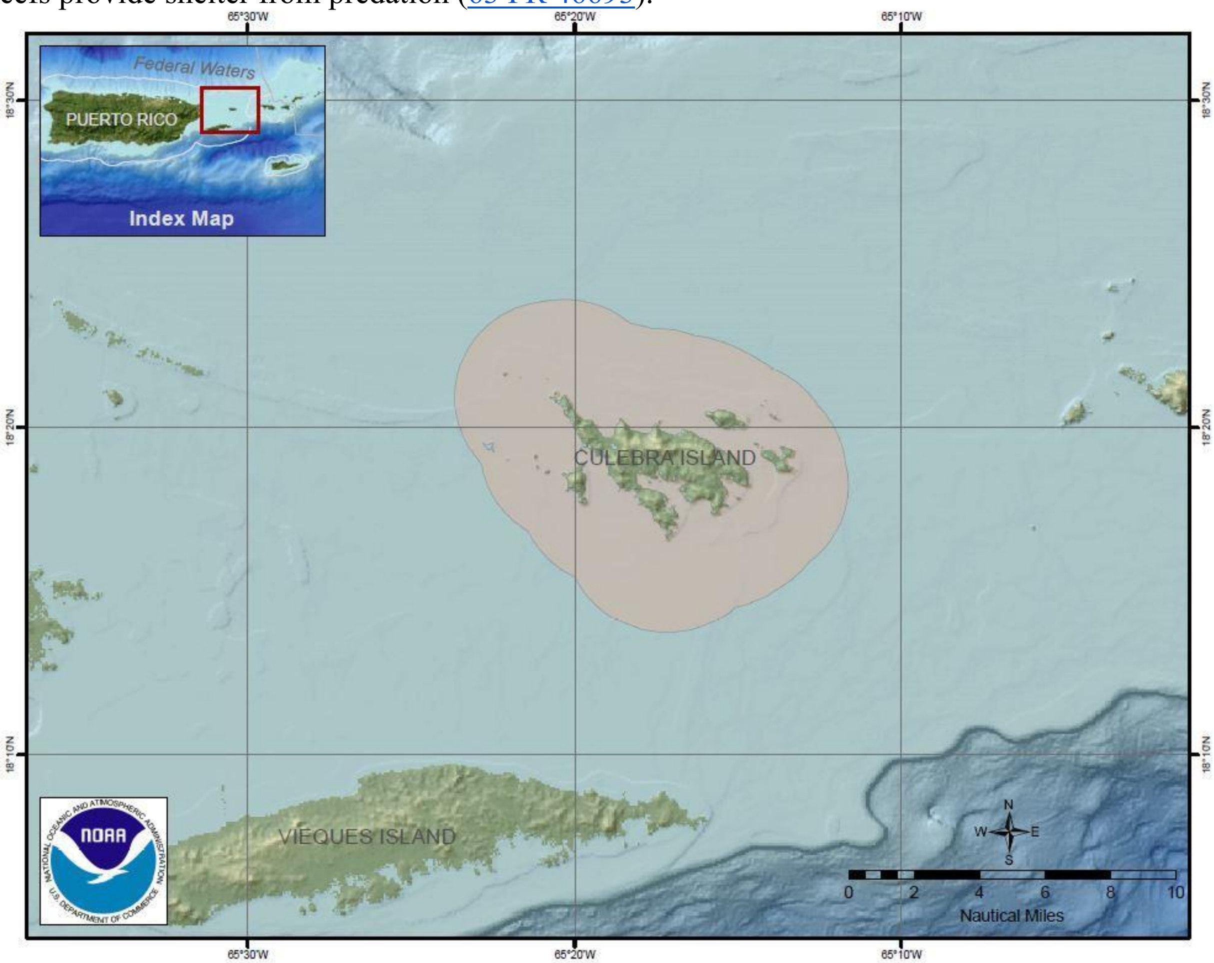

Figure 16. Green sea turtle designated critical habitat map from website - https://sero.nmfs.noaa.gov/maps_gis_data/protected_resources/critical_habitat/index.html

Hawksbill Turtle

The hawksbill turtle occurs in tropical and subtropical waters of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean. Within the United States, hawksbills are most common in Puerto Rico and its associated islands, the U.S. Virgin Islands, and Florida (63 FR 46693).

Critical habitat is designated in the waters surrounding Mona and Monita Islands in Puerto Rico (Figure 17). Hawksbills depend on coral reefs for food, feeding primarily on sponges, and shelter; therefore, the condition of reefs directly affects the hawksbill's well-being. Destruction of coral reefs due to deteriorating water quality and vessel anchoring, striking, or grounding is a growing problem ([63 FR 46693)](63 FR 46693).

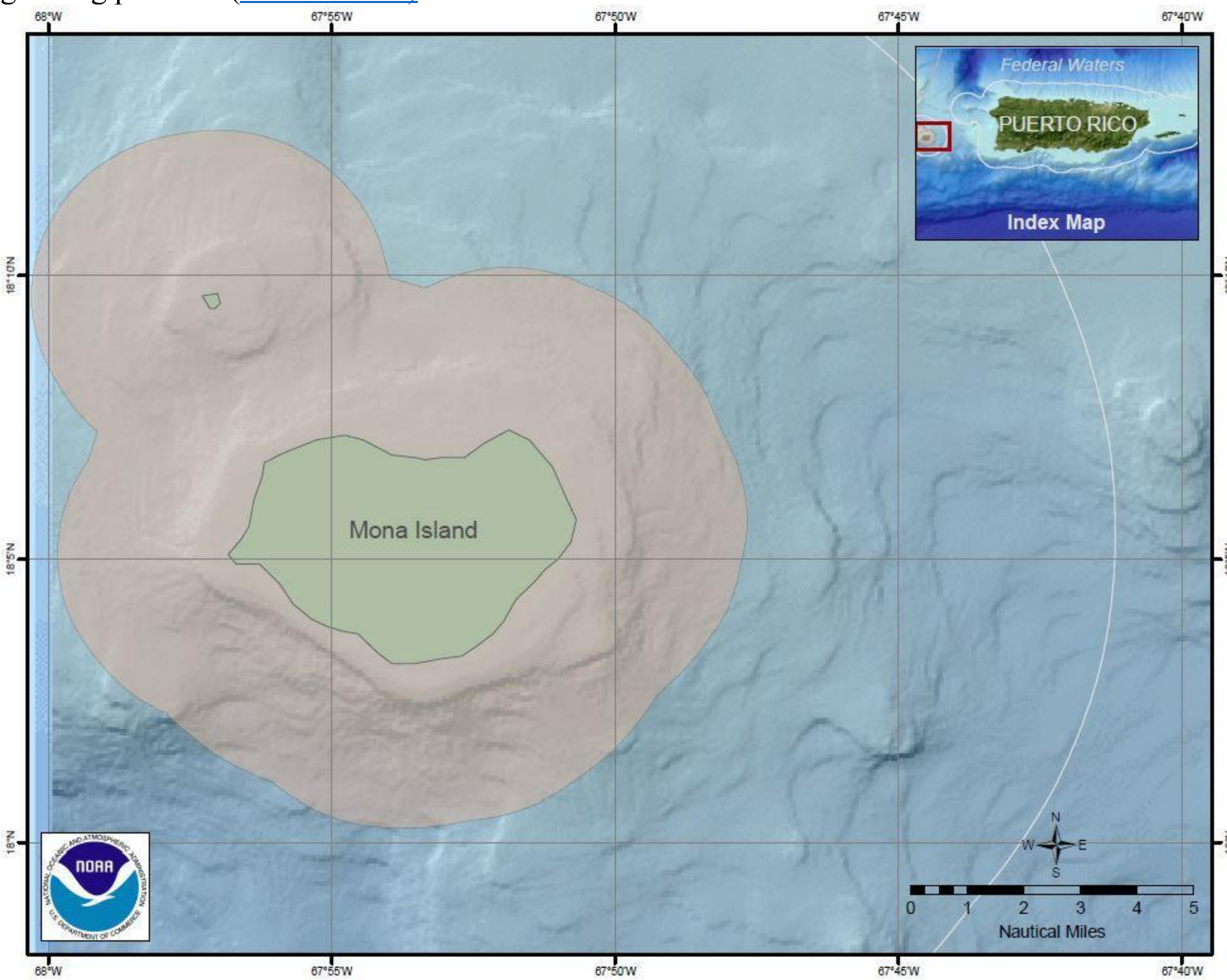

Figure 17. Hawksbill sea turtle designated critical habitat map from website - https://sero.nmfs.noaa.gov/maps_gis_data/protected_resources/critical_habitat/index.html

Leatherback Turtle

Leatherbacks occur in the Atlantic, Pacific, and Indian Oceans. They occupy U.S. waters in the West Pacific, East Pacific, and Northwest Atlantic (https://www.fisheries.noaa.gov/species/leatherback-turtle). There is critical habitat designated within the Atlantic Ocean (Figure 18) and along the west coast (Figure 19).

There are two primary constituent elements identified in the marine waters on the west coast that are important for leatherbacks

1. Occurrence of prey species, primarily scyphomedusae of the order Semaeostomeae (Chrysaora, Aurelia, Phacellophora and Cyanea), of sufficient condition, distribution, diversity, abundance and density necessary for growth and success of leatherback sea turtles.
2. Migratory pathway conditions to allow for safe and timely passage and access to/from/within high use foraging areas.

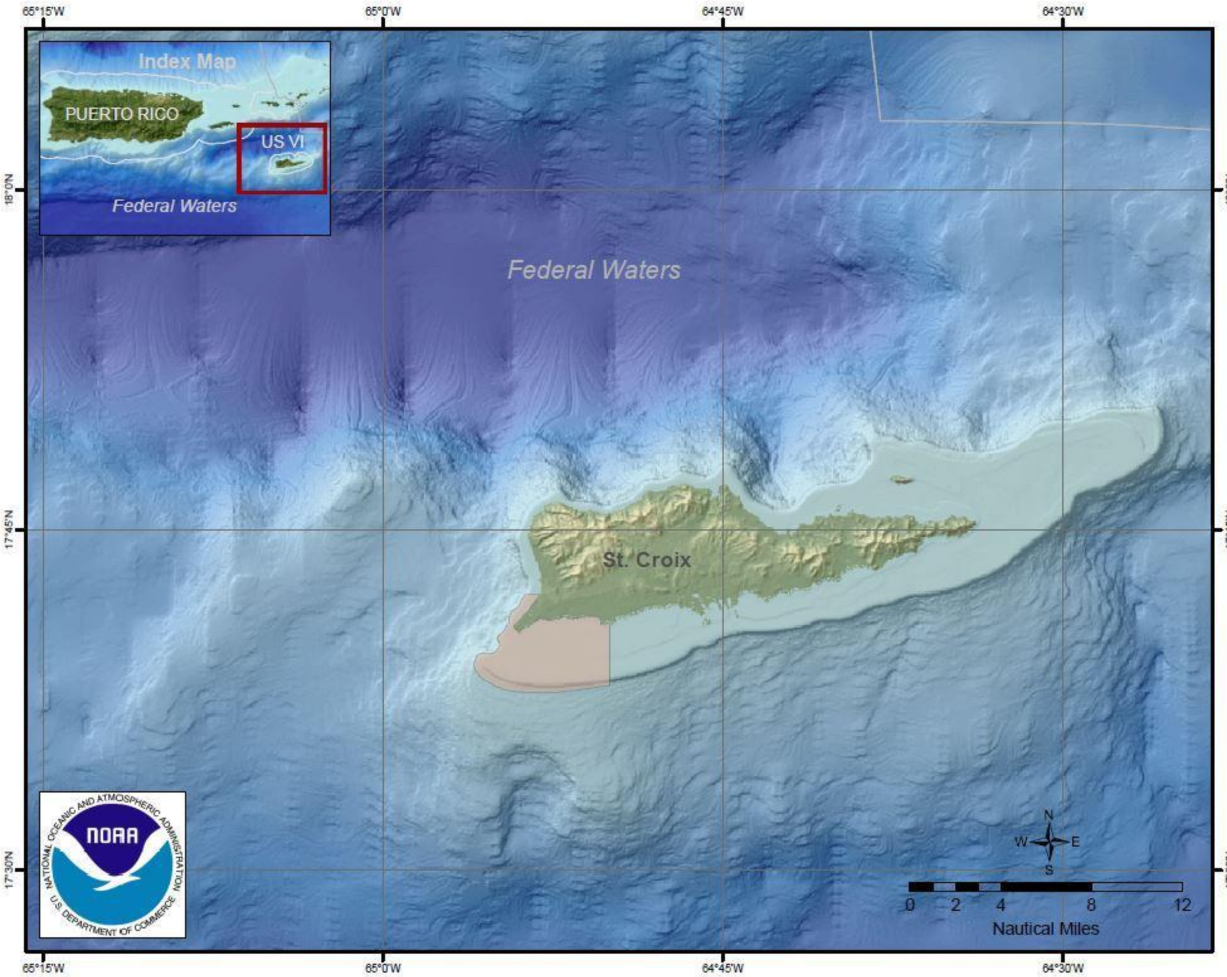

Figure 18. Leatherback sea turtle designated critical habitat map from website - [*https://sero.nmfs.noaa.gov/maps_gis_data/protected_resources/critical_habitat/index.html*](https://sero.nmfs.noaa.gov/maps_gis_data/protected_resources/critical_habitat/index.html)

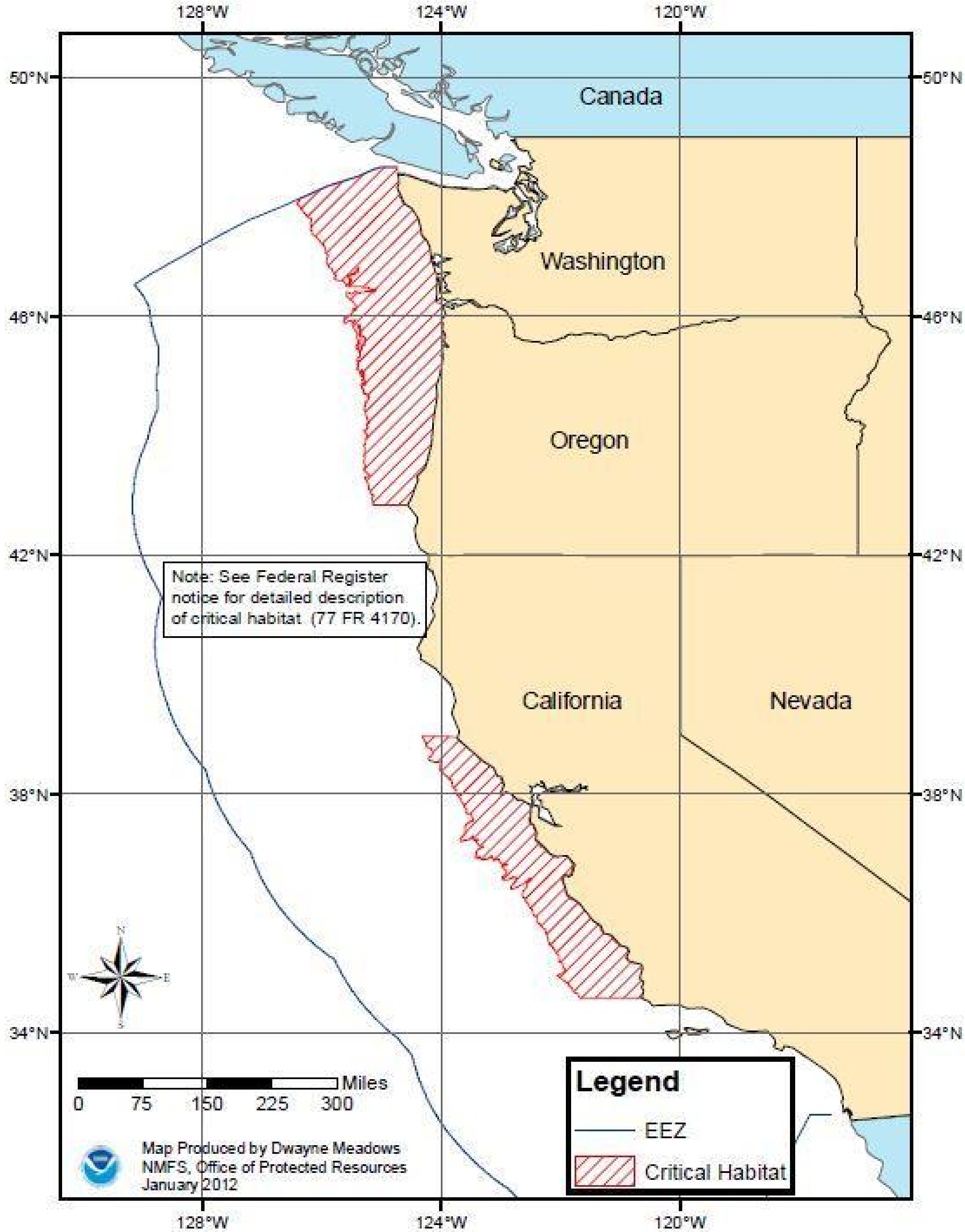

Figure 19. Map of leatherback sea turtle critical habitat along the US west coast from website - [*https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html*](https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html)

Loggerhead Turtle

Loggerheads are circumglobal, occurring throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Loggerheads are the most abundant species of sea turtle found in U.S. coastal waters (https://www.fisheries.noaa.gov/species/loggerhead-turtle). Critical habitat is designated throughout the southeast and Gulf of Mexico (Figure 20 and 21). The essential features, also known as PCEs for loggerheads are described in Table 7.

