GULF OF MEXICO SENSITIVE ECOLOGICAL RESOURCES AT RISK IN THE OFFSHORE ENVIRONMENT

SPATIAL TEMPORAL PROFILES AND
BEST MANAGEMENT PRACTICES

Bureau of Safety and
Environmental Enforcement

28 February 2023

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Top left to right

Rice's whale - National Oceanic and Atmospheric Association (NOAA) website
(Source: https://commons.wikimedia.org/wiki/File:Rice%27s_whale_prepares_to_surface.jpg)

Caribbean Spiny Lobster - NOAA Fisheries
(Source: https://www.fisheries.noaa.gov/species/caribbean-spiny-lobster)

Middle left to right

Coral - photograph taken by Greg McFall/NOAA
(Source: https://sanctuaries.noaa.gov/news/feb18/coral-reefs-of-flower-garden-banks-show-signs-of-resilience.html)

Loggerhead turtle - National Institute of Standards and Technology
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Bottom left to right

Sawtooth small fish (*Pristis pectinate)* - photograph taken by D. Ross Robertson
(Source: https://commons.wikimedia.org/wiki/File:Pristis_pectinata_SI.jpg)

Black-capped Petrel - photograph taken by Patrick Coin
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Gulf of Mexico Offshore Sensitive Geological Resources at Risk in the Offshore Environment

Spatial Temporal Profiles and Best Management Practices

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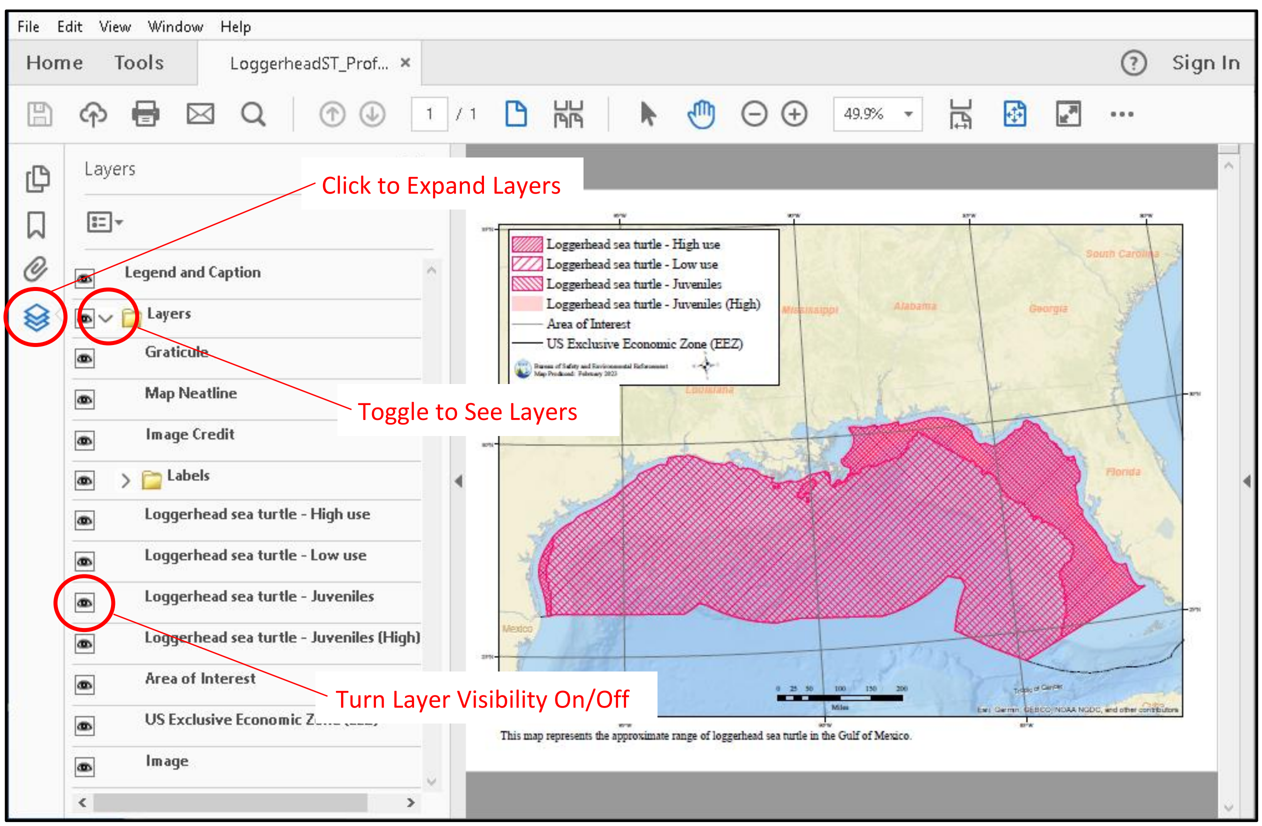
SPATIAL TEMPORAL PROFILES AND
BEST MANAGEMENT PRACTICES USER GUIDE

Spatial and temporal profiles were developed to describe the abundance and distribution of sensitive ecological resources in the offshore environment of the Gulf of Mexico. Each species profile includes a description of the species' vulnerabilities and sensitivities to oiling in the event of an oil spill.

Species profiles are outlined as follows. A single species profile was developed for each USFWS and NMFS federally listed threatened or endangered species. Non-federally listed species are grouped into profiles based on similar taxonomy, distribution, and behavior. Each summary includes: 1) scientific and common names; 2) status, if federally threatened or endangered; 3) description of critical habitat, if designated; 4) descriptions of appearance, diet, population trends, and distribution/habitat/migration; 5) vulnerabilities and sensitivities to oiling; 6) Best Management Practices (BMPs) for offshore operations; and 7) a table that provides a quick reference of potential presence within each Area Contingency Planning (ACP) area of response indicated by the USCG Sector or MSU (Corpus Christi, Houston/ Galveston, Port Arthur, New Orleans/Houma, Mobile, and St. Petersburg).

Finally, range maps are included at the end of each narrative species/taxa profile. Maps were generated from the GOM Offshore Environmental Sensitivity Index Atlas geospatial data, a separate deliverable for this effort. The range maps in the species profiles are layered PDF files, which allow the user to turn on or off selected data layers. For example, the map for loggerhead sea turtle has polygons showing high use areas, low use areas, juvenile distribution areas, and juvenile high use areas. The user can turn on/off each layer to get a better visualization of specific life history stages and concentration areas.

Example Species Profile Map – Layered PDFs



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SPATIAL TEMPORAL PROFILES AND BEST MANAGEMENT PRACTICES

Benthic Habitats

- Coral/Hardbottom
- Floating Aquatic Vegetation *(Sargassum)*
- Seagrasses

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<table>
<tr><th colspan="2">Coral/Hardbottom</th><th>ESA Status</th><th>Threatened (Elkhorn, Staghorn [2006]: 71 FR 26852. Other 5 species [2014]: 79 FR 53852)</th></tr>
<tr><td>Scientific Names of Listed Species</td><td>Staghorn coral (Acropora cervicornis)*
Elkhorn coral (Acropora palmata)
Pillar coral (Dendrogyra cylindrus)*
Lobed star coral (Orbicella annularis)
Mountainous star coral (Orbicella faveolata)
Boulder star coral (Orbicella franksi)
Rough cactus coral (Mycetophyllia ferox)*
Mesophotic and deep-sea corals (multiple species)
*Species does not occur in the Area of Interest, but may occur nearby (e.g., in the Florida Keys)</td><td>Critical Habitat</td><td>Elkhorn, Staghorn (2008):
Final Rule 73 FR 72210
Other 5 species:
Proposed Rule 85 FR 76302</td></tr>
<tr><td colspan="4">Appearance: <u>Staghorn coral</u> forms dense thickets of narrow branches rising from the sea floor in very shallow water. <u>Elkhorn coral</u> forms thickets of flattened, wider branches in very shallow water. <u>Pillar coral</u> resembles fingers (often with larger diameters) growing up from the sea floor. <u>Lobed star coral</u> colonies grow in a variety of shapes (heads, columns, or plates), depending on light conditions. <u>Mountainous star coral</u> colonies form massive mounds with small lumps or lobes. <u>Boulder star coral</u> colonies form massive clumps with uneven surfaces but may also form plates in lower light conditions. <u>Rough cactus coral</u> colonies form thin plates or are encrusting, and they have ridges and valleys covering the entire coral surface. All ESA-listed species occur on shallow coral reefs. Deep-sea coral species form complex structures on the sea floor, either as reefs or dense assemblages of tree-like species. Hardbottom reefs include hard substrate benthic areas (i.e., sloping bedrock, rock walls, and boulder fields), but exclude coral reefs. Hardbottom habitats often support deep-sea corals and other invertebrates.</td></tr>
<tr><td colspan="4">Distribution/Habitat (see maps for distribution in the GOM): Coral reefs are found in shallow tropical and subtropical waters with high light penetration, low turbidity, low nutrients, and open-ocean salinity. Reef-building corals are colonial marine invertebrates that house symbiotic photosynthetic algae in their tissues that provide nutrition. These corals deposit calcium carbonate exoskeletons that form the reef structure. This three-dimensional structure supports the highest taxonomic diversity of any marine ecosystem. Mesophotic coral reefs occur in tropical and subtropical regions at depths with low light penetration, loosely defined as between 30 m to >150 m. The physical environment on mesophotic reefs differs from its shallow counterparts, as light, wave energy, and temperature decrease with depth. These differences drive the species composition, diversity, and morphologies of mesophotic corals. Shallow coral reefs in the Gulf of Mexico occur in the Florida Keys Reef Tract and the Flower Garden Banks, and the ESA-listed coral species can be found on these reef systems. Mesophotic coral reefs are also present at the Flower Garden Banks. Hardbottom habitat occurs along the continental shelf and slope of the Gulf of Mexico, including deeper than the shelf and slope from authigenic carbonates formed by cold seeps.</td></tr>
<tr><td colspan="4">Vulnerabilities and Sensitivities to Oiling: Corals are most affected when heavily coated with oil and/or marine oil snow, sediments are contaminated, or reefs are physically damaged during response operations. Oil entrained in coral reef sediments and sediments of adjacent habitats (seagrass beds, mangroves) may persist for many years before degradation occurs and may continue to impact coral reefs as oil is released with tides or storms. Effects of oil exposure on corals include decreases in coral cover, diversity, and abundance, and increased coral mortality. Sublethal effects include bleaching, tissue swelling, tissue loss, mucus production, and bacterial infections. Coral gametes and larvae are more sensitive to contaminants than adult corals; exposing corals to oil at any point in the reproduction process can impact reproductive output and success. High levels of ultraviolet radiation, often occurring on shallow coral reefs, increase the toxicity of oil components on corals by an average of 7.2-fold; this phototoxicity also reduces coral settlement success (Nordborg et al., 2020) and developmental success (survival and metamorphosis) of coral larvae (Overmans et al., 2018). Furthermore, coral reefs are experiencing severe effects of multiple stressors worldwide, including bleaching from ocean warming,</td></tr>
</table>