Table 7. Essential features of loggerhead sea turtle Northwest Atlantic Ocean DPS designated critical habitat.

Loggerhead Critical Habitat Unit	Essential Features
Nearshore Reproductive Habitat	• Waters off of the highest density nesting beaches; • Waters sufficiently free of obstructions or artificial lighting; and • Waters with minimal manmade structures.
Constricted Migratory Habitat	• Constricted Continental Shelf area relative to nearby Continental Shelf waters; and • Passage conditions to allow for migration to and from nesting, breeding, and foraging areas.
Breeding Habitat	• High densities of reproductive males and females; • Proximity to primary Florida migratory corridor; and • Proximity to Florida nesting grounds.
Winter Habitat	• Water temperatures above 10°C from November to April; • Continental Shelf waters in proximity to the western boundary of the Gulf Stream; and • Water depths between 20 and 100 m.
Foraging Habitat	• Sufficient prey availability and quality, such as benthic invertebrates; and • Water temperatures to support loggerhead inhabitance, generally above 10°C.

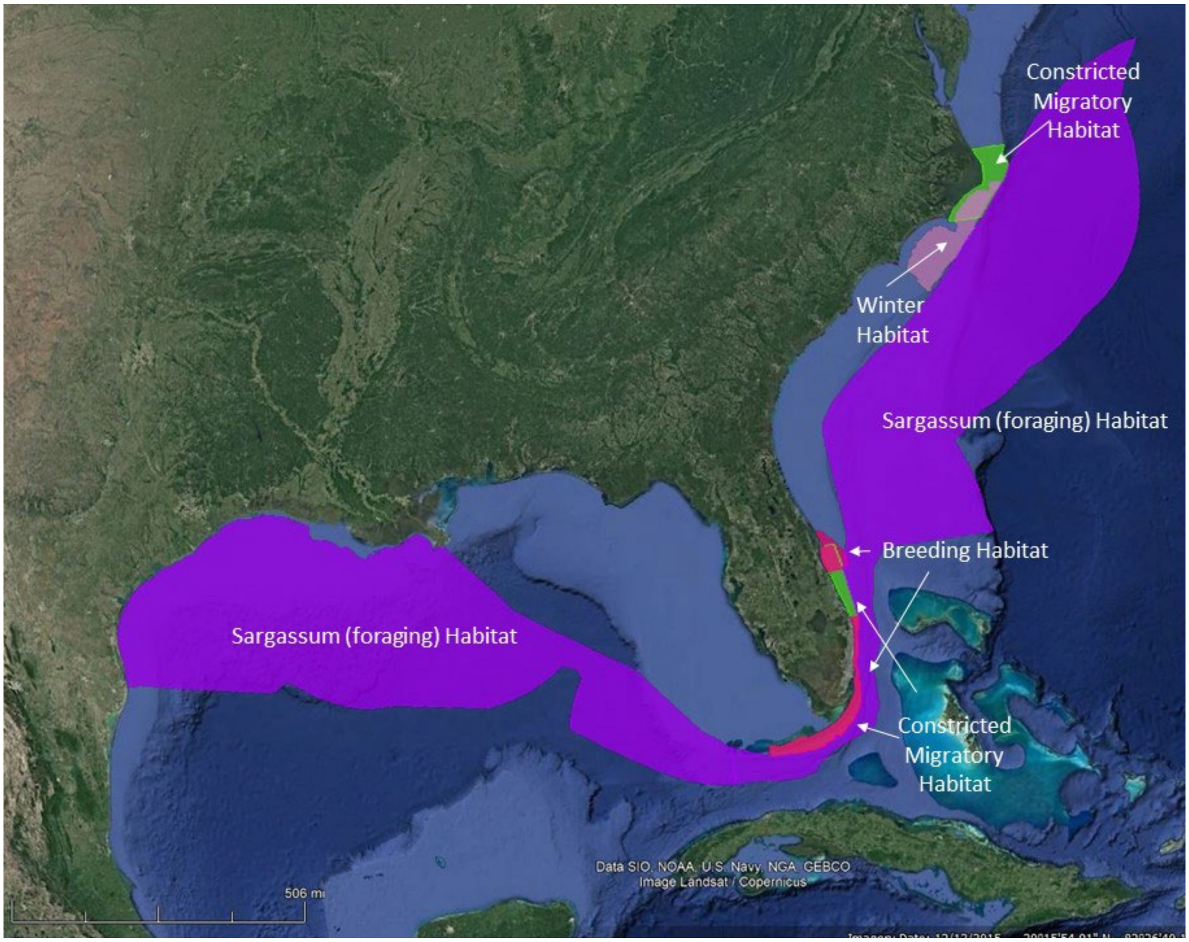

Figure 20. Map showing designated critical habitat for loggerhead sea turtles. Sargassum habitat is shown in deep purple and extends from the southeast to the Gulf of Mexico. Winter habitat is designated in rose color off the coast of North Carolina. Constricted migratory habitat is shown in green, offshore North Carolina and from Cape Canaveral to the Florida Keys. Breeding habitat, is shown in bright pink, offshore Cape Canaveral and then is designated from Jupiter, Florida through the Florida Keys. Breeding and constricted migratory habitat overlap in their extent.

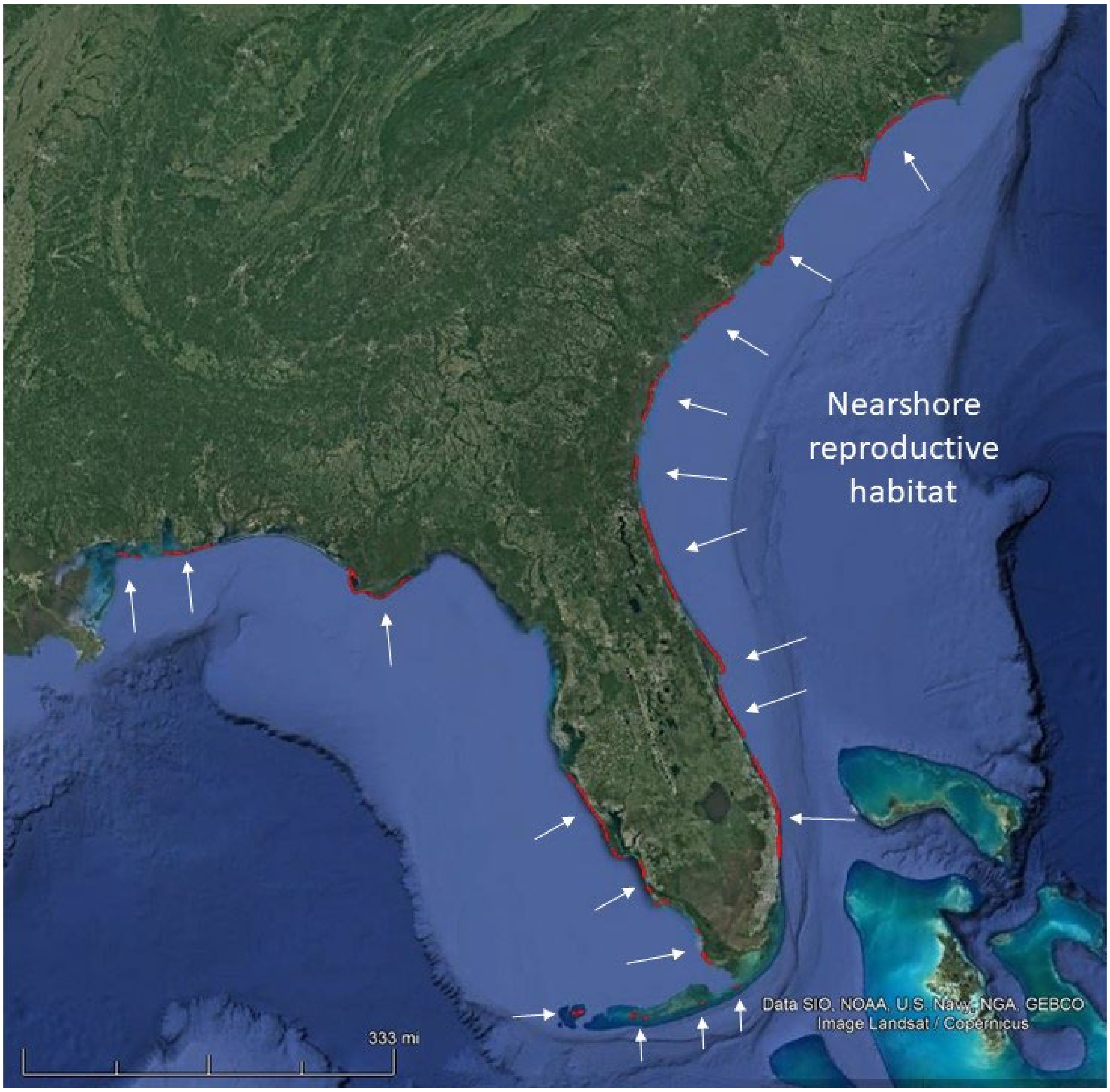

Figure 21. Map of loggerhead sea turtle nearshore reproductive habitat in red. White arrows help to illustrate the locations of the red polygons.

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Sea Turtle Effects Determination
Activities to be conducted fall into four main categories 1. Data and Sample Collection 2, Field Experiments, 3. Use of Gliders, AUVs, ASVs, UASs, and Drifters, and 4. Vessel Operations.

Data and sample collection

No adverse effects are anticipated to sea turtles as a result of data and sample collection activities. These activities are limited in spatial and temporal extent and occur in localized areas. No turtles would be impacted as a result of the deployment and operation of sampling instruments, the operation of cameras, sensors etc. as they passively collect data from the water column. No direct or indirect adverse effects to turtles from instrument deployment is expected as the frequency and duration of the instrument casts is minimal. Deployment and operation of non-destructive instrumentation such as platforms or moorings would also have no potential to adversely affect sea turtles as these are easily avoided by sea turtles and would not be placed in areas that could inhibit sea turtle migration, haul-out or movement to and from nesting beaches. Activities could potentially occur on or near designated nearshore reproductive critical habitat. However, researchers would avoid areas where sea turtles may be nesting during all activities. Further, activities would not occur at night and would not occur in proximity to sea turtle nests or otherwise obstruct the progress of adult sea turtles to their nesting sites or hatchlings access to the ocean. Non-destructive shellfish harvests would also have no potential to adversely affect sea turtles as these collections are by hand or tong and would occur in farmed shellfish beds or areas adjacent to farmed beds. Therefore, non-destructive sampling activities have no potential to adversely affect ESA-listed critical habitat. In addition, all efforts would be made to minimize entanglement of sea turtles by following the following BMPs:

a. Use of stiffer line materials will be used during operations to reduce the potential for entanglement;
b. Reduce knots in the line as much as possible; and
c. Clearly mark lines in the event an animal does become entangled so that NMFS experts can identify the gear.

Field experiments

Field experiments using caged shellfish, use of mesocosms, benthic landers, etc would not have any negative impact on sea turtles as these activities are of limited spatial extent and would not be an obstruction to or from the water by sea turtle juveniles or adults. Entanglement of marine species with mooring lines (i.e., lines connecting the topside buoy to the anchor) in the water column is considered highly unlikely due to the ability of marine species to detect and avoid the mooring lines and because the mooring cables are sufficiently rigid to eliminate the slack that causes entanglement. This action would be conducted under the terms and conditions of all applicable permits or permissions. Field experiments would not impact the essential elements of sea turtle critical habitat. Therefore, there is no potential to adversely impact sea turtles or their critical habitat.

Use of Gliders, AUVs, ASVs, UASs, and Drifters

The deployment of gliders, AUVs, and drifters would have no impact on sea turtles, as the proposed AUVs and gliders would move within the water column similar to a dolphin or whale, and drifters float on the sea surface, moving with ocean currents. Gliders move at very slow speeds (< 4 knots), minimizing the potential for collisions with sea turtles. ASVs are also slow moving (~4-5 knots) lightweight (~200 to 300 pounds) vehicles that could be easily avoided by sea turtles. AUVs, ASVs and gliders may use a variety of propulsion sources, including diesel, diesel/electric, battery, solar, buoyancy driven, and wave-gliding propulsion systems. However, most are powered by batteries that are sealed with little potential for leakage. AUVs also move at low speeds (approximately 3-5 knots) with little potential for collisions with marine species. Acoustic sources associated with the navigation and communications (e.g. altimeters - 170kHz, pingers/USBL telemetry - 27-35kHz) of these vehicles do not overlap with the hearing frequencies of sea turtles (<2000Hz). AUVs also move at low speeds (approximately 3-5 knots) with little potential for collisions with marine species. In the unlikely event of a glider, AUV, ASV or drifter malfunction, negligible adverse impacts on biological resources would be expected. For example, gliders would be programmed to avoid known obstructions, avoid striking the sea floor or other objects and to hover 1-2 meters above the benthos and to pause, reverse or surface in the unlikely event of a collision. There is no entanglement hazard associated with these vehicles. UAS used in NCCOS projects are small and lightweight and are used for the purposes of aerial observation of marine life, marine debris, and oceanographic characteristics. The UAS pilot will make sure to avoid flying directly over any sighted sea turtles, and will fly no lower than 30ft over the surface of the water and will not be operated in proximity to hauled out sea turtles. The pilot and observers will maintain a 500-meter line of sight during the entire operation which will allow researchers to avoid all observed sea turtles during UAS flight operations. Based on this analysis, NCCOS determines activities associated with the deployment and operation of these vehicles would not have adverse effects on sea turtles and would not result in unauthorized take of sea turtles.

Vessel Operations

Vessel operations may include transit of personnel and equipment, deployment of instrumentation and sample collections. For small vessels, transit operations may occur from the closest boat launch or home port to the project site. Transit aboard ships could be over a much broader area. Regardless of vessel size, operators would maintain 100% protected species observer coverage, maintain minimum approach distances for protected species (e.g. 50 yards sea turtles) and reduce speeds when protected species are observed (BMPs Pp. 84-87). Vessel operations are routine and do not represent an increase in vessel traffic, noise or pollution potential above baseline levels as vessels are used routinely for other purposes. Therefore, NCCOS determines that vessel operations would have no adverse impacts on sea turtles or their critical habitat.

Marine and Anadromous Fishes

There are twenty (20) species of fish listed as threatened or endangered that occur within all 5 regions within US waters (Table 8).

Table 8. There are twenty (20) species of threatened or endangered fish within US waters.

Fishes	SE	NE	GOM	West	AK	PI	ESA Status	Crit. Hab.
Atlantic Salmon (*Salmo salar*) – Gulf of Maine DPS	--	X Gulf of Maine DPS	--	--	--	--	E – 74 FR 29344, 65 FR 69459	74 FR 39903
Atlantic Sturgeon	X Carolina & South	X Chesapeake , Gulf of	--	--	--	--	E – 77 FR 5913,	82 FR 39160

(*Acipenser oxyrinchus oxyrinchus*)	Atlantic DPS	Maine & New York Bight DPS					T&E – 77 FR 5879	
Bocaccio (*Sebastes paucispinis*)	--	--	--	X Puget Sound DPS	X Georgia Basin DPS	--	E – 75 FR 22276 and 82 FR 7711	79 FR 68041
Chinook Salmon (*Oncorhynchus tshawytscha)*	--	--	--	X	X	--	T&E– 70 FR 37160 (8 ESUs*)	70 FR 52488, 70 FR 52629, 58 FR 33212,58 FR 68543,64 FR 57399
Chum Salmon (*Oncorhynchus keta*) –	--	--	--	X	--	--	T – 70 FR 37160 (2 ESUs**)	70 FR 52629
Coho Salmon (*Oncorhynchus kisutch*)	--	--	--	X	--	--	E – 70 FR 37160 (4 ESUs∞)	64 FR 24049, 81 FR 9251, 73 FR 7816
Eulachon (*Thaleichthys pacificus*)	--	--	--	X Southern DPS	X Southern DPS	--	T – 75 FR 13012	76 FR 65323
Giant Manta Ray (*Manta birostris*)	X	X	X	X	--	X	T – 83 FR 2916	--
Green Sturgeon (*Acipenser medirostris*)	--	--	--	X	X Southern DPS	--	T - 74 FR 52300	73 FR 52084
Gulf Grouper (*Mycteroperca jordani*)	--	--	--	X	--	--	E – 81 FR 72545	--
Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)	--	--	X	--	--	--	T – 56 FR 49653	68 FR 13370
Largetooth Sawfish (*Pristis pristis*)	X	--	X	--	--	--	E – 76 FR 40822 and E -	--

							79 FR 73977	
Nassau Grouper (*Epinephelus striatus*)	X	--	X	--	--	--	T – 81 FR 42268	--
Oceanic Whitetip Shark (*Carcharhinus longimanus*)	X	X	X	X	--	X	T – 83 FR 4153	--
Scalloped Hammerhead Shark (*Sphyrna lewini*)	X Central & Southwest Atlantic DPS	--	X Indo-West Pacific DPS	X Eastern Pacific DPS	--	X Indo-West Pacific DPS	T&E – 79 FR 38213	--
Shortnose Sturgeon (*Acipenser brevirostrum*)	X	X	X	--	--	--	E – 32 FR 4001	--
Smalltooth Sawfish (*Pristis pectinata*)	X	--	X	--	--	--	E – 68 FR 15674	74 FR 45353
Sockeye Salmon (*Oncorhynchus nerka*)	--	--	--	X	--	--	T&E – 70 FR 37160 (2 ESUs[º])	70 FR 52630, 58 FR 68543
Steelhead Trout (*Oncorhynchus mykiss*)	--	--	--	X (11 DPSs[α])	X	--	T – 71 FR 834, T – 72 FR 26722	70 FR 52487, 70 FR 52629, 70 FR 52487,81 FR 9251 (11 DPSs)
Yelloweye Rockfish (*Sebastes rubberimus*)	--	--	--	X Puget Sound/Georgia Basin DPS	X Puget Sound/Georgia Basin DPS	--	T – 75 FR 22276 and 82 FR 7711	79 FR 68041

*Chinook Salmon Evolutionary Significant Units (ESUs): California Coastal, Central Valley Spring-Run, Lower Columbia River, Puget Sound, Sacramento River Winter-Run, Snake River Fall-Run, Snake River Spring/Summer Run, Upper Columbia River Spring Run, Upper Willamette River.
**Chum Salmon ESUs: Columbia River, Hood Canal Summer-Run
∞Coho Salmon ESUs: Central California Coast, Lower Columbia River, Oregon Coast, Southern Oregon and Northern California Coasts.
ºSockeye Salmon ESUs: Ozette Lake ESU, Snake River ESU

αSteelhead Trout DPSs: California Central Valley, Central California Coast, Lower Columbia River, Middle Columbia River, Northern California, Puget Sound, Snake River Basin, South-Central California Coast, Southern California, Upper Columbia River, Upper Willamette.

Critical Habitat

Atlantic Salmon

Atlantic salmon are the only salmon native to the Atlantic Ocean. In the United States, Atlantic salmon were once native to almost every river north of the Hudson River. Due to the effects of industrial and agricultural development (including habitat destruction, dams, and historic overfishing), most populations native to New England were eradicated. Now, the only native populations of Atlantic salmon in the United States are found in Maine (https://www.fisheries.noaa.gov/species/atlantic-salmon).

Within the occupied range of the Gulf of Maine DPS, Atlantic salmon PCEs include sites for spawning and incubation, sites for juvenile rearing, and sites for migration (Figure 22). The physical and biological features of the PCEs that allow these sites to be used successfully for spawning, incubation, rearing and migration are the features of habitat within the Gulf of Maine DPS that are essential to the conservation of the species. The description below of these features are extracted from this 2009 report) https://www.greateratlantic.fisheries.noaa.gov/prot_res/altsalmon/BIOLOGICAL%20VALUATION%20Final.pdf.

(A). Physical and Biological Features of the Spawning and Rearing PCE

1. Deep, oxygenated pools and cover (e.g. boulders, woody debris, vegetation, etc.), near freshwater spawning sites, necessary to support adult migrants during the summer while they await spawning in the fall.
2. Freshwater spawning sites that contain clean, permeable gravel and cobble substrate with oxygenated water and cool water temperatures to support spawning activity, egg incubation, and larval development.
3. Freshwater spawning and rearing sites with clean, permeable gravel and cobble substrate with oxygenated water and cool water temperatures to support emergence, territorial development and feeding activities of Atlantic salmon fry.
4. Freshwater rearing sites with space to accommodate growth and survival of Atlantic salmon parr.
5. Freshwater rearing sites with a combination of river, stream, and lake habitats that accommodate parr's ability to occupy many niches and maximize parr production.
6. Freshwater rearing sites with cool, oxygenated water to support growth and survival of Atlantic salmon parr.
7. Freshwater rearing sites with diverse food resources to support growth and survival of Atlantic salmon parr.

(B). Physical and Biological Features of the Migration PCE

1. Freshwater and estuary migratory sites free from physical and biological barriers that delay or prevent access of adult salmon seeking spawning grounds needed to support recovered populations.
2. Freshwater and estuary migration sites with pool, lake, and instream habitat that provide cool, oxygenated water and cover items (e.g., boulders, woody debris, and vegetation) to serve as temporary holding and resting areas during upstream migration of adult salmon.

3. Freshwater and estuary migration sites with abundant, diverse native fish communities to serve as a protective buffer against predation.
4. Freshwater and estuary migration sites free from physical and biological barriers that delay or prevent emigration of smolts to the marine environment.
5. Freshwater and estuary migration sites with sufficiently cool water temperatures and water flows that coincide with diurnal cues to stimulate smolt migration.
6. Freshwater migration sites with water chemistry needed to support sea water adaptation of smolts.

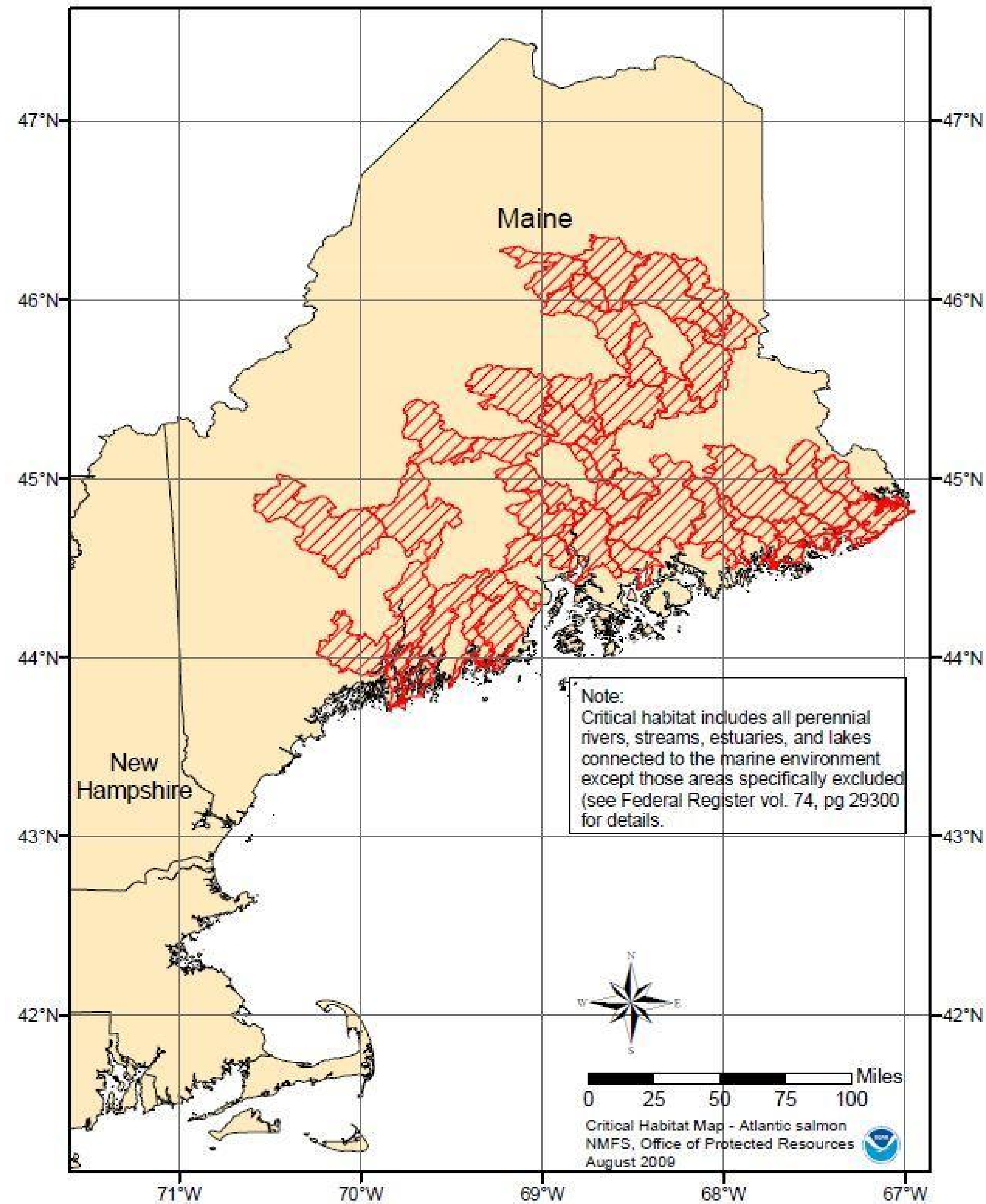

Figure 22. Map of Atlantic salmon critical habitat from website - https://www.greateratlantic.fisheries.noaa.gov/protected/section7/listing/index.html

Atlantic Sturgeon

Atlantic sturgeon live in rivers and coastal waters from Canada to Florida. Hatched in the freshwater of rivers, Atlantic sturgeon head out to sea as juveniles, and return to their birthplace to spawn, or lay eggs, when they reach adulthood. Historically, Atlantic sturgeon ranged along the Canadian and U.S. Atlantic Coast from Labrador to Florida. Due to overfishing, the abundance of natal populations is much less than historic levels, but breeding populations still exist in at least 22 U.S. rivers from Maine to Georgia and in several more in Canada. Atlantic sturgeon are anadromous fish—they are born in freshwater, then migrate to the sea and back again to freshwater to spawn. Most juveniles remain in their river of birth (natal river) for at least several months before migrating out to the ocean. Tagging data indicate that these immature Atlantic sturgeon travel widely up and down the East Coast, and as far as Iceland, when they are at sea (https://www.fisheries.noaa.gov/species/atlantic-sturgeon).

There is critical habitat designated for the Atlantic sturgeon along the east coast of the US (Figure 23). There are four (4) physical and biological features critical to reproduction and recruitment of the Atlantic sturgeon:

1. Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0–0.5 ppt range) for settlement of fertilized eggs, refuge, growth, and development of early life stages;
2. Aquatic habitat with a gradual downstream salinity gradient of 0.5 up to as high as 30 ppt and soft substrate (e.g., sand, mud) between the river mouth and spawning sites for juvenile foraging and physiological development;
3. Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, thermal plumes, turbidity, sound, reservoirs, gear, etc.) between the river mouth and spawning sites necessary to support: Unimpeded movements of adults to and from spawning sites; seasonal and physiologically dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary, and; staging, resting, or holding of subadults or spawning condition adults. Water depths in main river channels must also be deep enough (e.g., at least 1.2 m) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river, and
4. Water, between the river mouth and spawning sites, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support: Spawning; annual and interannual adult, subadult, larval, and juvenile survival; and larval, juvenile, and subadult growth, development, and recruitment (e.g., 13 °C to 26 °C for spawning habitat and no more than 30 °C for juvenile rearing habitat, and 6 mg/L or greater DO for juvenile rearing habitat).

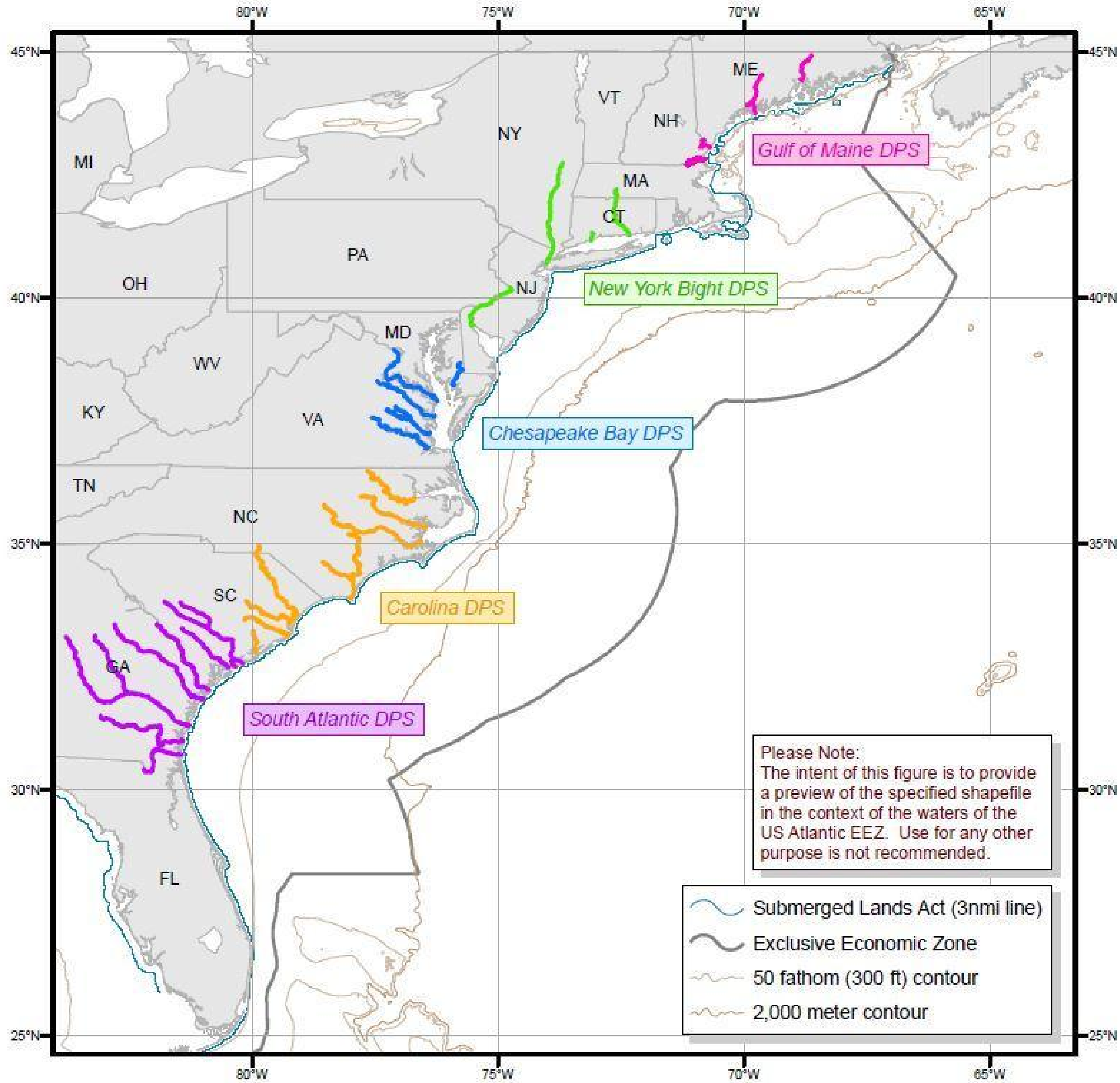

Figure 23. Map of Atlantic sturgeon critical habitat in the southeast region. From website - https://www.greateratlantic.fisheries.noaa.gov/protected/section7/listing/index.html

Bocaccio and Yelloweye Rockfish

Bocaccio are large Pacific coast rockfish. They range from Punta Blanca, Baja California, to the Gulf of Alaska off Krozoff and Kodiak Islands. They are most common between Oregon and northern Baja California. The Puget Sound/Georgia Basin distinct population segment of bocaccio are listed as endangered under the ESA. Bocaccio are slow-growing, late to mature, and long-lived (https://www.fisheries.noaa.gov/species/bocaccio). Yelloweye rockfish are among the longest lived of rockfishes, living up to 118 years. This species is slow growing, late to mature, and long-lived. As they occupy similar habitat with Bocaccio they are critical habitat and PCEs are similar and are considered together below (Figure 24).

PCEs essential to the conservation of Adult Bocaccio and Adult and juvenile yelloweye rockfish are (from [79 FR 68041](79 FR 68041)): Benthic habitats or sites deeper than 30 m (98ft) that possess or are adjacent to areas of complex bathymetry consisting of rock and or highly rugose habitat are essential to conservation because these features support growth, survival, reproduction, and feeding opportunities by providing the structure for rockfishes to avoid predation, seek food and persist for decades.

Juvenile settlement habitats located in the nearshore with substrates such as sand, rock and/or cobble compositions that also support kelp (families Chordaceae, Alariaceae, Lessoniacea, Costariaceae, and Laminaricea) are essential for conservation because these features enable forage opportunities and refuge from predators and enable behavioral and physiological changes needed for juveniles to occupy deeper adult habitats.