ocean acidification, overfishing, coral diseases, and runoff and sedimentation from terrestrial sources; thus, additional stresses due to oil exposure and response impacts may compound their on-going decline. Deep-sea corals support a complex habitat that provides biodiversity and ecosystem function; combined with their slow growth rates, these habitats are particularly vulnerable to impacts from spilled and dispersed oil. Subsea dispersant injection can increase the amount of dissolved and dispersed oil in the water column, which can lead to increased exposure and health impacts to deep-water corals (DeLeo et al., 2015). Recovery of heavily impacted shallow coral reefs may take several years; whereas, recovery of heavily impacted mesophotic and deep-sea corals may take up to 50 years or be unlikely to occur (as summarized in Michel 2021a,b).					
BMPs for Offshore Operations: General: Anchoring methods should avoid coral reef and hardbottom areas. Secure all materials on vessels to prevent inadvertent loss overboard. Skimming and Booming: Maintain control of all materials to prevent inadvertent release and sinking. Burning: If incident-specific RRT approval allows burning over these habitats, recover any floating burn residue as quickly and efficiently as possible. Aerial Dispersant: Dispersant application as deep as possible and as far down current from the FGBNMS as possible. Subsea Dispersants: Spill-specific BMPs to be followed. Ideally, subsea dispersant injection should be avoided where there are identified deep-sea coral colonies >20 km downstream of the injection site, based on studies after the *Deepwater Horizon* oil spill that showed extensive colony damage at distances of 11 km and lesser impacts at 22 km from the wellhead (Fisher et al. 2014).					
Potential Range by Area Contingency Planning Area					
Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

References:

DeLeo DM, et al. 2015. Response of deep-water corals to oil and chemical dispersant exposure. Deep-Sea Research II. http://dx.doi.org/10.1016/j.dsr2.2015.02.028i.

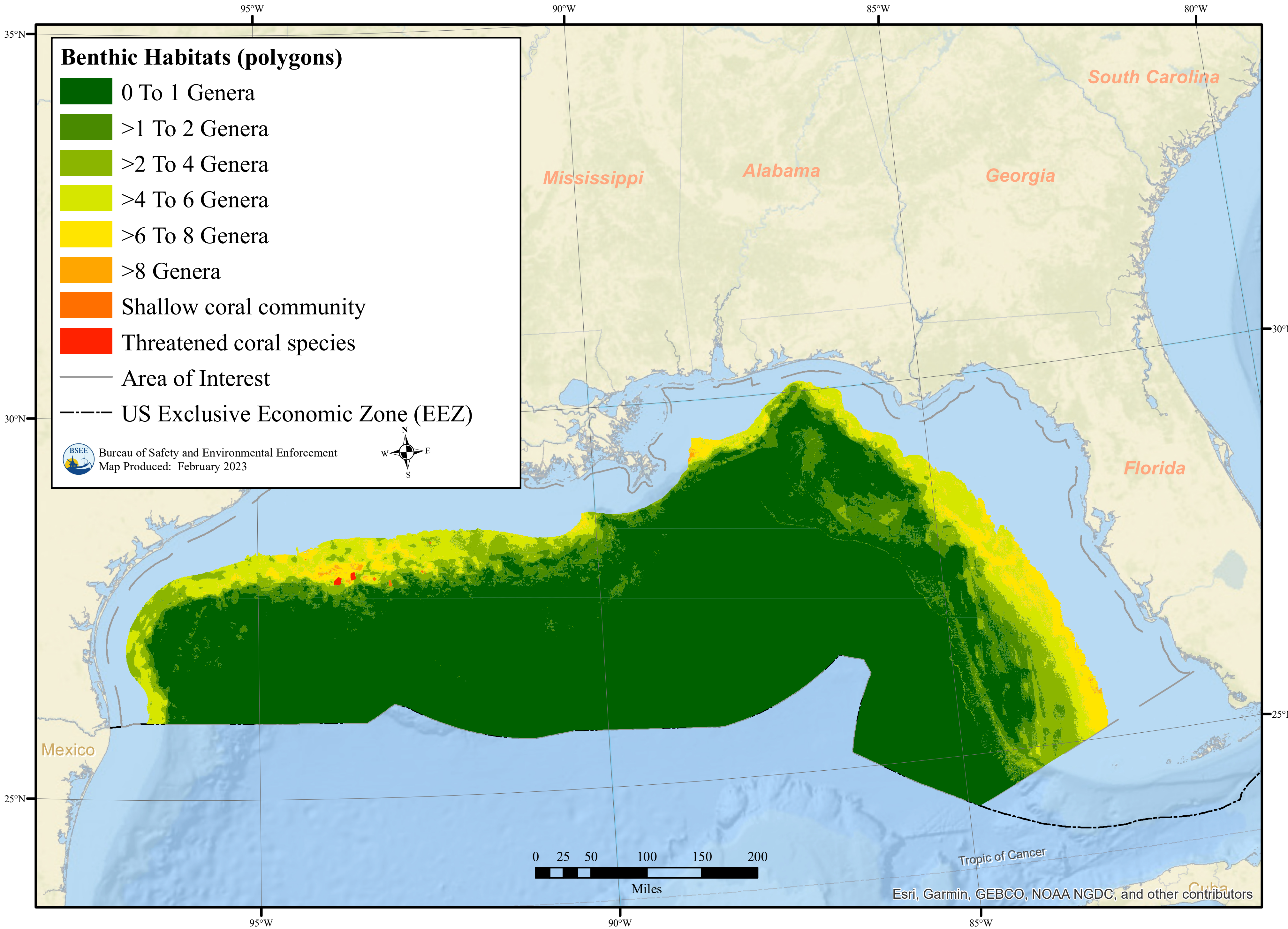
Fisher CR, Hsing PY, Kaiser CL, Yoerger DR, Roberts HH, Shedd WW, Cordes EE, Shank TM, Berlet SP, Saunders MG, et al. 2014. Footprint of *Deepwater Horizon* blowout impact to deep-water coral communities. Proceedings of the National Academy of Sciences. 111:11744-11749.

Michel J. (ed). 2021. Oil spill effects literature study of spills of greater than 20,000 barrels of crude oil, condensate, or diesel. Sterling (VA): US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2020-058. 326 p.

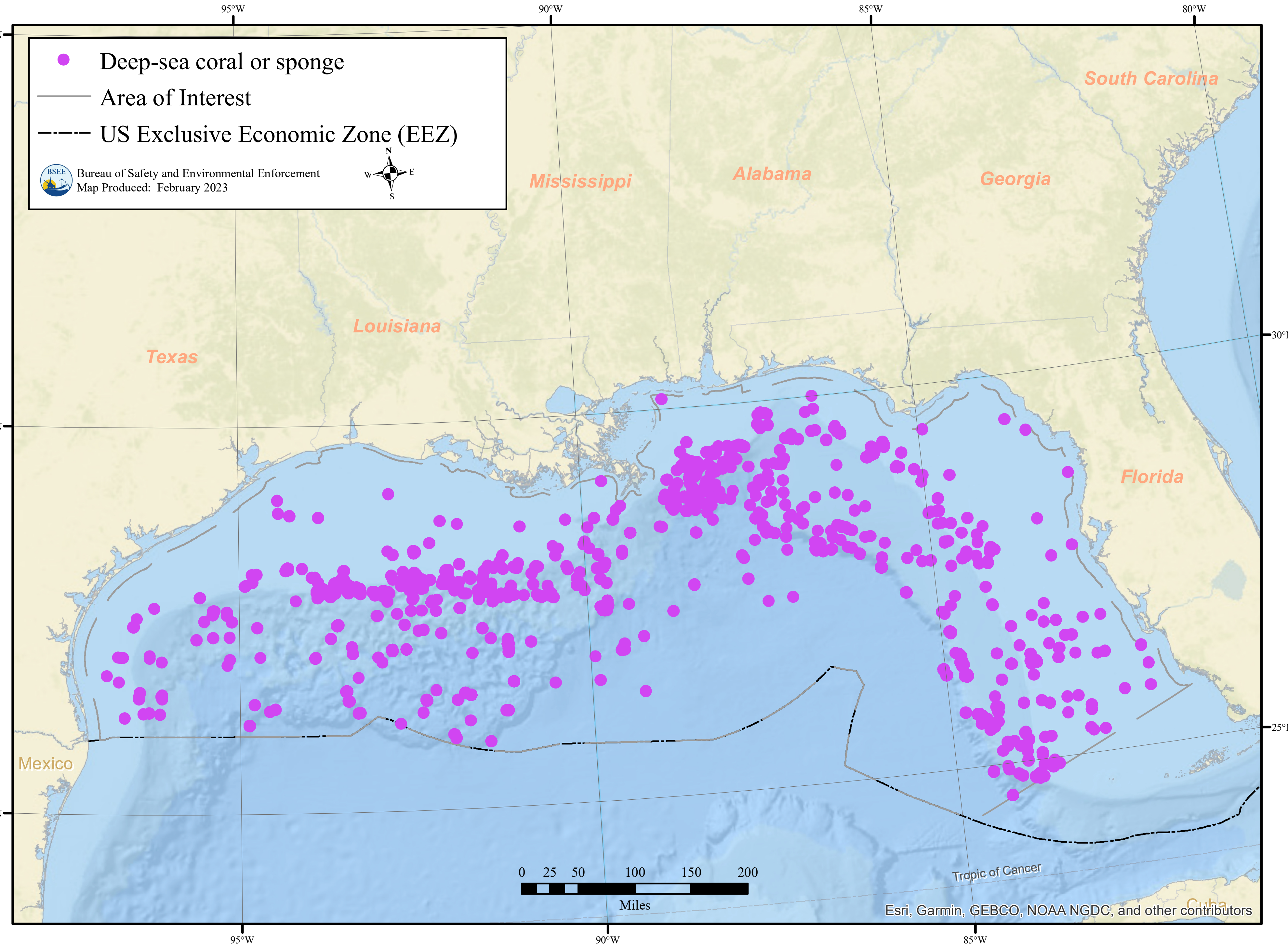
Michel J. (ed). 2021. Oil spill effects literature study of spills of 500–20,000 barrels of crude oil, condensate, or diesel. Anchorage, AK: US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2021-048. 216 p.