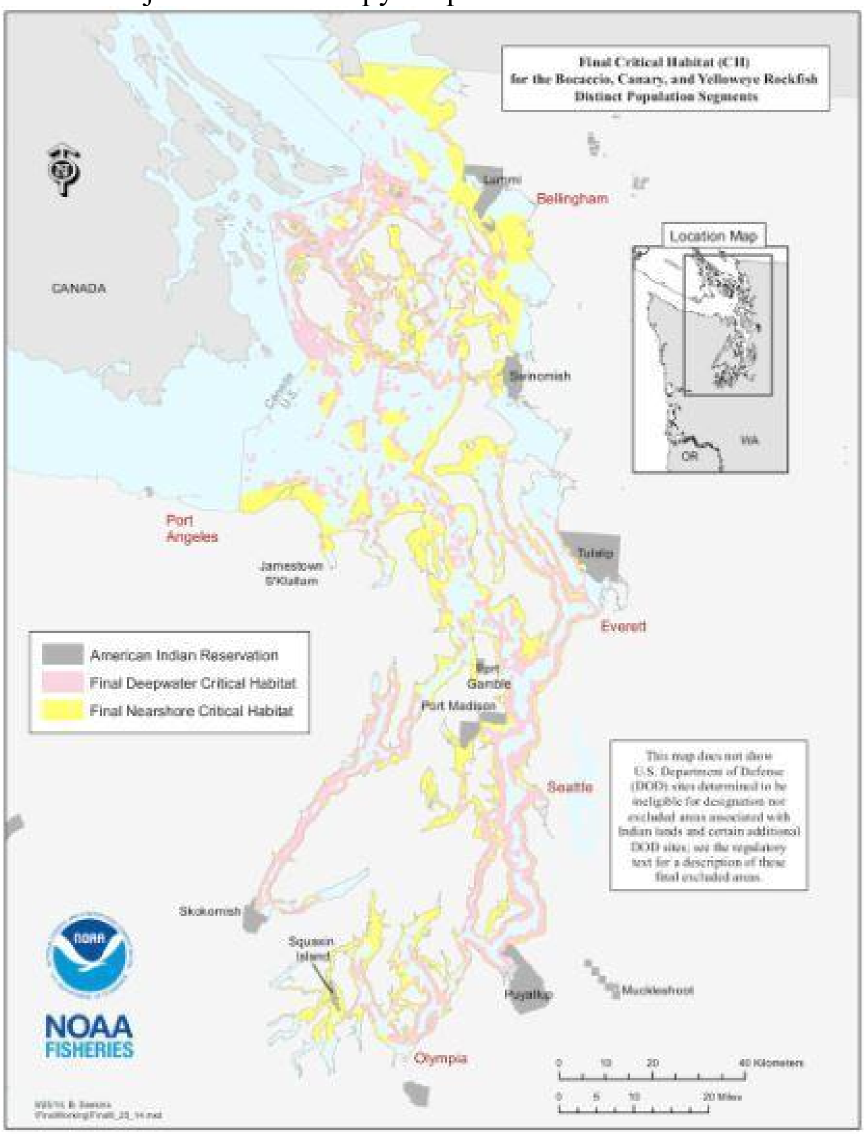

Figure 24. Map showing designated critical habitat for Bocaccio, canary, and yelloweye rockfish from the website - https://www.fisheries.noaa.gov/action/critical-habitat-puget-sound-georgia-basin-distinct-population-segments-yelloweye-rockfish for more detailed maps go to this link 79 FR 68041

Chinook Salmon

Chinook Salmon are anadromous fish that are found in US rivers and coastal waters along the west coast and Alaska. Only the west coast DPS/ESUs are listed under the ESA (https://www.fisheries.noaa.gov/species/chinook-salmon).

There is critical habitat designated within rivers for eight (8) DPS/ESUs from Washington State to California (Figure 25). The PCEs essential for conservation of Chinook Salmon are (from 70 FR 52488):

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.
2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jamsand beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.
4. Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.
5. Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.
6. Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

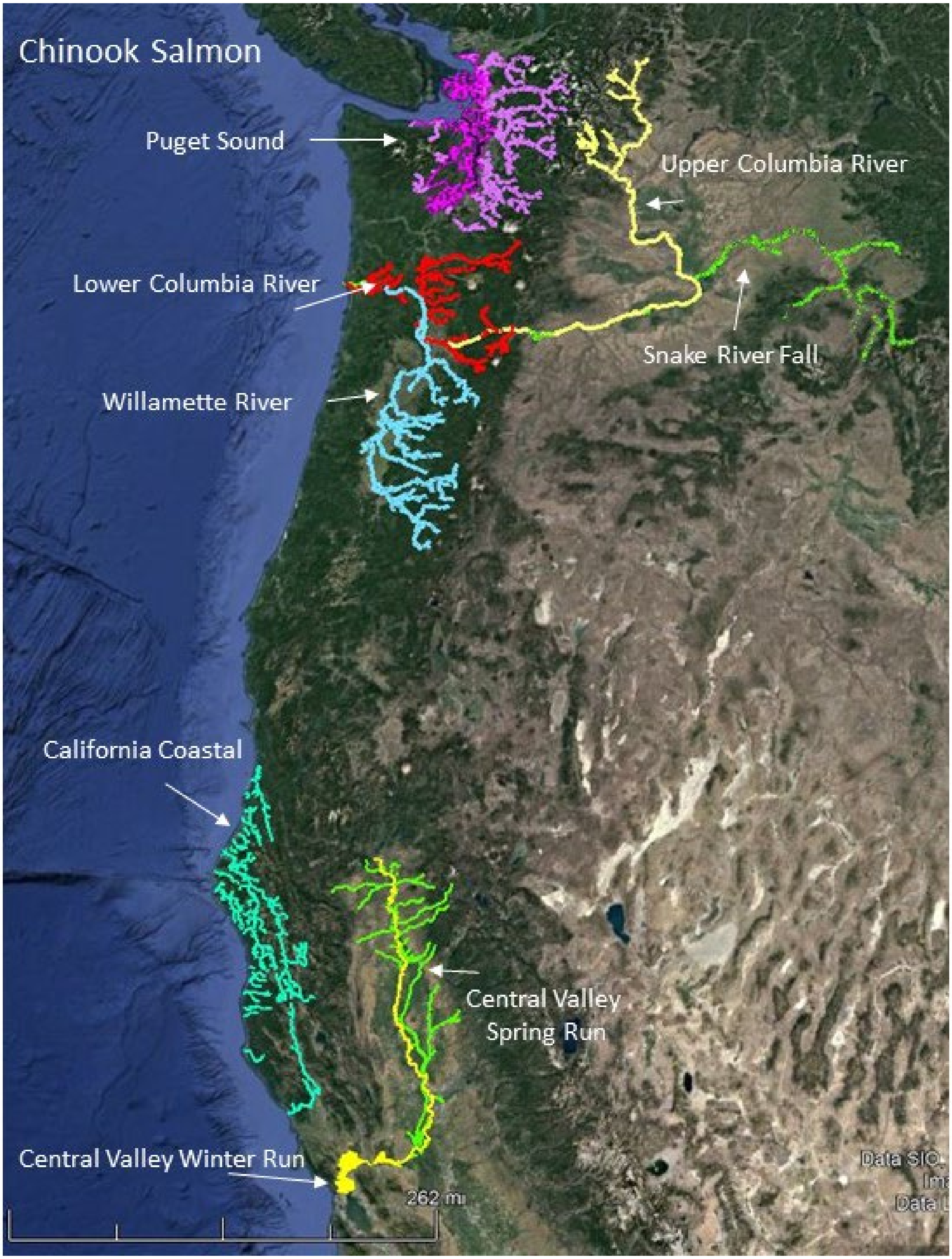

Figure 25. Map showing chinook salmon critical habitat for eight (8) Distinct Population Segments. Data from this website - https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html

Chum Salmon

Chum salmon occur in rivers, estuaries and nearshore marine environments along the US west coast and Alaska. Only two DPS/ESUs are listed under the ESA. Critical habitat for each is designated in Washington State and Oregon (Figure 26, https://www.fisheries.noaa.gov/species/chum-salmon). The PCEs for chum salmon are the same as for chinook salmon (above) and for brevity will not be repeated here (70 FR 52629).

Figure 26. Map of chum salmon critical habitat for two distinct population segments. Data from website - https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html

Coho Salmon

Coho salmon are found in US west coast and Alaska rivers, estuaries and nearshore marine environments. Only populations along the west coast are listed on the ESA (https://www.fisheries.noaa.gov/species/coho-salmon). Critical habitat is designated for two DPS/ESUs in rivers from Oregon and in northern and central California (Figure 27). The PCEs for coho salmon are similar to those listed above for chinook and for brevity are not mentioned here (73 FR 7816).

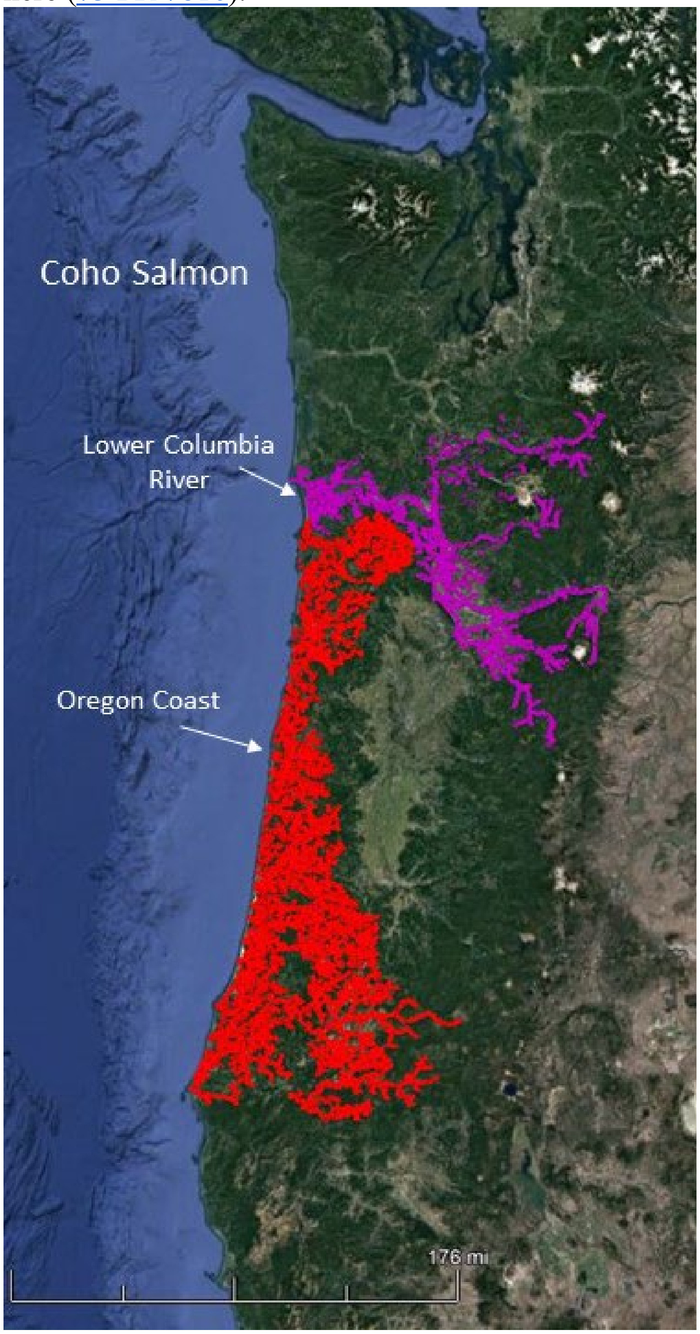

Figure 27. Map of coho salmon critical habitat for two distinct population segments (DPS). There are two (2) other DPSs not shown, (southern Oregon/northern California and central California coast) whose designations predated mapping capabilities according to the metadata from the website - https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html

Eulachon

Eulachon are a small, anadromous fish (moving between freshwater and saltwater) and are found from northern California to southwest Alaska (https://www.fisheries.noaa.gov/species/eulachon).

There is critical habitat designated for Eulachon in Washington State and within the Columbia River, California and associated tributaries (Figure 28, 29). The PCEs essential to conservation of the species includes (from 76 FR 65323):

1. Freshwater spawning and incubation sites with water flow, quality and temperature conditions and substrate supporting spawning and incubation, and with migratory access for adults and juveniles.
2. Freshwater and estuarine migration corridors associated with spawning and incubation sites that are free of obstruction and with water flow, quality and temperature conditions supporting larval and adult mobility, and with abundant prey items supporting larval feeding after the yolksac is depleted.
3. Nearshore and offshore marine foraging habitat with water quality and available prey, supporting juveniles and adult survival.

Figure 28. Map of critical habitat in red, for Eulachon in Washington and Oregon from website - https://www.westcoast.fisheries.noaa.gov/protected_species/eulachon/eulachon_critical_habitat.html

Figure 29. Map of critical habitat in red, for Eulachon in Oregon and California from website: https://www.westcoast.fisheries.noaa.gov/protected_species/eulachon/eulachon_critical_habitat.html

Green Sturgeon

Green sturgeon are an anadromous fish, which means they can live in both fresh and saltwater. They have a relatively complex life history that includes spawning and juvenile rearing in rivers followed by migrating to saltwater to feed, grow, and mature before returning to freshwater to spawn. They are a long-lived, slow-growing fish and are found in the waters off Alaska and the west coast (https://www.fisheries.noaa.gov/species/green-sturgeon).

There is designated critical habitat for green sturgeon off the west coast from Washington to California just south of San Francisco Bay (Figure 30).The PCEs essential to the conservation of green sturgeon in marine, estuarine and riverine areas are (from [73 FR 52084]).

1. Food resources - Abundant prey items for larval, juvenile, subadult, and adult life stages.
2. Substrate type or size (i.e., structural features of substrates) for egg deposition and development, larval development, subadults and adults.
3. Water flow - A flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) necessary for normal behavior, growth, and survival of all life stages.
4. Water quality - Water quality, including temperature, salinity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages.
5. Migratory corridor - A migratory pathway necessary for the safe and timely passage of Southern DPS fish within riverine habitats and between riverine and estuarine habitats (e.g., an unobstructed river or dammed river that still allows for safe and timely passage).
6. Water depth - Deep (≥5 m) holding pools for both upstream and downstream holding of adult or subadult fish, with adequate water quality and flow to maintain the physiological needs of the holding adult or subadult fish.
7. Sediment quality - Sediment quality (i.e., chemical characteristics) necessary for normal behavior, growth, and viability of all life stages.

Figure 30. Map of green sturgeon critical habitat data from website - https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html .

Gulf Sturgeon

The Gulf sturgeon is a sub-species of the Atlantic sturgeon that can be found from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi to the Suwannee River in Florida. Hatched in the freshwater of rivers, Gulf sturgeon head out to sea as juveniles, and return to the rivers of their birth to spawn (lay eggs) when they reach adulthood. Based on current data, populations continue to reproduce in seven river systems (Pearl, Pascagoula, Escambia, Yellow/Blackwater, Choctawhatchee, Apalachicola, and Suwannee rivers). In addition to the seven spawning riverine populations, Gulf sturgeon are also known to inhabit the Mississippi, Mobile, and Ochlocknee rivers (https://www.fisheries.noaa.gov/species/gulf-sturgeon).

Critical habitat is designated for Gulf Sturgeon (Figure 31). The primary constituent elements essential for the conservation of the Gulf sturgeon include the following (from 68 FR 13370):

1. Abundant food items, such as detritus, aquatic insects, worms, and/or molluscs, within riverine habitats for larval and juvenile life stages; and abundant prey items, such as amphipods, lancelets, polychaetes, gastropods, ghost shrimp, isopods, molluscs and/or crustaceans, within estuarine and marine habitats and substrates for subadult and adult life stages.
2. Riverine spawning sites with substrates suitable for egg deposition and development, such as limestone outcrops and cut limestone banks, bedrock, large gravel or cobble beds, marl, soapstone, or hard clay;
3. Riverine aggregation areas, also referred to as resting, holding, and staging areas, used by adult, subadult, and/or juveniles, generally, but not always, located in holes below normal riverbed depths, believed necessary for minimizing energy expenditures during fresh water residency and possibly for osmoregulatory functions;
4. A flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) necessary for normal behavior, growth, and survival of all life stages in the riverine environment, including migration, breeding site selection, courtship, egg fertilization, resting, and staging, and for maintaining spawning sites in suitable condition for egg attachment, egg sheltering, resting, and larval staging;
5. Water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages;
6. Sediment quality, including texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages; and
7. Safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats (e.g., an unobstructed river or a dammed river that still allows for passage).

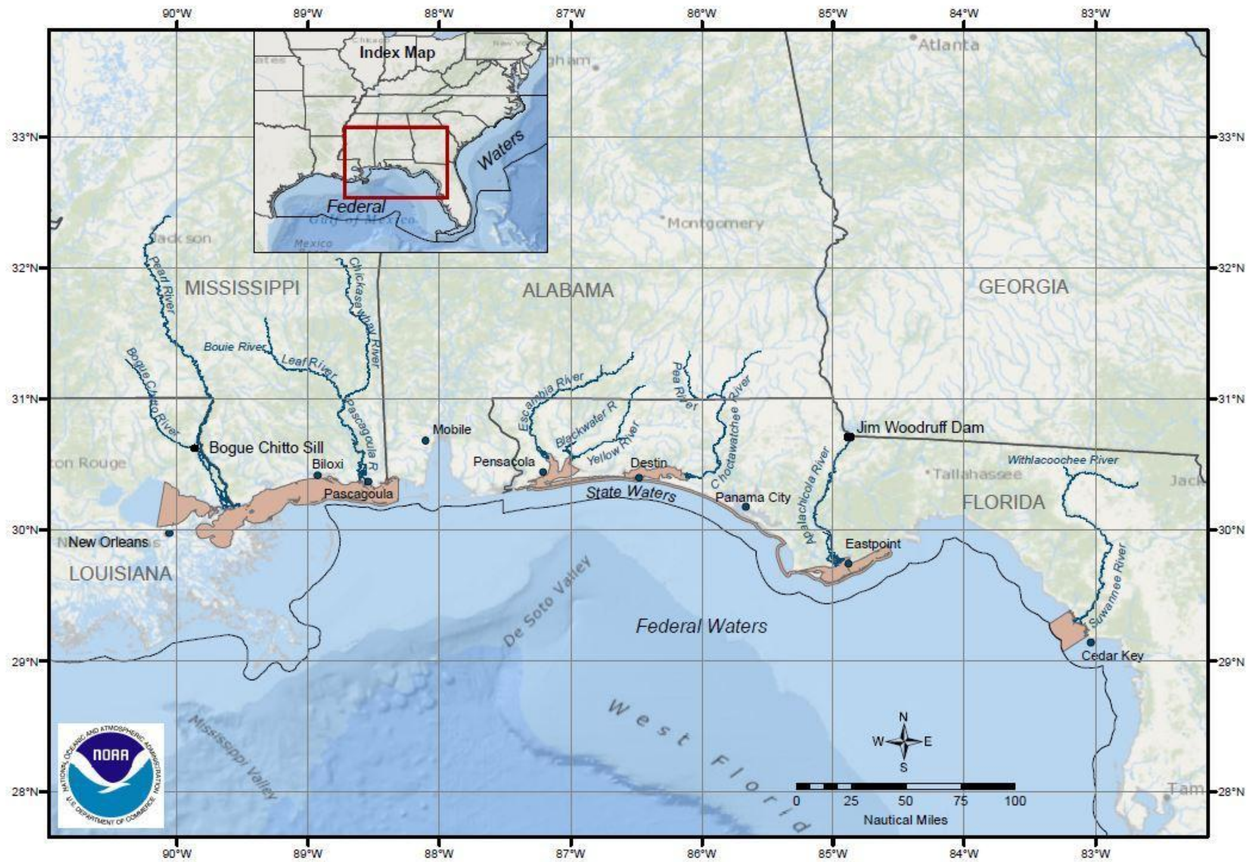

Figure 31. Map of Gulf sturgeon critical habitat from website - [*https://sero.nmfs.noaa.gov/maps_gis_data/protected_resources/critical_habitat/index.html*](https://sero.nmfs.noaa.gov/maps_gis_data/protected_resources/critical_habitat/index.html)

Smalltooth Sawfish

Smalltooth sawfish live in tropical seas and estuaries (semi-enclosed areas where rivers meet the sea) of the Atlantic Ocean. They are most at home in shallow, coastal waters, and sometimes enter the lower reaches of freshwater river systems. In the United States, they can be found off the coast of Florida (https://www.fisheries.noaa.gov/species/smalltooth-sawfish).

There is critical habitat designated for sawtooth sawfish off the southwest tip of Florida (Figure 32). NMFS determined that the habitat features essential to the conservation of the species are red mangroves and shallow euryhaline habitats characterized by water depths between the Mean High Water line and 3 ft (0.9 m) measured at Mean Lower Low Water (MLLW).

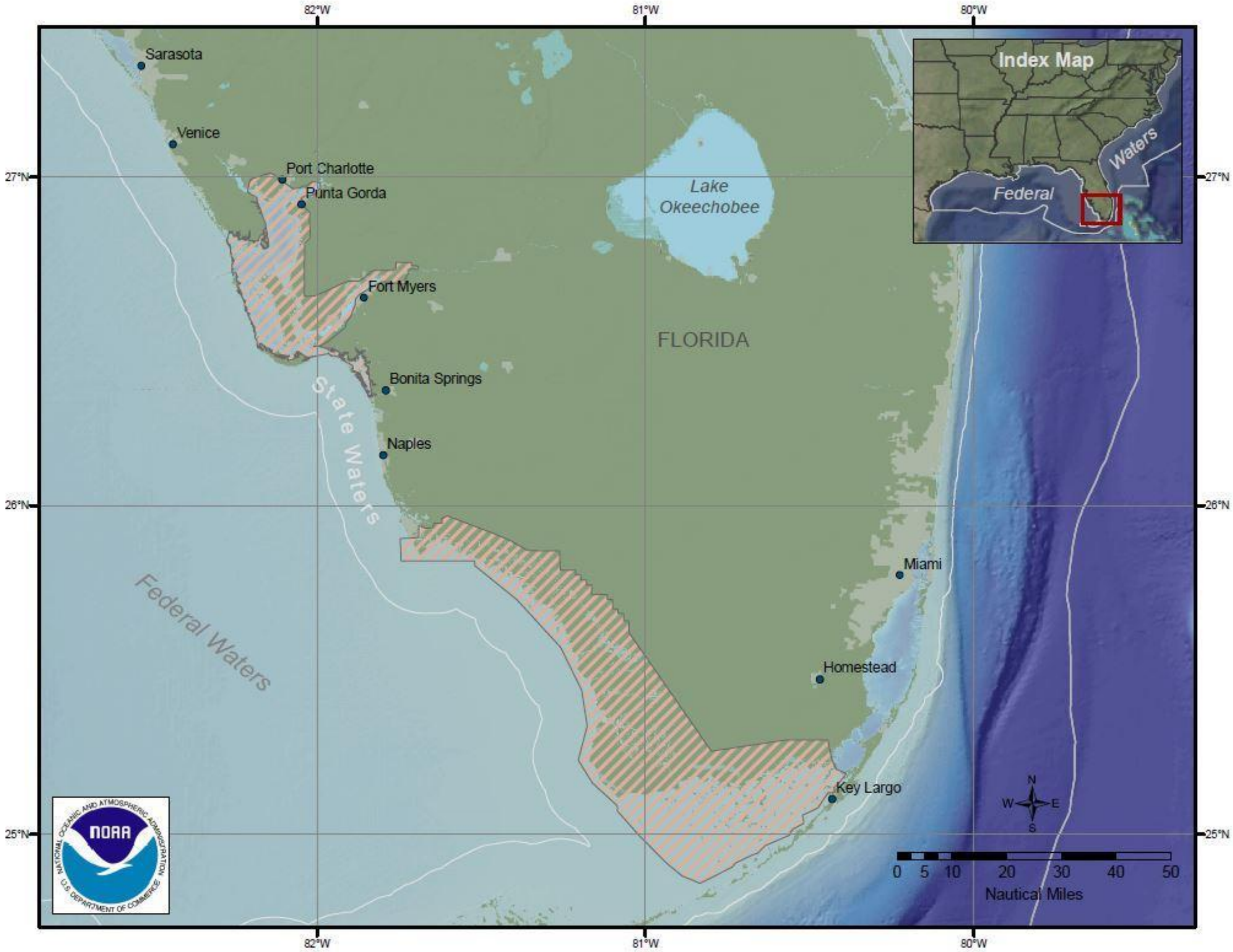

Figure 32. Map of smalltooth sawfish critical habitat from website - https://sero.nmfs.noaa.gov/maps_gis_data/protected_resources/critical_habitat/index.html

Sockeye Salmon

Sockeye salmon occur in US west coast and Alaska rivers, estuaries and marine environments (https://www.fisheries.noaa.gov/species/sockeye-salmon). Only one (1) population is listed under the ESA and it is found along the US west coast. There is critical habitat designated for this population in Washington State (Figure 33). The PCEs essential for conservation of this species are the same as described above for chinook salmon and are not repeated here (70 FR 52630).

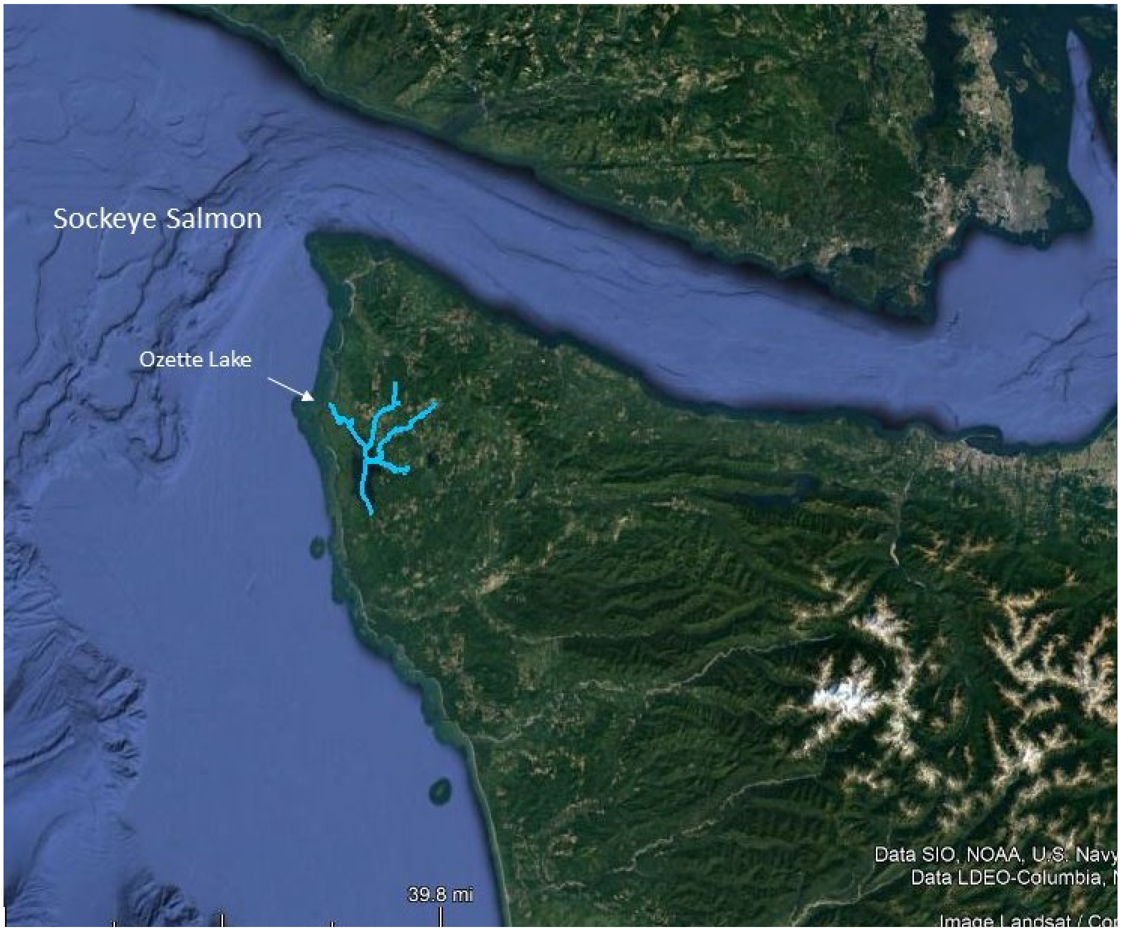

Figure 33. Map of critical habitat of sockeye salmon for one(1) Distinct Population Segment(DPS). There is one (1) other DPS not shown here (snake river) whose designation predated mapping capabilities according to the metadata from the website - https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html

Steelhead trout

Steelhead trout are a unique species. Individuals develop differently depending on their environment. All steelhead trout hatch in gravel-bottomed, fast-flowing, well-oxygenated rivers and streams. Some stay in fresh water all their lives, and are called rainbow trout. Steelhead trout that migrate to the ocean typically grow larger than the ones that stay in freshwater. Steelhead trout may occur in US west coast and Alaska rivers, estuaries and marine environments (https://www.fisheries.noaa.gov/species/steelhead-trout). There are eleven (11) DPS/ESUs listed under the ESA. These populations are found along the US west coast and within western rivers (Figure 34, 35).

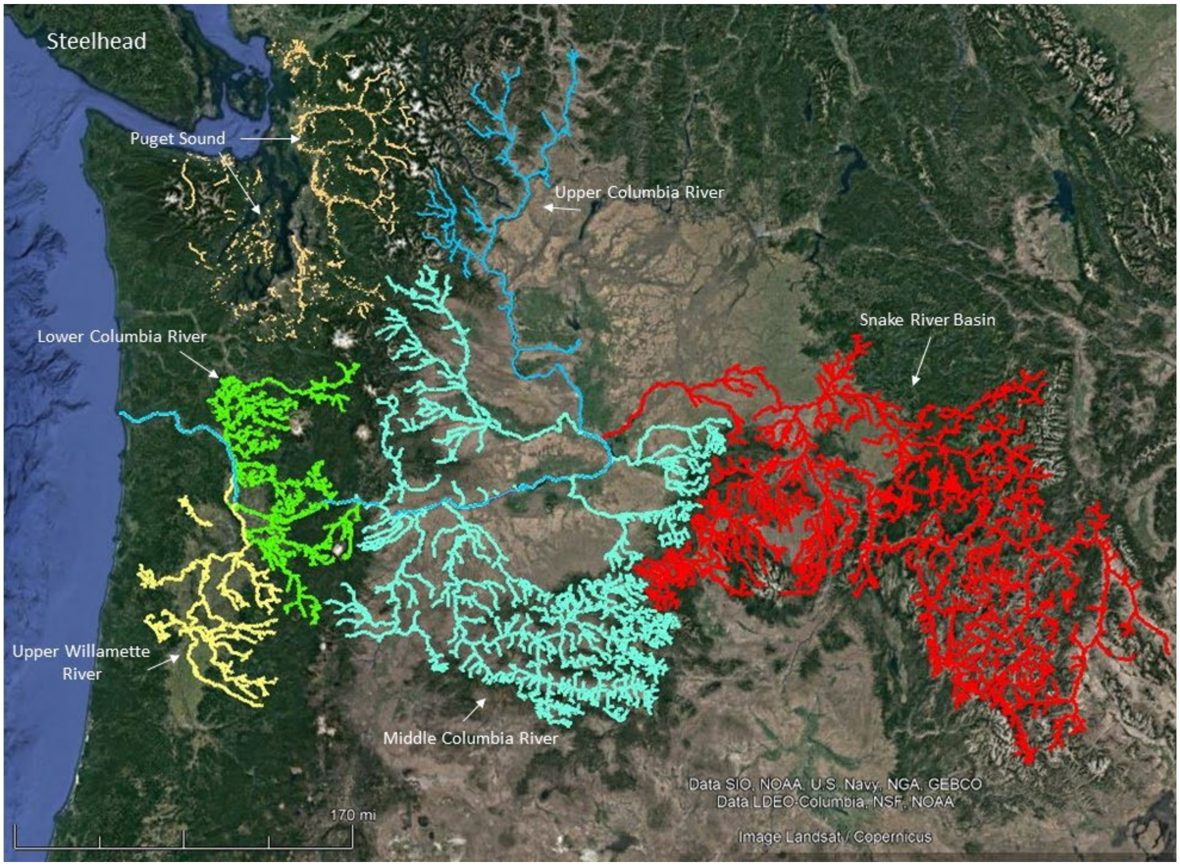

Figure 34. Map of steelhead trout critical habitat in for six (6) different Distinct Population Segments (DPS) in the Pacific Northwest. Data are from the following website - https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html.

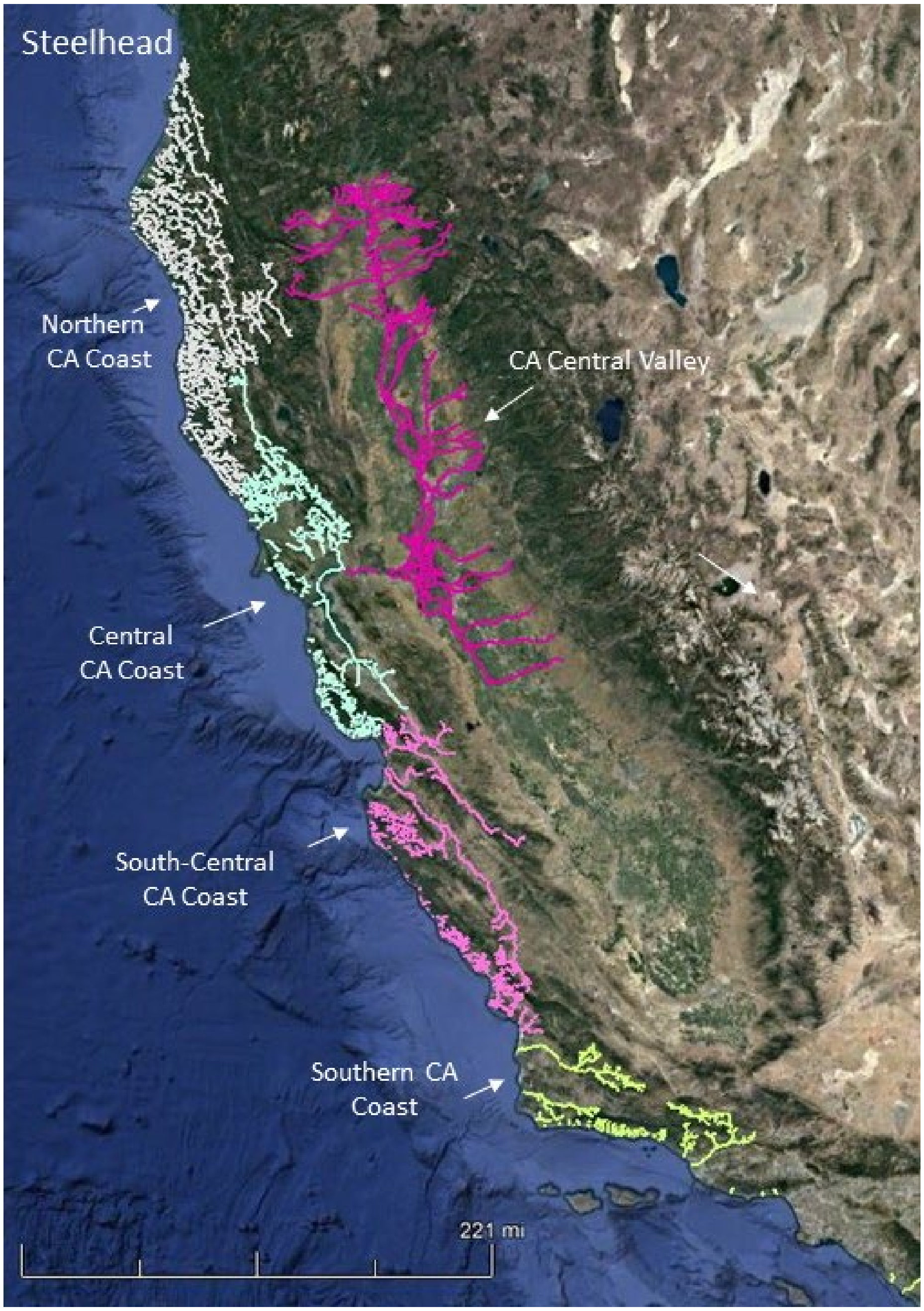

Figure 35. Map of steelhead trout critical habitat for five (5) Distinct Population Segments (DPS) in California. Data are from the website -
https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html

Marine and Anadromous Fishes Effects Determination

Activities to be conducted fall into four main categories 1. Data and Sample Collection 2, Field Experiments 3. Use of Gliders, AUVs, ASVs, UASs, and Drifters and 4. Vessel Operations.