Nordborg FM, Jones RJ, Oelgemoller M, and Negri AP. 2020. The effects of ultraviolet radiation and climate on oil toxicity to coral reef organisms - a review. Science of the Total Environment 720:137486.

Overmans S, Nordborg M, Diaz-Rua R, Brinkman DL, Negri AP, and Agusti S. 2018. Phototoxic effects of PAH and UVA exposure on molecular responses and developmental success in coral larvae. Aquatic Toxicology 198:165-174.



This map represents the approximate range of benthic habitats (predicted mesophotic or deep-sea coral genus richness and shallow coral community and threatened coral species presence) in the Gulf of Mexico.



This map represents the approximate distribution of benthic habitats (deep-sea coral and sponge presence) in the Gulf of Mexico.

Floating Aquatic Vegetation		ESA Status	None
Scientific Name	*Sargassum*	**Critical Habitat**	79 FR 39855 (as one of the critical habitats for loggerhead sea turtles)

Appearance: *Sargassum* is large, dark green or brown pelagic macroalgae (seaweed) with leafy appendages, branches, and round, berry-like structures called pneumatocysts that are filled primarily with oxygen that provide buoyancy to the plant structure and allow it to float on the surface. *Sargassum* has a rough, sticky texture with a robust but flexible body that is adapted to withstanding the ocean currents in which they travel.

Distribution/Habitat/Movement (see map for distribution in the GOM): *Sargassum*, also known as "Gulf weed", is a floating pelagic algae that occurs at the ocean surface as clumps, drift lines, and large mats or "rafts". *Sargassum* may be present in large concentrations in summer months; however, the amount of *Sargassum* in the Gulf of Mexico from year to year and in any specific location can be highly variable. *Sargassum* travels on ocean currents, consolidating into large mats towards the Caribbean. *Sargassum* does not attach to the seafloor, but as it loses buoyancy, can travel down the water column to the seafloor, providing carbon to fish and invertebrates. Pelagic *Sargassum* accumulations function as islands of concentrated biological activity and productivity in offshore surface waters, which are otherwise generally low in productivity and habitat structure. Pelagic *Sargassum* harbors its own unique community of dense, small, cryptic organisms that are difficult to distinguish from the algae itself: microorganisms and macroinvertebrates of many types including attached, crawling, and swimming forms such as small crabs, shrimp, and fish. There are seabirds that are *Sargassum*-foraging specialists (e.g., Audubon's shearwater, royal tern, bridled tern, and red-necked phalarope (Moser and Lee, 2012)); risk to these seabirds increases at floating *Sargassum* when algal mats aggregate with oil.

Sargassum also supports post-hatchling, juvenile, and adult sea turtles (Witherington et al., 2012) and juvenile and adult pelagic commercial and sport fish (Wells and Rooker, 2004). *Sargassum* provides habitat structure, substrate, cover, and/or food resources for many species, and many species may be particularly concentrated in and around *Sargassum*. *Sargassum* habitat is designated as Critical Habitat for loggerhead sea turtles under the ESA, particularly for post-hatchlings and juvenile turtles.

Vulnerabilities and Sensitivities to Oiling: Physical processes, such as convergent currents and fronts that play a role in transporting, retaining, and concentrating organisms and *Sargassum*, are the same processes that act to concentrate oil, thus increasing the exposure of organisms to oil. Oiled *Sargassum* also provides a mechanism for oil to be transported long distances. Monitoring during the *Deepwater Horizon* spill showed loss of oiled *Sargassum*. Mesocosm experiments showed that dispersants and dispersed oil caused *Sargassum* to lose buoyancy and sink, which would remove the habitat and potentially transport oil and dispersant vertically into the water column and eventually to the seafloor (Powers et al. 2013).

BMPs for Offshore Operations:
General: Avoid vessel traffic in areas of dense *Sargassum*. If vessel operations are necessary, follow open paths between dense patches. Secure all materials on vessels to prevent inadvertent loss overboard.
Skimming: Juvenile sea turtles associate with floating *Sargassum*, so avoid skimming *Sargassum* that is not oiled or is only very lightly oiled. To avoid entangling sea turtles, a trained observer or crew member is required for all skimming operations.
Booming: If an animal is observed trapped or entangled in boom, open the boom carefully until the animal leaves on its own.
Burning: Avoid burning unoiled/lightly oiled *Sargassum*.
Aerial Dispersant: No dispersant application directly on dense areas of *Sargassum*.
Subsea Dispersants: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

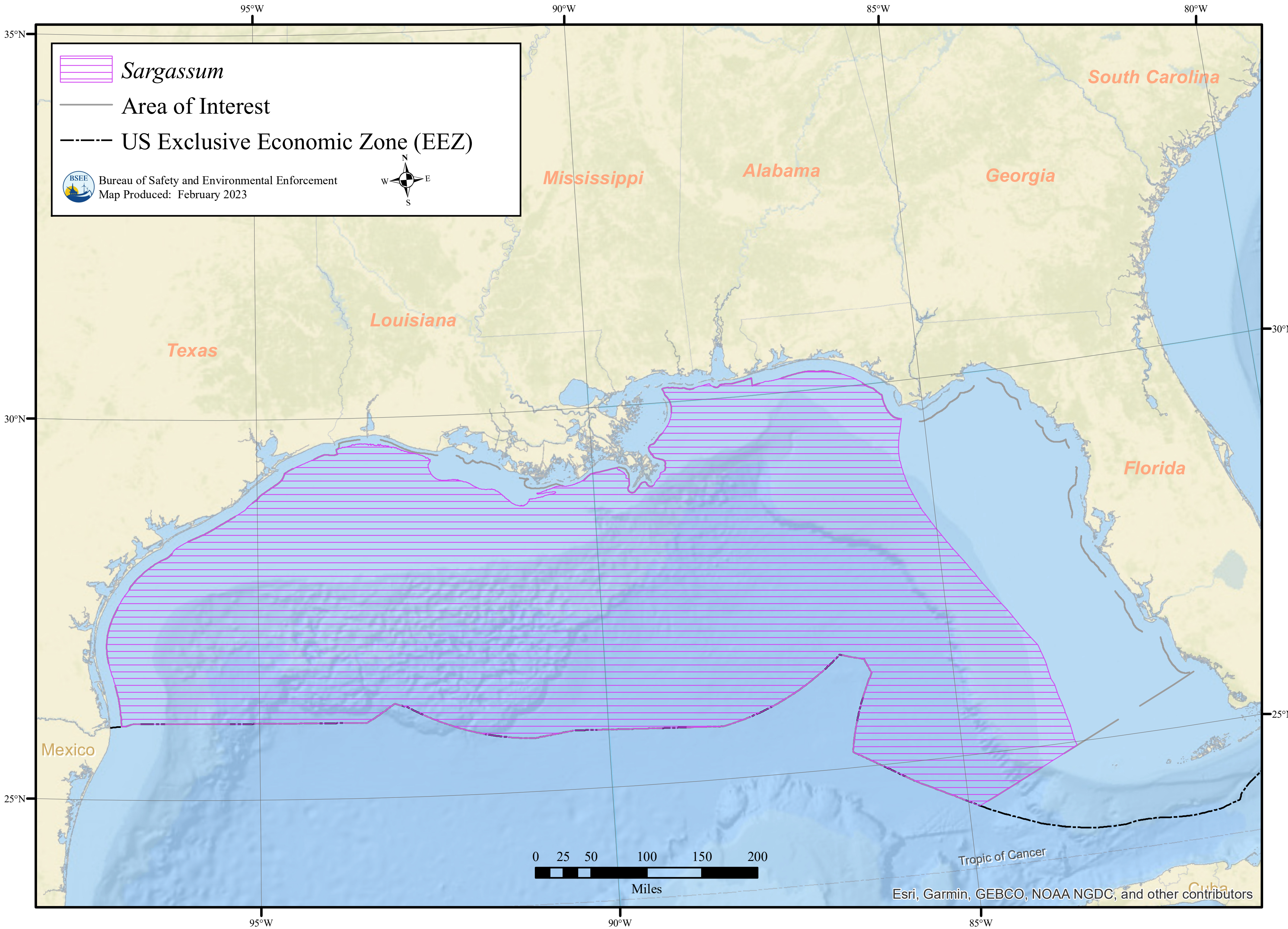
References:

Moser ML and Lee DS. 2012 Foraging over *Sargassum* by Western North Atlantic seabirds. The Wilson Journal of Ornithology 124(1):66-72.

Powers SP, Hernandez FJ, Condon RH, Drymon JM, Free CM. 2013. Novel pathways for injury from offshore oil spills: direct, sublethal and indirect effects of the *Deepwater Horizon* oil spill on pelagic *Sargassum* communities. PLoS ONE. 8(9):e74802.

Wells RJD and Rooker J. 2004. Spatial and temporal patterns of habitat use by fishes associated with *Sargassum* mats in the northwestern Gulf of Mexico. Bulletin of Marine Science 74(1):81-99.

Witherington B, Hirama S, and Hardy R. 2012. Young sea turtles of the pelagic *Sargassum*-dominated drift community: habitat use, population density, and threats. Marine Ecology Progress Series 463:1-22.



This map represents the approximate range of *Sargassum* in the Gulf of Mexico.