Data and sample collection

No adverse effects to ESA-listed marine and anadromous fishes are anticipated as a result of data and sample collection activities. These activities are limited in spatial and temporal extent and occur in localized areas, and are non-invasive by nature. No threatened or endangered marine and anadromous fish would be impacted as a result of the deployment and operation of sampling instruments, the operation of cameras, sensors etc. as they passively collect data from the water column, have no impact on water quality, and the frequency and duration of the instrument casts is minimal. Deployment and operation of non-destructive instrumentation such as platforms or moorings would also have no potential to adversely affect ESA-listed marine and anadromous fishes as these do not impact water quality, spawning habitat or block fish migration. For similar reasons, activities also would have no adverse effects to any critical habitat of marine and anadromous fishes, as there is no potential to affect the primary constituent elements such as, substrate type, salinity, depth, temperature, water flow or access of fishes to the habitat or migratory corridors.

Field experiments

Field experiments using caged shellfish, use of mesocosms, benthic landers etc would not have any negative impact on ESA-listed marine and anadromous fishes as these activities are of limited spatial extent and would not be an obstruction to fish movement or adversely affect water quality or water flow rate. There is no potential for fishes to be entangled with mooring lines (i.e., lines connecting the topside buoy to the anchor) in the water column due to fishes ability to detect and avoid the mooring lines and because the mooring cables are taut with no potential to entrap. Further, this action would be conducted under the terms and conditions of all applicable permits that would guide appropriate placement of these experiments. Likewise, field experiments would not adversely affect the primary constituent elements of marine and anadromous fishes. Therefore, there is no potential to adversely impact ESA-listed marine and anadromous fishes or their critical habitat.

Use of Gliders, AUVs, ASVs, UASs, and Drifters

The deployment of gliders, AUVs, and drifters would have no impact on ESA-listed marine and anadromous fishes, as the proposed AUVs and gliders would move within the water column similar to a dolphin or whale, and drifters float on the sea surface, moving with ocean currents. ASVs are slow moving (~4-5 knots) and are operated at the surface within line of sight of the operator and there is no potential for adverse impacts to marine or anadromous fishes as they can avoid these vehicles similar to other faster moving surface vessels. AUVs, ASVs and gliders may use a variety of propulsion sources, including diesel, diesel/electric, battery, solar, buoyancy driven, and wave-gliding propulsion systems. However, most are powered by batteries that are sealed with little potential for leakage. Gliders and AUVs also move at low speeds (approximately 3-5 knots) and have no potential for collision with fishes. In the unlikely event of a glider, AUV, ASV or drifter malfunction, negligible adverse impacts on biological resources would be expected. UAS used in NCCOS projects are small and lightweight and are used for the purposes of aerial observation of marine life, marine debris, and oceanographic characteristics. The UAS pilot will fly no lower than 30ft over the surface of the water and will not be operated in proximity to observed fish species. Noise produced by UASs has been found to not be above background levels when the UAS is above 5 ft above the surface of the water, therefore there will be no adverse effect related to sound levels in the water as the UAS will be flown no lower than 30ft over the water's surface. The pilot and observers will maintain a 500-meter line of sight during the entire operation which will allow researchers to avoid all observed fish during UAS flight operations. Based on this analysis NCCOS determines activities associated with the deployment and operation of these vehicles/equipment would not have adverse effects on marine and anadromous fishes or their critical habitat.

Vessel Operations

Vessel operations may include transit of personnel and equipment, deployment of instrumentation and sample collections. For small vessels, transit operations may occur from the closest boat launch or home port to the project site. Transit aboard ships could be over a much broader area. Regardless of vessel size, operators would maintain 100% protected species observer coverage, maintain minimum approach distances for protected species and reduce speeds when protected species are observed (BMPs Pp. 84-87). However, fishes can easily avoid vessels and would not likely be visible from the surface, thus there would be no impact. Vessel operations are routine and do not represent an increase in vessel traffic, noise or pollution potential above baseline levels as vessels are used routinely for other purposes. Therefore, NCCOS determines that vessel operations would have no adverse impacts on ESA-listed marine and anadromous fishes or their critical habitat.

Marine Invertebrates – Coral and Abalone

Nineteen (19) species of marine invertebrates listed under the ESA may occur within US and territorial waters. None of these species occur within Alaskan waters (Table 9).

Table 9. There are nineteen (19) species of threatened or endangered marine invertebrates within US waters.

Marine Invertebrates	SE	NE	GOM	West	AK	PI	ESA Status	Crit. Hab.
Acropora globiceps Coral	--	--	--	--	--	X	T – 79 FR 53851	--
Acropora jacquelineae Coral	--	--	--	--	--	X	T – 79 FR 53851	--
Acropora lokani Coral	--	--	--	--	--	X	T – 79 FR 53851	--
Acropora retusa Coral	--	--	--	--	--	X	T – 79 FR 53851	--
Acropora speciosa Coral	--	--	--	--	--	X	T – 79 FR 53851	--

Black Abalone (*Haliotis cracherodii*)	--	--	--	X	--	--	E – 74 FR 1937	76 FR 66805
Boulder Star Coral (*Orbicella franksi*)	X	--	X	--	--	--	T – 79 FR 53851	--
Chambered Nautilus (*Nautilus pompilius*)	--	--	--	--	--	X	T – 83 FR 48976	--
Elkhorn Coral (*Acropora palmata*)	X	--	X	--	--	--	T – 79 FR 53851	73 FR 72210
Euphyllia paradivisa Coral	--	--	--	--	--	X	T – 79 FR 53851	--
Isopora crateriformis Coral	--	--	--	--	--	X	T – 79 FR 53851	--
Lobed Star Coral (*Orbicella annularis*)	X	--	X	--	--	--	T – 79 FR 53851	--
Mountainous Star Coral (*Orbicella faveolata*)	X	--	X	--	--	--	T – 79 FR 53851	--
Rough Cactus Coral (*Mycetophyllia ferox*)	X	--	X	--	--	--	T – 79 FR 53851	--
Pillar Coral (*Dendrogyra cylindrus*)	X	--	X	--	--	--	T – 79 FR 53851	--
Seriatopora aculeata Coral	--	--	--	--	--	X	T – 79 FR 53851	--
Siderastrea glynni Coral	--	--	--	--	--	X	E – 80 FR 60560	--
Staghorn Coral (*Acropora cervicornis*)	X	--	X	--	--	--	T – 79 FR 53851	73 FR 72210
White Abalone (*Haliotis sorenseni*)	--	--	--	X	--	--	E – 66 FR 29046	66 FR 29046 (Not Prudent)

Critical Habitat

Black Abalone

Black abalone belong to a group of plant-eating marine snails that were once common in California. They once numbered in the millions along the California coast but are now endangered. Black abalone live on rocky substrates in intertidal and shallow subtidal reefs (to about 18 feet deep) along the coast. They typically occur in habitats with complex surfaces and deep crevices that provide shelter for juveniles and adults. Because they occur in coastal habitats, black abalone can withstand extreme variations in temperature, salinity, moisture, and wave action. Black abalone range from about Point Arena, California, to Bahia Tortugas and Isla Guadalupe, Mexico (Figure 36. https://www.fisheries.noaa.gov/species/black-abalone).

Critical habitat is designated along the west coast for black abalone (Figure 37). The Primary Constituent Elements (PCEs) deemed essential for conservation of black abalone are as follows: (from 76 FR 66805)

1. Rocky substrate. Suitable rocky substrate includes rocky benches formed from consolidated rock of various geological origins (e.g., igneous, metamorphic, and sedimentary) that contain channels with macro- and micro-crevices or large boulders (greater than or equal to 1 m in diameter) and occur from MHHW to a depth of 6 m relative to MLLW.
2. Food resources. Abundant food resources including bacterial and diatom films, crustose coralline algae, and a source of detrital macroalgae, are required for growth and survival of all stages of black abalone.
3. Juvenile settlement habitat. Rocky intertidal and subtidal habitat containing crustose coralline algae and crevices or cryptic biogenic structures (e.g., urchins, mussels, chiton holes, conspecifics, anemones) is important for successful larval recruitment and juvenile growth and survival of black abalone less than approximately 25 mm shell length.

Figure 36. Map of black abalone range from website -
[*https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html*](https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html)

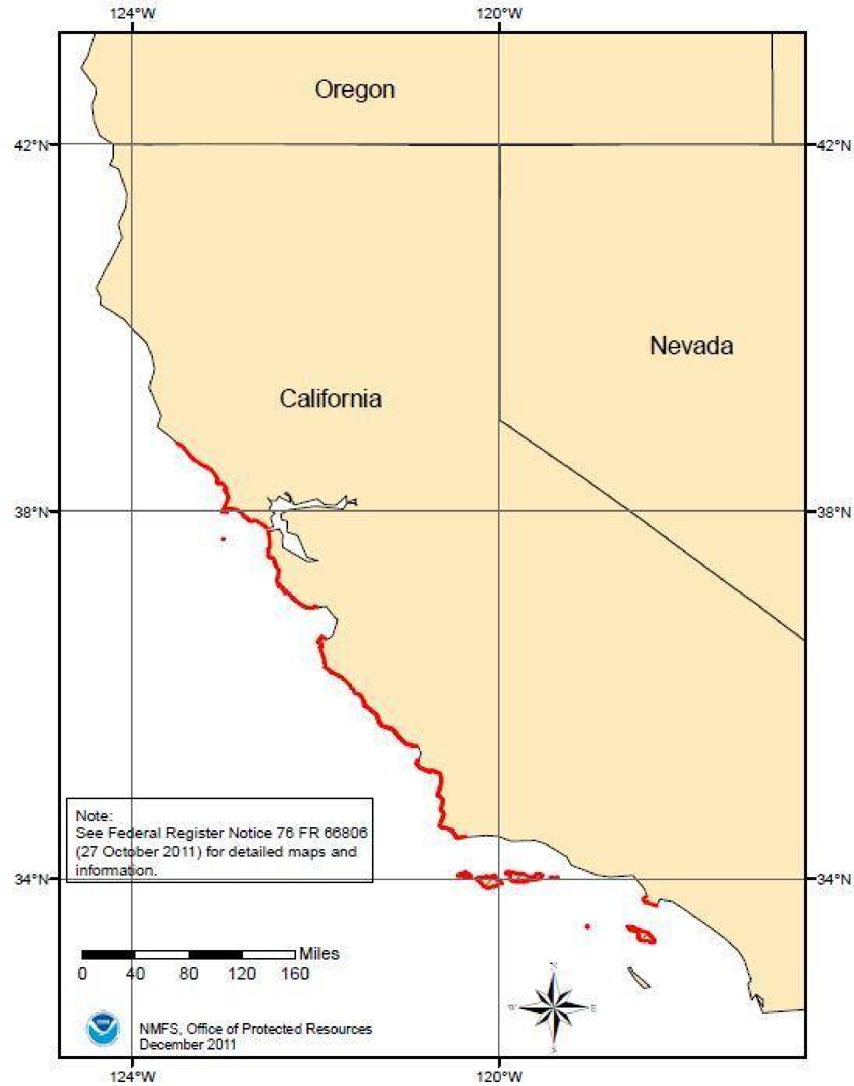

Figure 37. Map of black abalone critical habitat from website - https://www.westcoast.fisheries.noaa.gov/maps_data/endangered_species_act_critical_habitat.html

Elkhorn and Staghorn Coral

Elkhorn and staghorn coral are found typically in clear, shallow water from 1 to 15 feet and from 15 to 60 feet, respectively, on coral reefs throughout the Bahamas, Florida, and the Caribbean. The northern extent of elkhorn coral in the Atlantic Ocean is Broward County, Florida, where it is relatively rare (only a few known colonies). The northern extent of staghorn coral is Palm Beach County where it is relatively rare. Elkhorn coral lives in high-energy zones, with a lot of wave action. Too much wave action (major storms) can cause this branching coral to break. However, fragmentation via branch breakage is one method of reproduction for elkhorn coral. Staghorn coral lives in many coral reef habitats including spur and groove, bank reef, patch reef, and transitional reef habitats, as well as on limestone ridges, terraces, and hardbottom habitats. NOAA Fisheries has designated four critical areas determined to provide critical recruitment habitat for elkhorn and staghorn corals off the coast of Florida and off the islands of Puerto Rico and the U.S. Virgin Islands (https://www.fisheries.noaa.gov/species/elkhorn-coral, https://www.fisheries.noaa.gov/species/staghorn-coral).

Critical habitat is designated in Florida and Puerto Rico for elkhorn and staghorn coral (Figure 38, 39). NMFS determined the feature essential to the conservation of the species (also known as essential feature), which supports the identified conservation objective, was substrate of suitable quality and availability, in water depths from the mean high water (MHW) line to 30 m, to support successful larval settlement, recruitment, and reattachment of fragments (from 73 FR 72210).

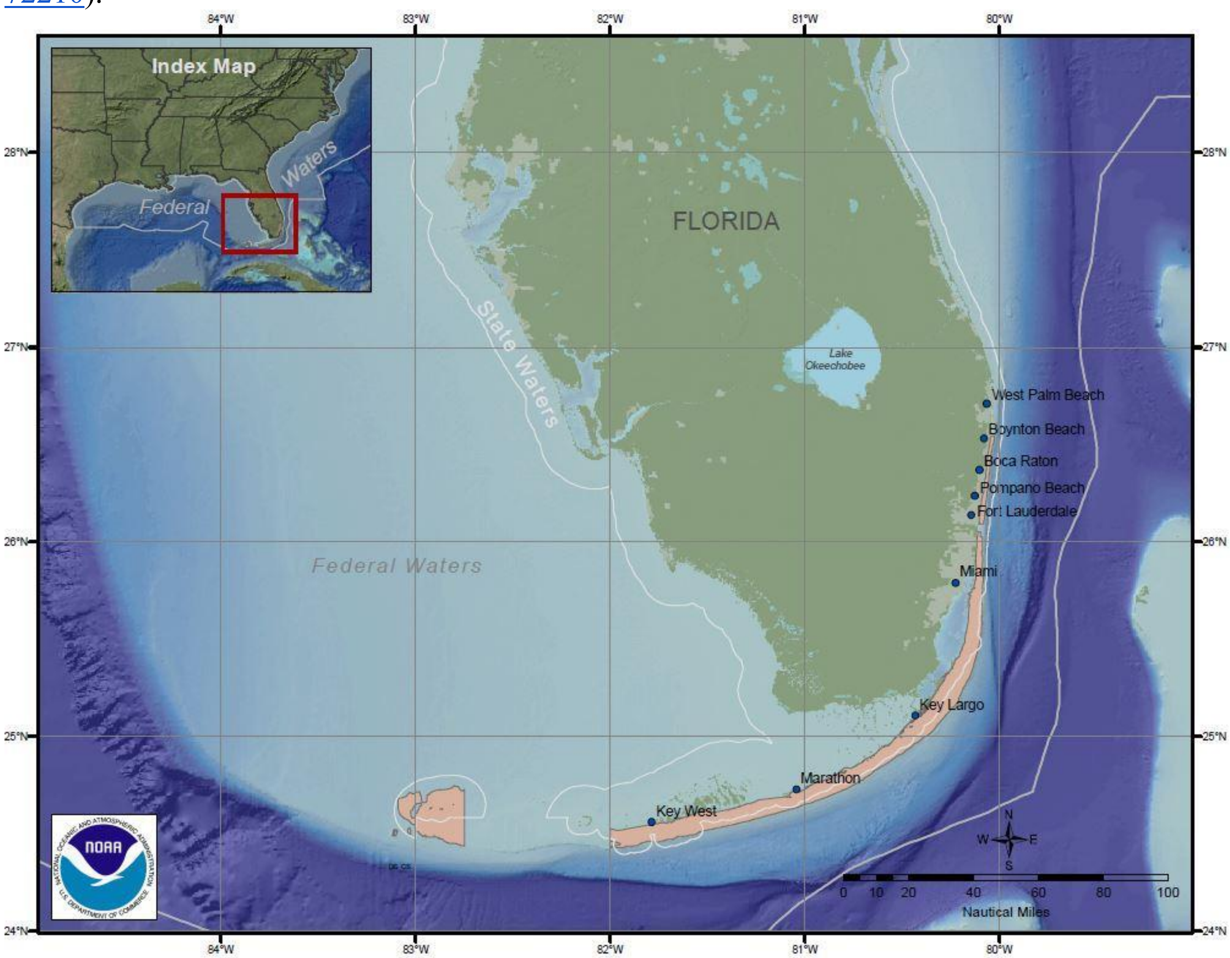

Figure 38. Map of elkhorn and staghorn coral critical habitat in Florida from website - https://sero.nmfs.noaa.gov/maps_gis_data/protected_resources/critical_habitat/index.html