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<table>
<tr><td colspan="2">Seagrasses*</td><td>ESA Status</td><td>None</td></tr>
<tr><td>Scientific Names</td><td>Turtle grass (Thalassia testudinum)
Shoal grass (Halodule wrightii)
Manatee grass (Syringodium filiforme)
Star grass (Halophila engelmanni)
Paddle grass (Halophila decipiens)
Widgeon grass (Ruppia maritima)
*Data to map seagrasses were not available, and seagrasses may not occur in the Area of Interest. However, seagrasses occur nearby (e.g., in nearshore areas).</td><td>Critical Habitat</td><td>None</td></tr>
<tr><td colspan="4">Appearance: Turtle grass has flat, ribbon-like blades up to 35 cm long and 10 mm wide, with 9-15 parallel veins colonized by epiphytes. Shoal grass has flat, narrow blades up to 10-15 cm, clustered from a single node on the rhizome. Manatee grass has 2-4 cylindrical blades that can grow up to 50 cm long, originating from each rhizome node. Star grass has blades up to 10-30 mm and are clustered in groups of 4-8 arranged in a star-like whorl. Paddle grass resembles the threatened Johnson's seagrass, but can be distinguished by its finely serrated leaf margin and paddle-shaped green blade terminating with rounded tip. Its two opposite blades grow 10-25 mm long and 3-6 mm wide, extending directly from nodes on the rhizome. Widgeon grass has wide blades at the base of the stem, alternating from the sheath, and tapering to long, pointed tips.</td></tr>
<tr><td colspan="4">Population: According to the 2020 Seagrass Status and Trends report (Handley and Lockwood, 2020), which analyzed data from approximately 1987 through 2017, Texas, Alabama, and Florida experienced an overall net gain in seagrass acreage, with the largest acreage gain in Florida. Seagrass populations in Louisiana and Mississippi showed a net loss.</td></tr>
<tr><td colspan="4">Distribution/Habitat: Seagrasses are the only flowering plants that grow in marine environments. They occur in shallow, subtidal, or intertidal unconsolidated sediments where there is good water clarity. They are negatively affected by freshwater inflow, high turbidity, and high tidal amplitude. Seagrass meadows in the Gulf of Mexico contain more that 50% of the total U.S. seagrass distribution, with the largest coverages in Florida Big Bend, Florida Bay, and Laguna Madre (Handley et al., 2006; see discussion of seagrass salinities and distribution by estuary and state). Six species are found in the Gulf of Mexico. Turtle grass and manatee grass, two of the most common seagrasses in Florida, have an optimum salinity range from 24-35 ppt. Shoal grass can be found in areas with lower salinities of 10-25 ppt. Widgeon grass is a freshwater plant that has broad temperature and salinity tolerances. Star grass is found in sandy, muddy bottoms at depths up to 40 m. Paddle grass covers large areas of the west Florida shelf at depths from 9 m to more than 30 m.</td></tr>
<tr><td colspan="4">Vulnerabilities and Sensitivities to Oiling: Fonseca et al. (2017) determined that effects of oil spills on seagrass beds were dependent on many factors: proximity of the site to the point of oil release; oil type; tidal stage, range, and circulation patterns; and the location of the seagrass beds in the tidal frame. Seagrasses are most affected when the blades are heavily coated with oil, sediments are contaminated, the beds are physically damaged during response operations, or deprived of light for prolonged periods. During the Amoco Cadiz spill, eelgrass (Zostera marina) was directly oiled and displayed dieback and "burnt" leaves in heavily oiled locations followed by normal new leaf tissue growth within a few weeks. In addition, immediate decline in invertebrate species was observed; however, those organisms recovered to pre-spill abundance within 2 years post spill (Jacobs 1980). Seagrasses in the Chandeleur Islands, Louisiana, exposed to oil during the Deepwater Horizon spill showed persistent and delayed loss of seagrass cover over 2 years, as documented using aerial image analysis, although gains in cover in nearby seagrasses were also observed (Kenworthy et al. 2017). In addition, response vessel operations caused prop scars in seagrasses. Acute exposure may cause minor fouling of leaf blades and flowering parts of seagrass; however, full recovery is often relatively rapid, within 1-2 years (Fonseca et al., 2016). Oil on the sediment surface may be worked deeper into sediments by seepage, burial, bioturbation, or other disturbance (Zieman et al. 1984). Oil entrained in sediments within seagrass meadows may persist for many years before degradation occurs.</td></tr>
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Indirect impacts to seagrass during oil spills can occur during spill response. Seagrass impacts during response operations can include physical impacts and increased turbidity from vessel groundings, prop scarring, prop wash blowouts, anchoring of vessels and booms, stranding of boom in shallow water, and boom washing back and forth over seagrass beds during each tidal cycle. These actions can cause physical damage to seagrass leaves, shoots, and rhizomes; can displace sediments directly or cause scour; and can cause dieback and loss of seagrasses.

BMPs for Offshore Operations:
<u>General</u>: No anchoring is allowed. Secure all materials on vessels to prevent inadvertent loss overboard.
<u>Skimming and Booming</u>: Maintain control of all materials to prevent inadvertent release and sinking.
<u>Burning</u>: No burning directly over seagrass beds. Recover any floating burn residue as quickly and efficiently as possible.
<u>Aerial Dispersant</u>: No dispersant application over seagrass beds.
<u>Subsea Dispersants</u>: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

References:

Fonseca M, et al. 2016. Susceptibility of seagrass to oil spills: A case study with eelgrass, *Zostera marina* in San Francisco Bay, USA, Marine Pollution Bulletin 115(1-2):29-38.

Handley L, and Lockwood C. 2020. Seagrass Status and Trends Update for the Northern Gulf of Mexico: 2002-2017. Final Report to the Gulf of Mexico Alliance for Contract No.: 121701-00. Ocean Springs, MS.

J Handley L, Altsman D, and Demay R (eds). Seagrass Status and Trends in the Northern Gulf of Mexico: 1940-2002. U.S. Geological Survey Scientific Investigations Report 2006-5287. 267 p. Available at: https://pubs.usgs.gov/sir/2006/5287/

Jacobs RPWM. 1980. Effects of the 'Amoco Cadiz' oil spill on the seagrass community at Roscoff with special reference to the benthic infauna. Marine Ecology Progress Series 2(3):207-212.

Kenworthy WJ, Cosentino-Manning N, Handley L, Wild M, Rouhani S. 2017. Seagrass response following exposure to *Deepwater Horizon* oil in the Chandeleur Islands, Louisiana (USA). Marine Ecology Progress Series 576:145-161.

Michel J. (ed). 2021. Oil spill effects literature study of spills of greater than 20,000 barrels of crude oil, condensate, or diesel. Sterling (VA): US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2020-058. 326 p.

Zieman JC, Orth R, Phillips RC, Thayer G, and Thorhaug A. 1984. Effects of oil on seagrass ecosystems. In: Cairns J, John, Buikema J, Arthur L (eds). Restoration of habitats impacted by oil spills. Boston (MA): Butterworth Publishers, pp. 37-64.

SPATIAL TEMPORAL PROFILES AND BEST MANAGEMENT PRACTICES

Birds

- Anseriformes
- Charadriiformes
- Procellariiformes
- Suliformes, Phaethontiformes, Pelicanidae, and Gaviidae

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Anseriformes		ESA Status	None
Genus	*Melanitta* spp.	Critical Habitat	None

Sea Ducks / Scoters:

Species List and Appearance:

Black scoter (*Melanitta americana*): Medium-sized sea duck. Males are solid black with a yellow knob on their relatively small bill. Females are dark brown with a pale cheek patch and a dark crown.

Surf scoter (*Melanitta perspicillata*): Stout sea duck. Adult males are distinguished by their bright, bulbous, multi-colored bills, lustrous velvety black plumage, and conspicuous white patches on the forehead and the back of the head/neck.

White-winged scoter (*Melanitta deglandi*): Largest of the scoters. Males are entirely blackish with a small white, teardrop-shaped patch around its eye. The orange bill has a black hump at the base and is wedge-shaped.

Diet and Feeding Behavior: Surface dive for marine benthic invertebrates.

Black scoter: mussels, scallops, clams, limpets, chitons, periwinkles, snails, barnacles, crabs, and shrimp.

Surf scoter: mussels, clams, marine snails, crabs, sea squirts, hydrozoans, and marine worms.

White-winged scoter: clams, oysters, mussels, scallops, periwinkles, soft-bodied crustaceans, and small fish.

Populations:

Black scoter: About 400,000 black scoters winter on the Atlantic coast of North America.

Surf scoter: Roughly 600,000 to 1 million birds for all of North America, the majority of which breed in the western part of the continent.

White-winged scoter: North American population is between 500,000 and 800,000 birds. They winter in large bays, estuaries, and shallow offshore banks along the Pacific and Atlantic coasts from Newfoundland to Texas.

Distribution/Habitat/Migration (see map for distribution in the GOM):

Black scoter: From late fall through early spring, flocks congregate along ocean and bay coastlines, wherever water is relatively shallow and shellfish such as mussels are abundant, on both rocky and sandy bottoms. Black scoters form large winter flocks along both Atlantic and Pacific coasts; they are scarcer south of the Carolinas and California. It is not known how many black scoters winter in the Gulf of Mexico.

Surf scoter: Surf scoter is a bird of the ocean coasts, found usually in shallow waters close to land, although roosting flocks at night often move several miles offshore in good weather. Migrating, molting, and wintering surf scoters form large flocks. Surf scoters spend most of their annual cycle on wintering areas, where they are found in shallow (<10 m) coastal waters. Birds depart coastal molting areas August through November.

White-winged scoter: In winter, most white-winged scoters move to Atlantic and Pacific coastal areas, where they use relatively shallow areas with sandy or stony bottoms. They winter in small to large flocks, often among other scoter and sea duck species. In spring, scoters move from the saltwater habitats where they wintered (usually bays and inlets) to inland freshwater habitat, using estuaries and open coast habitats, then large lakes and rivers when moving inland to breeding areas.

Vulnerabilities and Sensitivities to Oiling:

Sea ducks are particularly vulnerable to oil exposure because they spend all their time in the Gulf of Mexico on water. They often occur in large flocks in both nearshore and offshore waters, increasing their risks of oil exposure as spills approach the shoreline. Birds are exposed to oil through several potential routes, including adsorption, ingestion, inhalation, fouling, and aspiration. External contamination/fouling of feathers is the most common, and typically most devastating, form of exposure to birds and is the main cause of immediate mortalities of marine birds following oil spills. In addition to direct fouling, birds also may ingest oil when preening, consuming oil-contaminated food, water, or sediments, and potentially inhaling volatile compounds. Destruction or depletion of their marine invertebrate food sources would be critical for all scoter species.

All these species nest outside of the Gulf of Mexico.