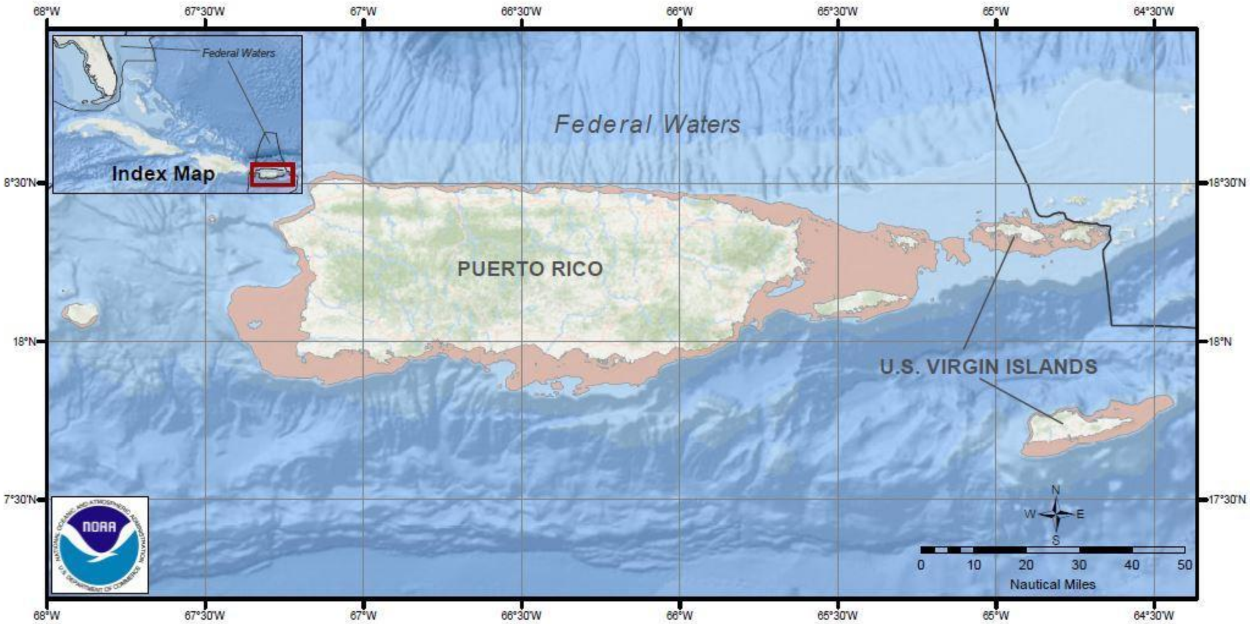

Figure 39. Map of elkhorn and staghorn coral critical habitat in the Caribbean from website - https://sero.nmfs.noaa.gov/maps_gis_data/protected_resources/critical_habitat/index.html

Marine Invertebrates Effects Determination

Activities to be conducted fall into four main categories 1. Data and Sample Collection, 2. Field Experiments, 3. Use of Gliders, AUVs, ASVs, UASs, and Drifters, and 4. Vessel Operations.

Data and sample collection

No adverse effects are anticipated to ESA-listed marine invertebrates as a result of data and sample collection activities. These activities are limited in spatial and temporal extent and occur in localized areas and measures will be taken to avoid disturbance to ESA listed marine invertebrates, especially sensitive benthic habitats. No marine invertebrates would be impacted as a result of the deployment and operation of sampling instruments, the operation of cameras, sensors etc. as they passively collect data from the water column and the frequency and duration of the instrument casts is minimal and they do not affect the benthos. Deployment and operation of non-destructive instrumentation such as platforms or moorings would also have no potential to adversely affect marine invertebrates as these do not impact water quality and would not be placed in or near sensitive or critical habitat for marine invertebrates. Deployment of new moorings would only be conducted in accordance with the terms and conditions of permits to guide their placement. Further, there would be no non-destructive shellfish collections conducted near ESA-listed marine invertebrates as these species are not the target of these investigations and they would be avoided. Based on this analysis there would be no adverse effects to marine invertebrates or their critical habitat as a result of this activity.

Field experiments

Field experiments using caged shellfish, use of mesocosms, benthic landers, etc would not have any adverse effect on ESA- listed marine invertebrates as activities are of limited spatial extent and would avoid disturbing ESA- listed corals or abalones. This action would be conducted under the terms and conditions of all applicable permits that would guide their placement to avoid disturbance to marine invertebrates such as corals and abalone. Field experiments would not be conducted in critical habitat in such a way that could impact the primary constituent elements of ESA-listed marine invertebrates. Therefore, there is no potential to adversely impact marine invertebrates or their critical habitat.

Use of Gliders, AUVs, ASVs, UASs, and Drifters

The deployment of gliders, AUVs, and drifters would have no impact on marine invertebrates, as the proposed AUVs and gliders would move within the water column similar to a dolphin or whale, and drifters float on the sea surface, moving with ocean currents and would have no direct contact with any benthic habitat. In the unlikely event of a glider, AUV, ASV or drifter malfunction, negligible adverse impacts on biological resources would be expected. For example, gliders would be programmed to avoid known obstructions, avoid striking the sea floor or other objects and to hover 1-2 meters above the benthos and to pause, reverse or surface in the unlikely event of a collision. UAS used in NCCOS projects are small and lightweight and are used for the purposes of aerial observation of marine life, marine debris, and oceanographic characteristics. The UAS pilot will fly no lower than 30ft over the surface of the water. The pilot and observers will maintain a 500-meter line of sight during the entire operation. Based on this analysis, NCCOS determines activities associated with the deployment and operation of these vehicles/equipment would not have adverse effects on marine invertebrates.

Vessel Operations

Vessel operations may include transit of personnel and equipment, deployment of instrumentation and sample collections. For small vessels, transit operations may occur from the closest boat launch or home port to the project site. Transit aboard ships could be over a much broader area. The vessel operators will avoid anchoring and or grounding, raise prop and reduce speed when in the range and critical habitat of ESA- listed corals or in ESA- listed abalone habitat. Vessel operations are routine and do not represent an increase in vessel traffic, noise or pollution potential above baseline levels as vessels are used routinely for other purposes. Therefore, NCCOS determines that vessel operations would have no adverse impacts on marine invertebrates or their critical habitat.

Marine Plants

There is one (1) species of marine plant listed under the ESA. It is found in Florida (Table 10).

Table 10. There is one (1) species of marine plant that is listed under the ESA.

Marine Plants	SE	NE	GOM	West Coast	AK	Pacific Islands	ESA Status	Crit. Hab.
Johnson's Seagrass (*Halophila johnsonii*)	X	--	--	--	--	--	T – 63 FR 49035	65 FR 17786

Critical Habitat

Johnson's Seagrass

Johnson's seagrass plays a major role in the health of benthic resources as shelter and nursery habitat. It has been documented as a food source for endangered West Indian manatees and threatened green sea turtles (https://www.fisheries.noaa.gov/species/johnsons-seagrass).

NMFS determined that the general physical and biological features of the critical habitat essential to conservation of Johnson's seagrass include adequate water quality, salinity levels, water transparency, and stable, unconsolidated sediments that are free from physical disturbance (Figure 40 from [65 FR 17786](65 FR 17786)).

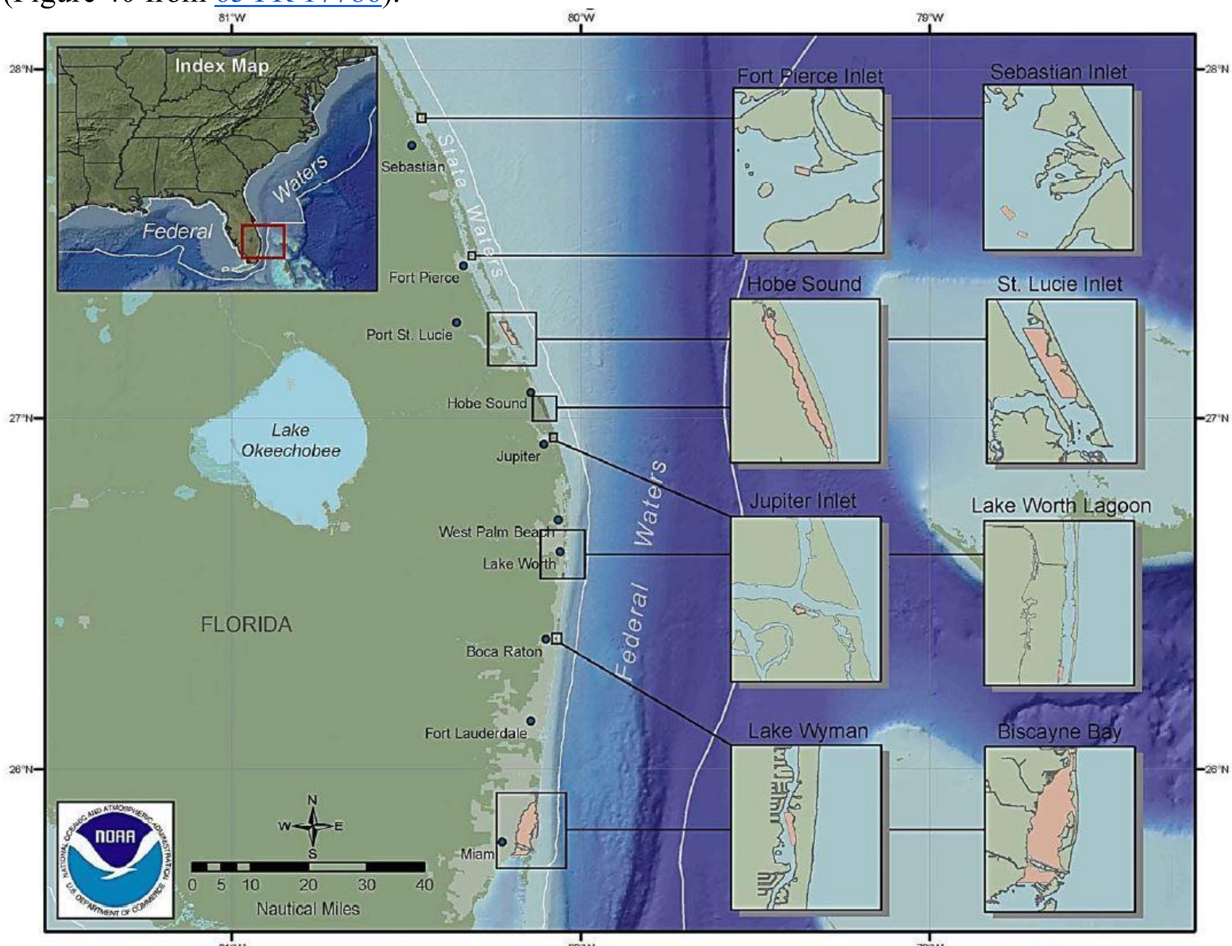

Figure 40. Map of Johnson's seagrass critical habitat from website - https://sero.nmfs.noaa.gov/maps_gis_data/protected_resources/critical_habitat/index.html

Johnson's Seagrass Effects Determination

Activities to be conducted fall into four main categories 1. Data and Sample Collection, 2. Field Experiments, 3. Use of Gliders, AUVs, ASVs, UASs, and Drifters, and 4. Vessel Operations.

Data and sample collection

No adverse effects are anticipated to Johnson's seagrass as a result of data and sample collection activities. These activities are of limited spatial and temporal extent and occur in localized areas and measures will be taken to avoid disturbance to seagrass beds. Johnson's seagrass beds would not be impacted as a result of the deployment and operation of sampling instruments such as the operation of cameras, sensors etc. as they passively collect data from the water column and the frequency and duration of the instrument casts is minimal with no benthic contact. Deployment and operation of non-destructive instrumentation such as platforms or moorings would not be cited in Johnson's seagrass habitat and all activities such as this would adhere to the terms and conditions of permits to ensure appropriate site placement and no adverse impacts. Further, there would be no non-destructive shellfish collections conducted near Johnson's seagrass habitat. Therefore, non-destructive sampling activities have no potential to adversely affect the critical habitat of Johnson's seagrass.

Field experiments

Field experiments using caged shellfish, use of mesocosms, benthic landers, etc would not have any adverse effect on Johnson's seagrass as these activities would not be conducted in areas where Johnson's seagrass is found. This action would be conducted under the terms and conditions of all applicable permits including the citing of these experiments. Field experiments would not be conducted in Johnson's seagrass critical habitat or in Johnson's seagrass beds. Therefore, there is no potential to adversely impact Johnson's seagrass or their critical habitat.

Use of Gliders, AUVs, ASVs, UASs, and Drifters

The deployment of gliders, AUVs, and drifters would have no impact on Johnson's seagrass, as the proposed AUVs and gliders would move within the water column similar to a dolphin or whale, and drifters float on the sea surface, moving with ocean currents and would have no contact with benthic habitat. In the unlikely event of a glider, AUV, ASV or drifter malfunction, negligible adverse impacts on biological resources would be expected. For example gliders would be programmed to avoid known obstructions, avoid striking the sea floor or other objects and to hover 1-2 meters above the benthos and to pause, reverse or surface in the unlikely event of a collision. UAS used in NCCOS projects are small and lightweight and are used for the purposes of aerial observation of marine life, marine debris, and oceanographic characteristics. The UAS pilot will fly no lower than 30ft over the surface of the water and will not be operated in proximity to Johnson's seagrass. Based on this analysis, NCCOS determines activities associated with the deployment and operation of these vehicles would not have adverse effects on Johnson's seagrass.

Vessel Operations
Vessel operations may include transit of personnel and equipment, deployment of instrumentation and sample collections. For small vessels, transit operations may occur from the closest boat launch or home port to the project site. Transit aboard ships could be over a much

broader area. Vessel operations would not have any direct or indirect effects on Johnson's seagrass as no contact is made with the sediment surface. The vessel operators will avoid anchoring in Johnson's seagrass critical habitat. Vessel operations are routine and do not represent an increase in vessel traffic, noise or pollution potential above baseline levels as vessels are used routinely for other purposes. Therefore, NCCOS determines that vessel operations would have no adverse impacts on Johnson's seagrass or their critical habitat.

Birds

According to the USFWS IPaC (Information for Planning and Consultation) website there are dozens of birds listed on the endangered species act and hundreds of bird species protected by the Migratory Bird Treaty Act and/or the Bald and Golden Eagle Protection Act that may occur within the general area of project activities. However, apart from UAS, there would be little if any overlap in sampling activities and areas where birds would congregate to nest, rest or feed. All UAS activities will be limited to flights over the water and will fly no lower than 30ft above the surface. Site-specific analysis of the project area will be conducted to ensure no birds will be adversely impacted as a result of UAS activities. If ESA-listed birds are sited in the project area, UAS activities will be stopped until the birds have left the area. Best Management Practices (Pp. 84-87) will be employed by researchers to avoid disturbance to nesting birds and rookeries. All activities will be conducted under the terms and conditions of applicable permits. Therefore, NCCOS determines that non-destructive sampling activities would have no adverse effects on birds.

4.2 Essential Fish Habitat and Managed Species

Essential fish habitat (EFH) describes all waters and substrate necessary for fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. 1802 sec. 3(10)). EFH includes all types of aquatic habitat where fish spawn, breed, feed or grow to maturity, such as wetlands, kelp forests, deep corals, coral reefs, seagrasses and rivers (https://www.fisheries.noaa.gov/national/habitat-conservation/essential-fish-habitat). EFH applies to federally managed species in both state and federal jurisdictional waters throughout the range of the species within U.S. waters. The designation of EFH by itself does not confer any protection of the areas from non-fishing or fishing impacts. Instead, it is a tool used by managers to reduce impacts and improve fisheries management. It is described and identified in Fishery Management Plans (FMP) that are developed by regional fisheries management councils. NMFS regional offices implement FMPs to facilitate long-term protection of EFH through conservation and management measures.

The EFH for a managed species is designated separately for each life stage: eggs, larvae (normally pelagic), juveniles, and adults (pelagic and/or demersal). For certain species EFH is also designated for spawning adults. Many species require different habitats for different life stages, which means that the EFH for a single species may cover a large geographic area. As a result, when taken over all species and all life stages, EFH occurs almost everywhere in the project action of vessel operations.