Following the *Deepwater Horizon* oil spill, natural resource trustees estimated the total mortalities and additional lost productivity for surf scoters at 26 birds. However, it should be noted that a large offshore spill in the Gulf of Mexico during winter, when scoters may be more abundant, could have very different mortalities. Because scoters tend to concentrate in large flocks close to shore, they are at high risk of oiling as slicks move towards

land. Use of dispersants, either at the surface or via subsea injection, reduces the impacts of spilled oil on all sea ducks. Ronconi et al. (2004) describe the potential use of radar-activated and cannon bird deterrents that could be deployed on offshore vessels, based on studies on inland ponds. However, they noted that these deterrents only applied to flying birds. They suggest that multiple cannons could be fixed to the outer decks of vessels, and a computer could be linked directly to the existing ship's radar system to detect birds in the vicinity of the spill and to activate deterrents. For large spills, multiple vessels would be necessary to cover the extent of a spill effectively and to continue moving with a drifting oil slick. Such deterrent systems have not been evaluated for offshore spills in the Gulf of Mexico.
BMPs for Offshore Operations: General: Watch for and avoid collisions with wildlife and report all distressed or dead birds. Avoid hovering or landing of aircraft near bird concentration areas. No flights below 150 m over areas with concentrated birds. Booming and Skimming: A trained observer or crew member is required for all skimming and booming operations, with responsibility for avoiding birds and reporting distressed or dead birds. Burning: Avoid burning close to bird concentration areas and minimize bird exposure from wind drift of smoke. Aerial Dispersant: Avoid dispersant applications close to bird concentration areas and minimize bird exposure from wind drift of applied dispersant. Subsea Dispersants: No specific BMPs at this time.

Potential Range by Area Contingency Planning Area					
Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

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Michel J. (ed). 2021. Oil spill effects literature study of spills of greater than 20,000 barrels of crude oil, condensate, or diesel. Sterling (VA): US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2020-058. 326 p.

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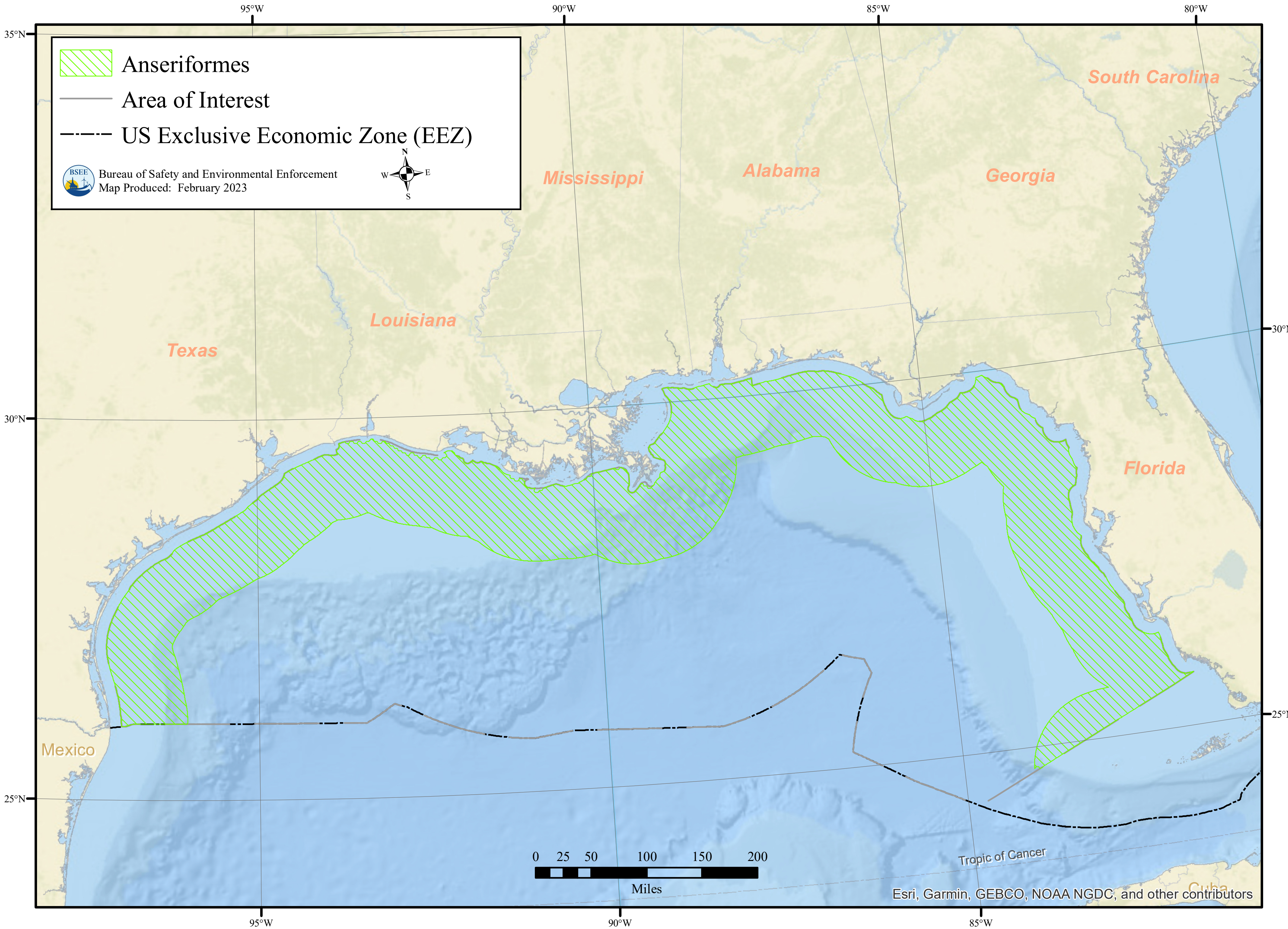

This map represents the approximate range of Anseriformes (sea ducks/scoters) in the Gulf of Mexico.

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Charadriiformes		ESA Status	None
Scientific Name	**Terns:** Bridled tern (*Onychoprion anaethetus*) Brown noddy *(Anous stolidus)* Royal tern (*Thalasseus maximus)* Sandwich tern *(Thalasseus sandvicensis)* Sooty tern *(Onychoprion fuscatus)* **Skuas and Jaegers:** Long-tailed jaeger/skua (*Stercorarius longicaudus)* Parasitic jaeger/skua (aka arctic skua/jaeger) (*Stercorarius parasiticus)* Pomarine jaeger/skua (*Stercorarius pomarinus)* **Phalaropes:** Red-necked phalarope (*Phalaropus lobatus)* Red phalarope (*Phalaropus fulicarius)*	**Critical Habitat**	None

Appearance: Terns: Brown or dark grey to black on the upper portion of their body with pale to white undersides, dark or black feet and legs, white forehead, forked tail and long wings. The bridled tern typically has a paler back than the sooty tern with a narrower white forehead and hindneck collar as a distinguishing characteristic. The royal tern can be differentiated from the sandwich tern by its orange-red bill versus the sandwich tern's black bill with yellow tip. The brown noddy has a dark chocolate brown upper with pale grey or white crown and forehead.

Skuas and Jaegers: Grey, brown, or black uppers with pale to white underparts, yellowish white to white head, and a black cap. The long-tailed jaeger is easily identifiable as an adult, but its juvenile coloration makes it difficult to separate from the parasitic and pomarine jaegers, which both have three color morphs. Long-tailed jaegers are slimmer and more tern-like, having dark primary wing feathers without a white flash, while parasitic and pomarine jaegers both have primary wing feathers with a white flash. Parasitic jaegers have a warmer-toned coloration than grey with a flight pattern resembling that of a falcon. In comparison, pomarine jaegers are bulkier, broad-winged, and less falcon-like.

Phalaropes: Lobed toes for swimming with dark grey, dark brown, or black above, rust colored neck, upper breast, and/or undersides. Younger birds will have a black patch through the eye. The red phalarope is a rust-colored bird with a black/grey back and white face, thick yellow-tipped black bill, and black cap during summer and white with a smooth grey back during winter with a black bill. The red-necked phalarope is grey above with a rust-colored neck and dark grey cap with needle thin bill during summer and white with mottled grey and a black bill during winter.

Diet: Terns generally feed by dipping down in flight to obtain food from the surface or feeding on small fish that have been driven to the surface by schools of large predatory fish. Sandwich terns differ as they plunge headfirst into the water to feed. Terns prefer small fish, small squid, crustaceans, and insects.

Skuas and jaegers forage for food at sea by dipping to the surface during flight, hovering, or by stealing from other birds. They eat a varied diet of fish, small rodents (especially if breeding), small birds, berries, insects, squid, and/or carrion. Parasitic jaegers are less dependent on rodents as food.

Phalaropes are rapid surface-feeders, foraging while swimming in circles to drive food closer to the surface. *Sargassum* is important feeding habitat for both red and red-necked phalaropes, as are hydrographic fronts. They prefer a diet of insects (flies, beetles, caddisflies), crustaceans, and mollusks.

Population: Terns, skuas, and jaeger populations are listed as Least Concern with trends either unknown or stable according to the International Union for Conservation of Nature (IUCN) Red List for 2018-2020. Red phalarope populations are also listed as Least Concern in the IUCN Red List for 2018, but the red-necked phalarope showed a decreasing population trend.

Distribution/Habitat/Migration (see map for distribution in the GOM): Terns are widespread throughout tropical and subtropical oceans and are distributed throughout the Gulf coast, south Atlantic coast, and around Florida, especially the Dry Tortugas. Migration patterns for terns are not well known but they are generally seen throughout the southeastern and Gulf of Mexico coasts in the summer months. The bridled tern, brown noddy, and sooty tern all share similar habitat requirements as they are all more offshore species, preferring warm tropical and subtropical seas with warm currents, resting on ocean debris, and seldom observed from land. They nest on islands with rocky rubble or ledges, bushes, open sandy beaches, or limestone caves. The royal tern and sandwich terns are commonly seen together, preferring shallower coastal areas such as sandy beaches, salt bays, lagoons, estuaries, jetties, and other warm water areas near coastlines. They nest on low-lying sandy islands, beaches, sandbars, lagoons, and offshore.

Skuas and jaegers are the largest of the Charadriiformes species included here. They prefer offshore areas, open seas, and tundra for breeding (summer). Parasitic jaegers generally stay within a few miles of land. Pomarine jaegers venture farther from land, concentrating over upwellings and boundaries of currents. During breeding season, they prefer higher and drier areas inland within the tundra and rocky barrens. They migrate south in winter to both North American coasts and the Gulf of Mexico, with pomarine jaegers being the latest of the jaegers to migrate.

Phalaropes prefer open ocean, bays, lakes, ponds, and tundra for breeding (summer). Like some jaegers, they tend to concentrate over upwellings or tide rips. They can also be found using the edges of kelp beds or inland sewage ponds where insects congregate. They migrate to southern waters, including the Gulf of Mexico, in winter, staying mostly offshore. Red phalaropes migrate later in the season than red-necked phalaropes.

Seabirds that are *Sargassum*-foraging specialists include royal tern, bridled tern, and red-necked phalarope; red phalaropes are *Sargassum* users (Moser and Lee, 2012). Risks to these seabirds are increased at floating *Sargassum* when aggregated with oil.

Vulnerabilities and Sensitivities to Oiling: Birds are exposed to oil through several potential routes, including adsorption, ingestion, inhalation, fouling, and aspiration. External contamination/fouling of feathers is the most common, and typically most devastating, form of exposure to birds and is the main cause of immediate mortalities of marine birds following oil spills. In addition to direct fouling, birds also may ingest oil when preening, consuming oil-contaminated food, water, or sediments, and potentially inhaling volatile compounds. Birds that nest and feed in coastal waters are at higher risk of exposure to spilled oil. However, in offshore habitats, birds resting on the water surface can be transported into convergence zones and feed in patches of *Sargassum*, where oil can also be concentrated. Experiments have shown that phalaropes can rapidly learn to avoid small patches of oil, but only after an initial learning period. Destruction or depletion of their marine invertebrate food sources would be critical for all birds. Nocturnal-feeding pelagic seabirds may be attracted to the light from in-situ oil burning flames and may then die in the flames, smoke, or residual oil. Use of dispersants, either at the surface or via subsea injection, reduces the direct impacts of spilled oil on birds.

Ronconi et al. (2004) describe the potential use of radar-activated and cannon bird deterrents that could be deployed on offshore vessels, based on studies on inland ponds. However, they noted that these deterrents only applied to flying birds. They suggest that multiple cannons could be fixed to the outer decks of vessels, and a computer could be linked directly to the existing ship's radar system to detect birds in the vicinity of the spill and to activate deterrents. For large spills, multiple vessels would be necessary to cover the extent of a spill effectively and to continue moving with a drifting oil slick. Such deterrent systems have not been evaluated for offshore spills in the Gulf of Mexico.

BMPs for Offshore Operations:
General: Watch for and avoid collisions with wildlife and report all distressed or dead birds. Avoid hovering or landing of aircraft near bird concentration areas. No flights below 150 m over bird concentration areas.
Booming and Skimming: A trained observer or crew member is required for all skimming and booming operations, with responsibility for avoiding birds and reporting distressed or dead birds.
Burning: Avoid burning near bird concentration areas and minimize bird exposure from wind drift of smoke.

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<tr><td colspan="6">Potential Range by Area Contingency Planning Area</td></tr>
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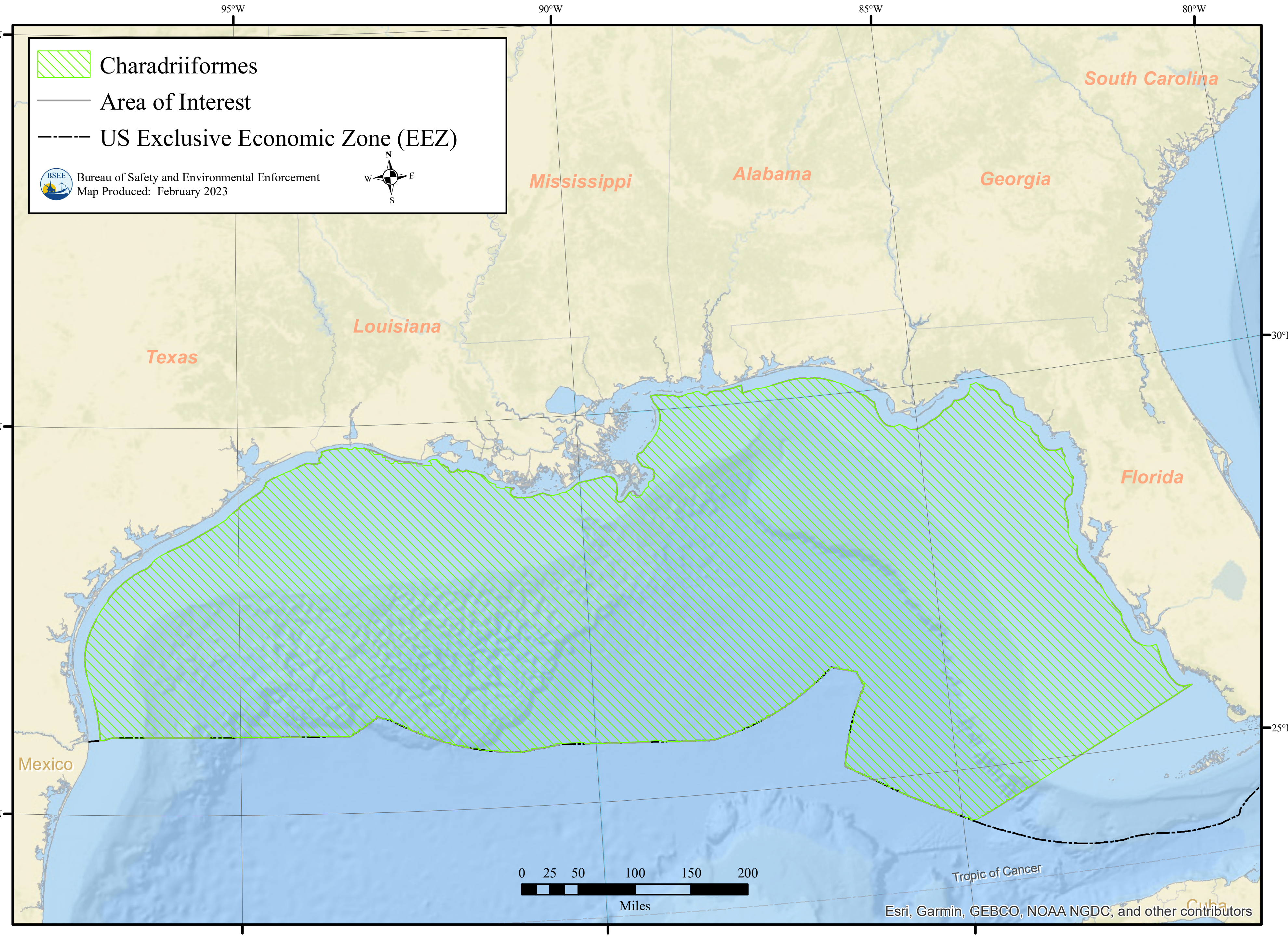

This map represents the approximate range of Charadriiformes (terns, skuas, jaegers, and phalaropes) in the Gulf of Mexico.

Procellariiformes		ESA Status	Proposed
Scientific Name	**Shearwaters and Petrels:** Audubon's shearwater (*Puffinus lherminieri*) Black-capped petrel (*Pherodroma hasitata*) – proposed for listing as Threatened under the ESA in 2018 Cory's shearwater (*Calonectris Diomedea*) Great shearwater (*Puffinus gravis*) **Northern and Southern Storm-petrels:** Band-rumped storm-petrel (*Oceanodroma castro*) – listed as Endangered in Hawai'i where it nests Leach's storm-petrel (*Oceanodroma leucorhoa*) Wilson's storm-petrel (*Oceanites oceanicus*)	**Critical Habitat**	None
Appearance: Audubon's shearwaters are small, black-and-white and with a relatively long tail and somewhat rounded wings. Black-capped petrels are the size of a gull, with grey-brown back and wings, white nape and rump, and the namesake black cap. The underparts are mainly white with some dark underwing markings. Cory's shearwaters are large, gray-brown, with white underparts and a pale yellow bill. Great shearwaters are large, all dark above with a dark cap and black bill. Band-rumped storm-petrels are medium-sized, mostly black or brown-black with a conspicuous thick white band across the rump forming a contrasting horseshoe shape. Leach's storm-petrels are medium-sized, with a dark brown body, a white rump and under tail feathers, and a long, dark forked tail. Wilson's storm-petrels are small, dark blackish-brown overall with an even-width white rump patch and conspicuous pale wing panels.			
Diet: Audubon's shearwaters specialize in foraging in *Sargassum* patches on small squid and fish. Black-capped petrels forage by dipping to the surface of water, with feet down and pattering on water, or by settling briefly on water with wings upstretched; they sometimes feed while swimming. May do most feeding early morning and late evening. Diet includes small squid and fish. Cory's shearwaters forage mainly by plunging into the water from just above the surface, and by seizing items while swimming. Often may feed at night. Diet includes fish, squid, and crustaceans. Great shearwaters forage by plunging into the water from the air, by diving from the surface and swimming underwater, or by seizing items while swimming on the surface. Diet includes small squid and fish. Band-rumped storm-petrels forage for squid and fish, mainly at night and in flocks, though they also feed on crustaceans during the day. Leach's storm-petrels forage mostly by hovering or skimming low over water and taking items (mostly crustaceans) from the surface. Seldom sits on water to feed. Wilson's storm-petrels forage mostly by hovering with feet touching the water and picking at surface with bill, also by dropping into water and then resuming flight. Diet is mainly crustaceans (especially euphausiid shrimp and amphipods) and small fish.			
Population: Great shearwater, Cory's shearwater, and Wilson's storm-petrel populations are listed as Least Concern with trends either unknown or stable according to the International Union for Conservation of Nature (IUCN) Red List. Audubon's shearwater and band-rumped storm-petrel populations are listed as Least Concern on the IUCN Red List, but showed a decreasing population trend. Black-capped petrel populations are listed as Endangered on the IUCN Red List and proposed for listing as Threatened under the ESA, with an estimated population of 2,000 to 4,000 birds, among which are perhaps 500-1,000 breeding pairs. Leach's storm-petrel populations are declining, thus they are listed as Vulnerable on the IUCN Red List.			
Distribution/Habitat/Migration (see map for distribution in the GOM): All species spend the majority of their lives over open seas, coming ashore only to nest. Most species are highly pelagic, migrating over large distances after the breeding season. Most species occur in water deeper than 180 m. Audubon's and Wilson's shearwaters and band-rumped storm-petrels are most often reported in the Gulf of Mexico (mostly during summer months, but can be present year-round); whereas, the other species are mostly casual or rare. Audubon's shearwaters nest on small Caribbean islands and prefer warm tropical waters, so they do not migrate long distances. Black-capped petrels nest on Hispaniola and migrate from Guyana to Massachusetts. They are rarely seen in the eastern Gulf of Mexico in all but winter months. Cory's shearwaters nest on islands off Portugal and Spain, then migrate to the Northern and Southern Atlantic Oceans, generally flying 15,000-35,000 km on their			

trans-equatorial voyage. Great shearwaters nest on Gough and Tristan da Cunha in the South Atlantic, then follow a circular migration route, moving north up the eastern seaboard of South and North America, and wandering into the Gulf of Mexico, before crossing the Atlantic Ocean. Band-rumped storm-petrels range throughout the world's ocean most of the year, coming ashore to nest on small islands in the Pacific and Atlantic Oceans. Leach's storm-petrels nest on islands in the North Pacific and Atlantic Oceans, then migrate south to the tropics in winter, reaching the equator in the Pacific Ocean and south Brazil and South Africa in the Atlantic Ocean. Wilson's storm-petrels nest in Antarctica and on islands in the Southern Ocean, then undergo trans-equatorial migration, spending the off-season in the middle latitudes of the north Atlantic and north Indian Ocean.