Habitat Areas of Particular Concern (HAPC) are subsets of designated EFH and are defined as rare, particularly susceptible to human-induced degradation, especially ecologically important or located in an environmentally stressed area. The FMP regions have designated HAPC areas to focus conservation priorities on specific habitat areas that play a particularly important role in the life cycles of federally managed fish species. HAPCs may include high value intertidal and estuarine habitats, offshore areas of high habitat value or vertical relief, and habitats used for migration, spawning and rearing of fish and shellfish (NMFS, 2004).

Data and sample collection

No adverse effects are anticipated to EFH as a result of data and sample collection activities. These activities are limited in spatial and temporal extent and occur in localized areas. No EFH would be impacted as a result of the deployment and operation of sampling instruments, such as the operation of cameras, sensors etc. as they passively collect data from the water column. No direct or indirect adverse effects to EFH from instrument deployment as the frequency and duration of the instrument casts is minimal and this action would not affect water quality or cause physical disturbance to EFH. Deployment and operation of non-destructive instrumentation such as platforms or moorings would also have no potential to adversely affect EFH as these do not impact water quality and would not be placed in sensitive habitats such as seagrasses or coral reefs. Therefore, non-destructive sampling activities have no potential to adversely affect EFH

Field experiments

Field experiments using caged shellfish, use of mesocosms, benthic landers, etc would not have any adverse effect on EFH as activities are of limited spatial extent and would avoid disturbing EFH and not be placed in sensitive EFH such as seagrass beds or coral reefs. This action would be conducted under the terms and conditions of all applicable permits, including appropriate site placement to ensure no impacts. Therefore, there is no potential to adversely impact EFH.

Use of Gliders, AUVs, ASVs, UASs, and Drifters

The deployment of gliders, AUVs, and drifters would have no impact on EFH, as the proposed AUVs and gliders would move within the water column similar to a dolphin or whale, and drifters float on the sea surface, moving with ocean currents. Gliders move at very slow speeds (< 4 knots), minimizing the potential for impacts to benthic EFH. AUVs also move at low speeds (approximately 3-5 knots) with little potential for impacts to the benthic environment and would have no impacts to water quality. In the unlikely event of a glider, AUV, ASV or drifter malfunction, negligible adverse impacts on biological resources would be expected as they are programmed to avoid collisions and hover 1-2 meters above the substrate. UAS will only be operated at and above 30ft above the surface of the water, therefore there will be no overlap between the UAS activity area and EFH. Noise levels produced by UAS do not rise above background levels underwater when the UAS is flown greater than 5ft above the water surface. Based on this analysis, NCCOS determines activities associated with the deployment and operation of these vehicles/equipment would not have adverse effects on EFH.

Vessel Operations

Vessel operations may include transit of personnel and equipment, deployment of instrumentation and sample collections from a stationary or moving vessel. For small vessels transit operations may occur from the closest boat launch or home port to the project site. Regardless of vessel size, operators would take precautions to minimize impacts to EFH from anchor drag or other potential affects as described in the BMPs (Pp. 84-87). Vessel operations are routine and do not represent an increase in vessel traffic, noise or pollution potential above baseline levels as vessels are used routinely for other purposes. Therefore, NCCOS determines that vessel operations would have no adverse impacts on EFH or their critical habitat.

4.3 Managed and/or Protected Areas

All field activities may be conducted in areas under that is Managed or Protected in some form. These areas may include but not be limited to: National Marine Sanctuaries, National Monuments, Marine Protected Areas, National Estuarine Research Reserves, or National Wildlife Refuges, to name a few. Non-destructive sampling activities are generally allowed in most managed and/or protected areas. However, site specific analysis will ensure that all required permits and permissions are obtained and that all activities are authorized prior to work starting.

4.4 National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 (NHPA) (54 U.S.C. § 300101 et seq.) requires federal agencies to take into account the effects of their undertakings on historic properties in accordance with regulations issued by the Advisory Council on Historic Preservation (ACHP) at 36 C.F.R. Part 800. The regulations require that federal agencies consult with states, tribes, and other interested parties (consulting parties) when making their effect determinations, if needed.

Site specific analysis will be conducted to ensure that no cultural resources will be impacted by project activities, otherwise consultations will be completed. The National Park Service's cultural resources data layer will be consulted as needed or the State Historic Preservation Officer if there is any potential to adversely impact cultural resources (National Park Service website).

4.5 Section 404 Clean Water Act/Section 10 Rivers and Harbors Act

Any person or agency (including federal, state, and local government agencies) planning to work in jurisdictional waters of the United States, or discharge (dump, place, deposit) dredged or fill material in waters of the United States, including wetlands, must first obtain a permit from the U.S. Army Corps of Engineers (USACE), under section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act of 1899. A proposed project's impacts to these areas will determine what permit type is required. If applicable, site specific analysis will be conducted to ensure all required USACE permits are obtained prior to work starting.

A full listing of districts is found at http://www.usace.army.mil/Locations/

Summary list of Nationwide Permits can be found at:
https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll7/id/6711
Detailed description of Nationwide Permits can be found at:
https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll7/id/8593

4.6 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA, 16 U.S.C. § 1451) was enacted in 1972 to encourage coastal states, Great Lake states, and U.S. Territories and Commonwealths (collectively referred to as "coastal states" or "states") to preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone. The CZMA is a voluntary program for states; currently, thirty-four coastal states have a federally approved coastal management program except Alaska, which voluntarily withdrew from the program in 2011. Section 307 of the CZMA is known as the "federal consistency" provision.

The federal consistency provision requires federal actions (inside or outside a state's coastal zone) that affect any land or water use or natural resource of a state's coastal zone, to be consistent with the enforceable policies of the state coastal management program (CMP). For all other federal agency activities, inside or outside the coastal zone, the federal agency must submit a Consistency Determination to the state if the federal agency determines the activity may have reasonably foreseeable effects on the state's coastal uses or resources. Site specific analysis will be conducted to determine if the activity may affect coastal uses or resources, otherwise consultations with the States will be conducted.

4.7 Overlap with Subsistence Hunting: Co-management of Marine Mammals in Alaska

Section 119 of the Marine Mammal Protection Act (Public Law 103-238) allows NOAA Fisheries or the U.S. Fish and Wildlife Service to establish agreements with Alaska Native Organizations (ANOs), including, but not limited to, Alaska Native Tribes and tribally authorized co-management bodies. Individual co-management agreements shall incorporate the spirit and intent of co-management through close cooperation and communication between Federal agencies and the ANOs, hunters and subsistence users. Agreements encourage the exchange of information regarding the conservation, management, and utilization of marine mammals in U.S. waters in and around Alaska.

Agreements may involve: 1) Developing marine mammal co-management structures and processes with Federal and State agencies; 2) Monitoring the harvest of marine mammals for subsistence use; 3) Participating in marine mammal research; 4) Collecting and analyzing data on marine mammal populations. (For more information see: https://www.fisheries.noaa.gov/alaska/marine-mammal-protection/co-management-marine-mammals-alaska

Site-specific analysis of project activities will be conducted to ensure that project activities do not interfere with NMFS/USFWS authorized subsistence hunting activities by Alaska Native Tribes or Alaska Native Organizations. Actions to avoid conflicts may include but not be limited to stakeholder engagement with native tribes.

5.0 Permitting and Site-Specific Analysis

Depending on the regulatory authority overseeing the jurisdiction additional permits may be required. Site specific analysis of each project will be conducted to ensure that all appropriate consultations, permits and permissions are obtained, if needed.

6.0 Extraordinary Circumstances

Based on the non-destructive nature of the activities, incorporation of best management practices and the analysis in the project specific checklist-form, project activities would have negligible adverse effects or beneficial effects on areas with unique environmental characteristics, on geographically or ecologically critical areas, (sanctuaries, wetlands, watersheds), and National Historic Sites. NCCOS also determines no adverse impacts to marine mammals, essential fish habitat (marsh, wetlands, seagrasses), ESA-listed species and MBTA protected birds that are not negligible or discountable.

Further, vessel operators have decades of experience working in similar field locations and will employ Best Management Practices (BMPs, Pp. 84-87) to avoid interactions with protected species; such as 100% observer coverage (operator may double as observer), minimum approach distances and reducing speed if protected species (e.g. sea turtles, marine mammals) are observed. In addition, there is no potential to contribute to the introduction, continued existence or spread of non-native species as all gear used would be local to the area or rinsed thoroughly between water bodies as appropriate. Project activities would not result in a disproportionately high and adverse effect on the health or the environment of minority or low-income communities, compared to the impacts on other communities (EO 12898).

There would be no adverse effects on human health or safety that are not negligible or discountable. No chemicals would be transported as a result of this work and laboratory activities abide by the appropriate Standard Operation Protocols, as applicable to the activity and the facilities abide by all safety and disposal regulations such as; waste chemicals are disposed of through a licensed hazardous waste Treatment, Storage, and Disposal (TSD) facility and transported by a licensed transportation contractor. Therefore, there is no potential to generate, use, store, transport, or dispose of hazardous or toxic substances in a manner that may have a significant effect on the environment.

Finally, there are no uncertain environmental impacts or unknown risks as project activities and methods are routinely used for the purposes of research. Therefore these actions are not uncertain, unique or unknown, have no potential to establish a precedent for future action, to be controversial or to have cumulative impacts when combined with other past, present or reasonably foreseeable future actions.

As confirmed by the project-specific checklist, there are no extraordinary circumstances present that may require further analysis in an Environmental Assessment (EA) or Environmental Impact Statement (EIS).

7.0 References

IOOS 2016. U.S. Integrated Ocean Observing System (IOOS®) Program Programmatic Environmental Assessment. Final June 2016. https://cdn.ioos.noaa.gov/media/2017/12/IOOS_PEA-with-Appendices_FINAL_June-2016.pdf

OCS. 2013. Final Programmatic Assessment for the Office of Coast Survey Hydrographic Survey Projects. May 2013. https://repository.library.noaa.gov/view/noaa/2679

Christiansen, F., Rojano-Doñate, L., Madsen, P.T. and Bejder, L. 2016. Noise levels of multi-rotor unmanned aerial vehicles with implications for potential underwater impacts on marine mammals. Frontiers in Marine Science, 3, p.277. Https://doi.org/10.3389/fmars.2016.00277.

8.0 Best Management Practices

The following BMPs should be employed where applicable, incorporated into project instructions and communicated to the vessel operator and field party.

1. During transit a vessel operator and crew will maintain a look out for protected species and reduce speed as necessary to avoid protected species.

2. Upon sighting, vessel operator will maintain minimum approach distances for:
    a. Cetaceans
        i. 200 yards from large whales
        ii. 500 yards from North Atlantic right whales and
        iii. 100 yards from all other species.
    b. Sea turtles: 50 yards
    c. Sawfishes: 50 yards
    d. Sturgeon: 50 yards
    e. Manatees: 50 yards

3. Minimize vessel disturbance and ship strike potential
    a. Reduced speeds (<13 knots) when ESA-listed cetaceans are sighted (unless otherwise required, e.g., NOAA Sanctuaries);
    b. Reduced speeds (<13 knots) while transiting through designated critical habitat (unless slower speeds are required, e.g., < 10 knots in right whale critical habitat and management areas);
    c. Trained observers aboard all vessels; 100% observer coverage; and
    d. Species identification keys (for marine mammals, sea turtles, corals, abalone, and seagrasses) available on all vessels.
4. Minimize impacts to seagrasses and other Essential Fish Habitat (EFH) by:
    a. Anchoring in mud or sand (avoid seagrass or other EFH)
    b. Minimizing anchor drag (i.e. provide adequate scope)
    c. Avoid grounding by raising prop or reducing speed as necessary

5. Avoid disturbance of all nesting, resting or feeding birds
    a. Give birds plenty of space, let them feed and rest
    b. Respect posted areas. Disturbances to nesting birds can cause entire colonies to fail.
    c. Don't feed gulls or other wildlife
    d. Do not disturb wrack areas where birds are roosting

6. Avoid disturbance of Sea Turtles on land, (from USFWS)
    a. avoidance of known or marked nesting sites\
    b. avoid creation of deep ruts on the beach during stranding/rescue actions;
    c. avoid any night time work (if night time work is necessary then use minimal lighting and do not disturb nesting turtles or hatchlings if encountered)
    d. remove all material from beach when work is complete

7. Avoid disturbance of endangered plant species during all activities

    a. Be able to identify endangered plants species that may occur in the project area and avoid trampling or disturbing them during monitoring activities.

8. Injured or Dead Protected Species Reporting.
    a. In the unlikely event of an animal death or injury, vessel operators should immediately contact USFWS staff or NMFS staff, as applicable.
    b. If the NOAA vessel is responsible for the injury or death, the responsible parties will remain available to assist, as needed. Vessel operators must report the following information to the NMFS Regional Office immediately:
        i. the time, date, and location (latitude/longitude) of the incident;
        ii. the name and type of the vessel involved;
        iii. the vessel's speed during the incident;
        iv. a description of the incident;
        v. water depth;
        vi. environmental conditions (e.g., wind speed and direction, sea state, cloud cover, and visibility);
        vii. species identification or description of the animal, if possible; and the fate of the animal.
9. Uncrewed Aerial Vehicles (UAV)
    a. Conduct a pre-flight check for birds, sea turtles, and hauled out Pinnipeds in the flight area prior to UAV take-off. If these animals are observed in your flight airspace, wait until they depart before initiating take-off.
    b. Provide a 100ftbuffer from areas where birds are present. This includes on land, nearshore, or on the water. Provide a 150 foot buffer away from any Hawaiian monk seal.
    c. If one or more migratory birds or non-migratory birds or other wildlife is suspected of being disturbed in the air during airborne operations, wait until this wildlife clear the flight area. Attempt operations again using more conservative parameters such as different approach angle, different time of day, etc. If a second incident occurs, conduct no further UAV operations for this day.
    d. If one of more threatened or endangered bird(s), sea turtles, or Pinnipeds are suspected of being disturbed in/around its nest, and/or if disturbance occurs during nesting season, conduct no further UAS operations.
    e. Flight Operations Roles/Responsibilities/Qualifications
        i. Clear roles and responsibilities, as outlined below, will be maintained for all UAS operations. At a minimum, there must be two individuals at all times present during operations to fulfill specified ground control system (GCS) operation of the UAS and "see and avoid" roles/responsibilities.
            1. PM: The project manager (PM) will be focused on managing and coordinating the work of the project team, including the PIC, VO, and TA.
            2. PIC: The pilot-in-command (PIC) functions as the "internal pilot" and will be present during any and all UAS and ASV operations. The PIC will have responsibility for aircraft system preparation, launch, airborne operations, landing, and preventative maintenance. The PIC is the individual responsible for the remote

control of the aircraft. When at survey altitude, the operator may cede control of the aircraft to the autopilot, which will be programmed to follow a predetermined survey path.

a. The PIC is also tasked with overall responsibility for safe execution of the mission. It is the PIC's responsibility to ensure that all participants understand and can properly perform their specific roles for the flight. The PIC is additionally responsible for ensuring all documentation, including pre-and post-flight briefs are conducted. The PIC is charged with ensuring adherence to all SOP and checklist requirements.

3. VO: The visual observer (VO) is an external observer for "see and avoid" purposes. The VO is tasked with supporting the PIC as appropriate, including coordinating with local partners on logistics, and mobilizing and demobilizing gear.
4. TA: The role of the technical advisor (TA) is to review and comment on the project objectives and instructions, and to help execute these instructions as appropriate.

ii. Communications
    1. No flight or survey operations shall commence until the proper procedures communication has been established
    2. PIC shall announce when the UAS is about to takeoff or land to alert personnel
    3. PIC shall announce when the UAS is about to be launched or recovered to alert personnel
    4. PIC will have access to an aviation band radio and be able to monitor aviation guard (121.5) during all operations.

iii. Flight restrictions and conditions
    1. Operations will not be conducted if:
        a. Ceiling less than 800m
        b. Visibility less than 1.5km
        c. Windspeed greater than 15kts
        d. Light rain
        e. Presence of people in UAS operational area
        f. Marine mammals, sea turtles, or bird activity detected in the operational areas
    2. PIC will brief all participants on safe zones for launch and landing.
    3. Minimum/Maximum Flight Altitudes in airspace shall be defined as "minimum flight altitude of 30ft, maximum flight altitude of 400ft."
    4. Max distance from GCS will be line of site (estimated at 500m), weather permitting.
    5. Any non-participating aircraft encountered will be avoided as much as possible. Operations are limited to ensure proper separation from manned aircraft.

6. Routine maintenance checks must be performed before and after each flight.
7. Batteries must be charged or replaced as needed.
8. Flight data from the ground control station must be reviewed after each flight as necessary to ensure safe operation for subsequent flights.
9. PIC to maintain safe flight or terminate flight if unable.

iv. Mission Plans

1. Prior to a flight, a mission briefing shall be developed by the PIC with input and review from the participants. The PIC will conduct a briefing to include:
    a. Marine mammal and bird activity
    b. Weather
    c. Safety
    d. Status of equipment and personnel
    e. Communications plan
    f. Objectives
    g. Other relevant information as necessary
2. The survey will typically consist of launch, flight to altitude, perform survey/data collection, approach for landing, and landing/recovery. Expected individual flight duration will vary with what is being observed. Maximum flight or survey time is approximately 30 minutes.