Vulnerabilities and Sensitivities to Oiling: Marine birds are exposed to oil through several potential routes, including adsorption, ingestion, inhalation, fouling, and aspiration. External contamination/fouling of feathers is the most common, and typically most devastating, form of exposure to birds and is the main cause of immediate mortalities of marine birds following oil spills (Leighton, 1993; Haney et al., 2014a,b). In addition to direct fouling, birds also may ingest oil when preening, consuming oil-contaminated food, water, or sediments, and potentially inhaling volatile compounds. In offshore habitats, birds resting on the water surface can be transported into convergence zones, where oil can also be concentrated. Once oiled, these oceanic birds are likely to succumb quickly because they occur mostly far offshore. All of these species nest outside of the Gulf of Mexico and are free-ranging birds that seek prey in offshore environments where oil spills are not expected to reduce the prey base. Thus, impacts from spilled oil in the offshore region are likely to be a result of direct oiling and death from hypothermia, drowning, or being smothered and/or encased in oil.

Plunge-diving species (e.g., Cory's and great shearwaters) and species that feed at *Sargassum* patches (e.g., Audubon's shearwater) are at greater risk of oiling than those that skim food from the surface. These factors are evident in the estimated total mortalities and additional lost productivity for the species included in this profile by natural resource trustees following the *Deepwater Horizon* oil spill: Audubon's shearwater: 931; Cory's shearwater: 35; great shearwater: 242; band-rumped storm-petrel: 22; Leach's storm-petrel: 18; and Wilson's storm-petrel: 19 (DWH NRDA Trustees, 2016). However, it should be noted that a large offshore spill in the Gulf of Mexico during winter, when pelagic birds may be more abundant offshore, could have very different mortalities. Haney et al. (2017) identified the challenges to evaluation of acute impacts of oil spills on marine birds at individual and population levels. Use of dispersants, either at the surface or via subsea injection, is expected to reduce the impacts of spilled oil on all seabirds.

Ronconi et al. (2004) describe the potential use of radar-activated and cannon bird deterrents that could be deployed on offshore vessels, based on studies of inland ponds. However, they noted that these deterrents only applied to flying birds. They suggest that multiple cannons could be fixed to the outer decks of vessels, and a computer could be linked directly to the existing ship's radar system to detect birds in the vicinity of the spill and to activate deterrents. For large spills, multiple vessels would be necessary to cover the extent of a spill effectively and to continue moving with a drifting oil slick. Such deterrent systems have not been evaluated for offshore spills in the Gulf of Mexico.

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Potential Range by Area Contingency Planning Area					
Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg

X	X	X	X	X	X

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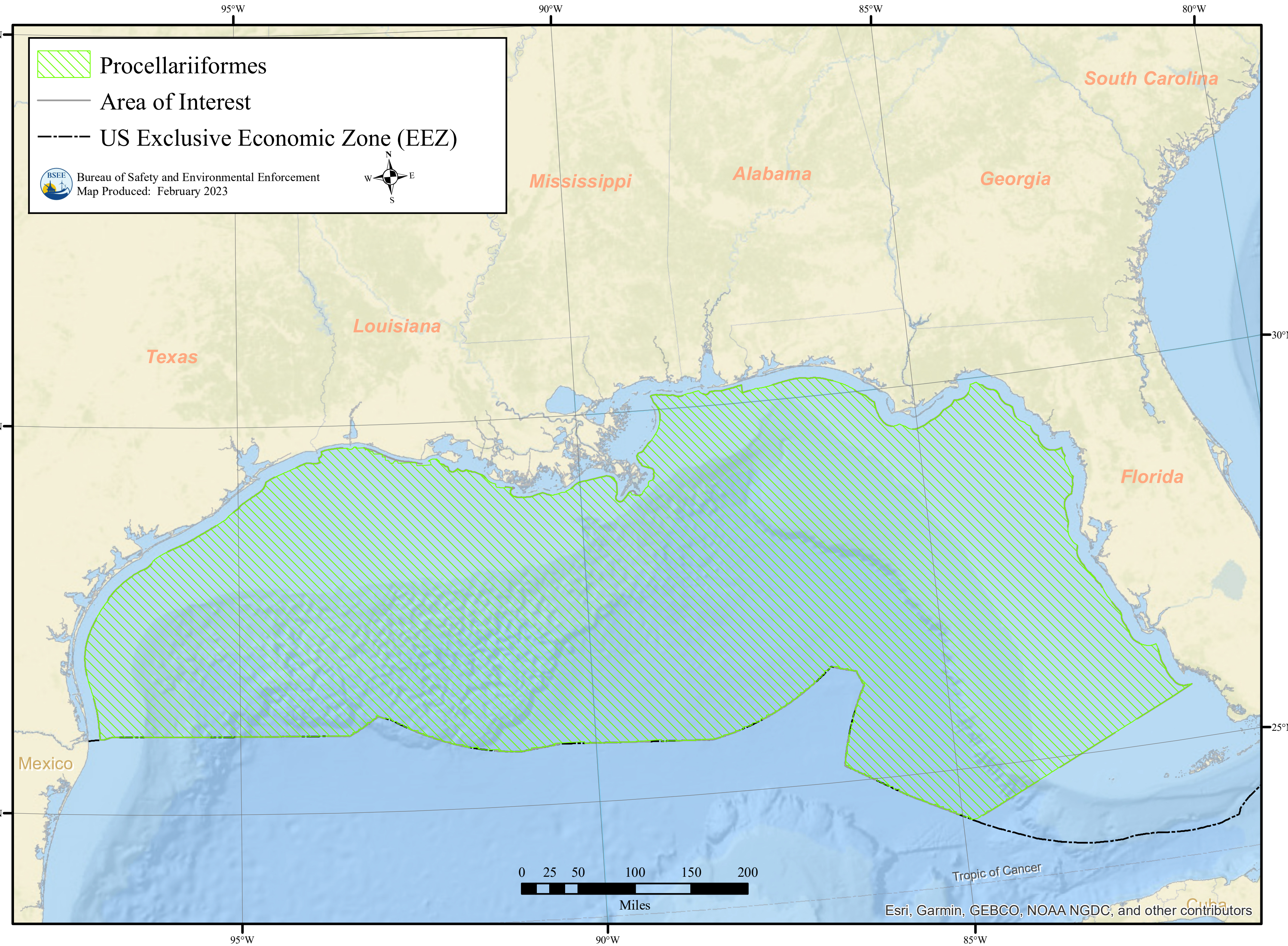

This map represents the approximate range of Procellariiformes (shearwaters, petrels, and storm-petrels) in the Gulf of Mexico.

Suliformes, Phaethontiformes, Pelecanidae, and Gaviiformes		**ESA Status**	None
Scientific Name	**Frigatebirds:** Magnificent frigatebird (*Fregata manificens*) **Boobies:** Brown booby (*Sula leucogaster*) Masked booby (*Sula dactylatra*) Red-footed booby (*Sula sula*) **Gannets:** Northern gannet (*Morus bassanus*) **Tropicbirds:** Red-billed tropicbird (*Phaethon aethereus*) **Pelicans:** Brown pelican (*Pelecanus occidentalis*) **Loons:** Common loon (*Gavia immer*)	**Critical Habitat**	None

Appearance: Magnificent frigatebirds are large and dark with long, angular wings. They have a deeply forked tail that is often held closed in a point. The bill is long and sturdy with a prominently hooked tip. Brown boobies are large, heavy-bodied seabirds with a daggerlike bills. They are dark brown above with a white belly and yellow feet. Masked boobies are large and mostly white with a black trailing edge to the wings, black tail, and dark mask at the base of stout yellow bill. Red-footed boobies are the smallest of the boobies, with a white body and head, black along back edges of the wings, and bright red feet. Northern gannets are large heavy-bodied seabirds with daggerlike bills. Adults are mostly white with a yellowish wash on the head and neck and black flight feathers. Red-billed tropicbirds are mostly white, with black wing tips, a stout red bill, and long white tail streamers. Brown pelicans are large, grey-brown, with a very long bill and pouch for scooping up fish.

Diet: Magnificent frigatebirds skim fish from the surface of the water, catch flying fish, or chase other birds, forcing them to disgorge their recent meal. Brown boobies dive from various heights and angles, often at a shallow angle (skim-plunging) and make several dives in rapid succession, to feed on fish and squid. Masked boobies plunge-dive from up to 30 m to feed on fish and squid. Red-footed boobies plunge-dive as much as 10 m deep into schools of fish, catch flying fish midflight, and hunt at night for squid. Northern gannets forage by plunging headfirst into water, sometimes from more than 30 m above the surface. May take food at surface or may steal food from other birds. Feed mostly on small fish (1-12" in length) of types that live in dense schools, including herring, sand lance, cod, pollack, menhaden. Red-billed tropicbirds feed by vertical plunge dives from as much at 40 m, which produce a plume of water like a mini whale blow. They will also sometimes skim the water's surface and grab fish or squid while in flight. Brown pelicans dive headfirst from as high as 20 m, expanding the throat pouch to trap small fish, usually within 20 km of shore.

Population: Most of these species are listed as Least Concern on the IUCN Red List but have decreasing population trends. The exception is brown pelican, whose population is increasing.

Distribution/Habitat/Migration (see map for distribution in the GOM): All these species have relatively large ranges. Magnificent frigatebirds live along American tropical coastlines, often nesting in mangroves. On the Atlantic coast, their range extends from Florida, including the Keys, to Brazil, including on the Dry Tortugas where ~100 (or more) pairs nest and are present Spring-Fall. They are often seen from shore, feeding just beyond the breaking waves. Brown boobies occur in tropical oceans around the world, nesting in colonies on predator-free tropical islands, especially coral atolls, including Campeche Bank (Mexico), Puerto Rico, and the Virgin Islands. They do not migrate but disperse to the oceans around breeding colonies. They are often seen from shore, feeding just beyond the breaking waves. Masked boobies occur in tropical oceans around the world, including nesting at Campeche Bank, the Florida Keys, and the Dry Tortugas. Red-footed boobies nest mainly on coral atolls or volcanic islands in the tropics, including Campeche Bank. They take long trips of up to 150 km from their breeding grounds to feed but do not migrate. They are rare on the Gulf Coast. Northern gannets forage mainly in saltwater, though they occasionally pursue fish well into the brackish mouths of large rivers. A few

gannets are regularly observed in Florida and the Gulf of Mexico. They are uncommon in very deep water, remaining instead over the continental shelf, where their main prey species are found. For nesting, they select cliff ledges at the edges of bays or oceans, especially places close to large concentrations of prey fish. Red-billed tropicbirds nest on remote coastal islands or occasionally coastal mainland, including along the Mexican and Caribbean regions. There is no regular migration, but they wander widely outside of the breeding season, with sightings as far north as Canada. They are rare on the Gulf Coast. Brown pelicans nest mostly on islands from Maryland to Venezuela in the Atlantic, and between southern California and southern Ecuador in the Pacific. They fly to and from their fishing grounds in V-formations or lines just above the water's surface. When not feeding or nesting, they rest on sandbars, pilings, jetties, breakwaters, mangrove islets, and offshore rocks.
Vulnerabilities and Sensitivities to Oiling: Marine birds are exposed to oil through several potential routes, including adsorption, ingestion, inhalation, fouling, and aspiration. External contamination/fouling of feathers is the most common, and typically most devastating, form of exposure to birds and is the main cause of immediate mortalities of marine birds following oil spills. In addition to direct fouling, birds also may ingest oil when preening, consuming oil-contaminated food, water, or sediments, and potentially inhaling volatile compounds. In offshore habitats, birds resting on the water surface can be transported into convergence zones, where oil can also be concentrated. Plunge-diving species are at greater risk of oiling than those that skim food from the surface. Consumption of contaminated prey can lead to accumulation of oil in birds, and potential toxic effects of ingested oil are wide ranging; however, this risk is likely to be greater for birds feeding in nearshore habitats. Oil exposure at less than acutely lethal doses, as well as chronic long-term sublethal exposure, can lead to a wide array of adverse impacts that slow population recovery. Physiological impairments and health effects include: feather damage, reduced flight capability, inflammation, immune system suppression/increased risk of disease, cellular damage, altered organ function, liver damage, gastrointestinal damage, changes in the salt gland, reduced reproductive success, hemolytic anemia (which compromises the ability of the blood to carry oxygen), decreased nutrient absorption, weight loss, impaired osmoregulation, endocrine disruption, and altered stress response. Nocturnal-feeding pelagic seabirds may be attracted to the light from in-situ oil burning flames and may then die in the flames, smoke, or residual oil. Most of these species, except for brown pelicans, nest outside of the Gulf of Mexico and are free-ranging birds that seek prey in offshore environments where oil spills are not expected to reduce the prey base. Thus, impacts from spilled oil in the offshore region are likely to be a result of direct oiling and death from hypothermia, drowning, or being smothered and/or encased in oil. Following the *Deepwater Horizon* oil spill, natural resource trustees estimated the total mortalities and additional lost productivity for the following species included in this profile as: Magnificent frigatebird: 142; brown booby: 2; masked booby: 78; and red-billed tropicbird: 9. Brown pelican mortality and additional lost productivity was estimated to be as great as 27,613 birds; these were mostly nearshore and nesting birds. Northern gannet mortality was estimated to be as great as 35,000 birds. It is acknowledged that quantification of bird mortality at sea is very difficult, and few carcasses of birds that are oiled and die in the offshore region come ashore. Furthermore, it should be noted that a large offshore spill in the Gulf of Mexico during winter, when pelagic birds may be more abundant in the offshore, could have very different mortalities. The spills where large numbers of pelagic birds were beached mostly occurred in locations where large numbers of these birds concentrate in nearshore settings, either while wintering or nesting. Use of dispersants, either at the surface or via subsea injection, is expected to reduce the impacts of spilled oil on all seabirds. Ronconi et al. (2004) describe the potential use of radar-activated and cannon bird deterrents that could be deployed on offshore vessels, based on studies on inland ponds. However, they noted that these deterrents only applied to flying birds. They suggest that multiple cannons could be fixed to the outer decks of vessels, and a computer could be linked directly to the existing ship's radar system to detect birds in the vicinity of the spill and to activate deterrents. For large spills, multiple vessels would be necessary to cover the extent of a spill effectively and to continue moving with a drifting oil slick. Such deterrent systems have not been evaluated for offshore spills in the Gulf of Mexico.
BMPs for Offshore Operations:

General: Watch for and avoid collisions with wildlife and report all distressed or dead birds. Avoid hovering or landing of aircraft near bird concentration areas. No flights below 150 m over bird concentration areas.
Booming and Skimming: A trained observer or crew member is required for all skimming and booming operations, with responsibility for avoiding birds and reporting distressed or dead birds.
Burning: Avoid burning near bird concentration areas and minimize bird exposure from wind drift of smoke.
Aerial Dispersant: Avoid dispersant applications near bird concentration areas and minimize bird exposure from wind drift of applied dispersant.
Subsea Dispersants: No specific BMPs at this time.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

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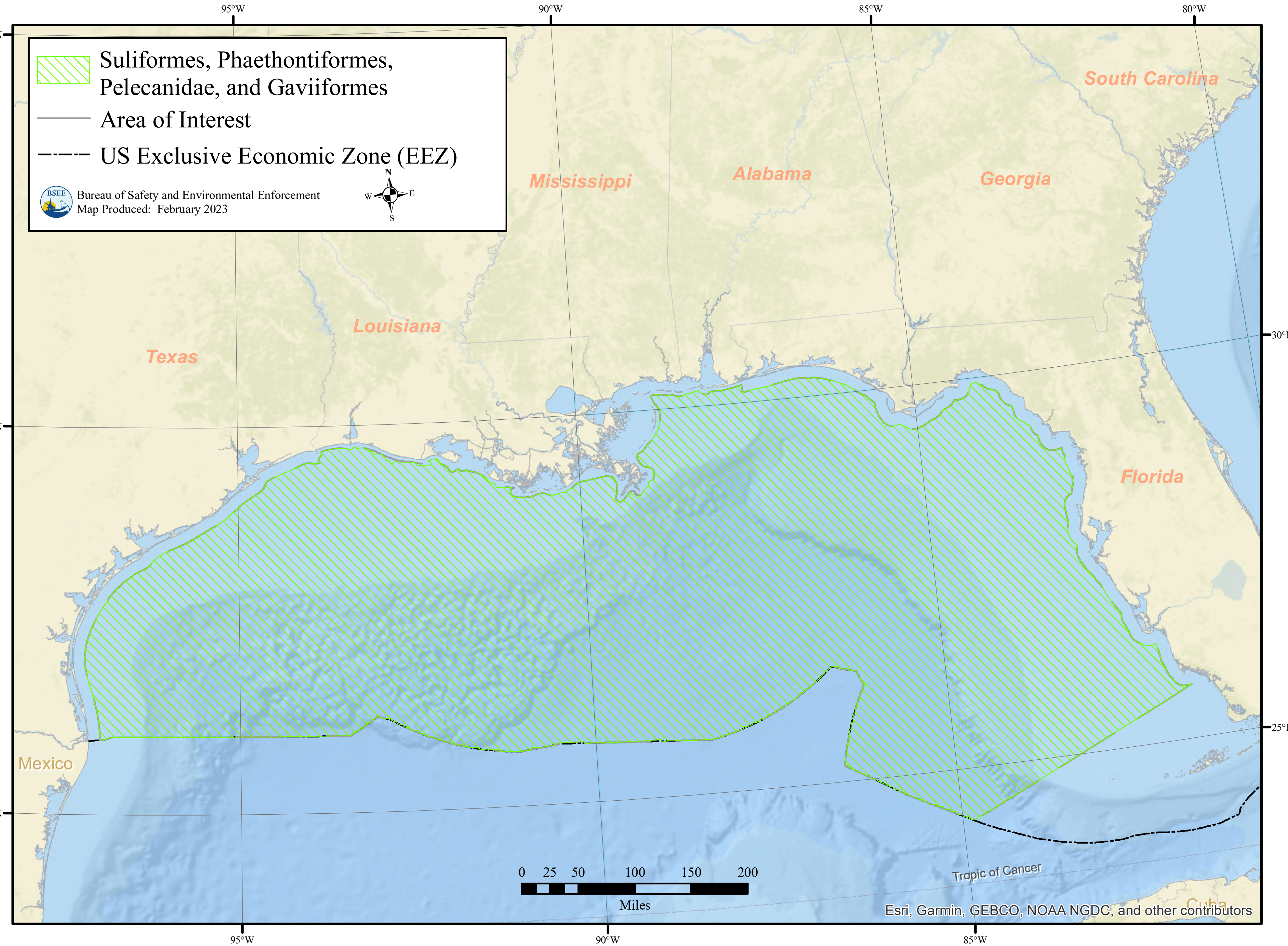

This map represents the approximate range of Suliformes, Phaethontiformes, Pelecanidae, and Gaviiformes (gannets, frigatebirds, boobies, tropicbirds, pelicans, and loons) in the Gulf of Mexico.

SPATIAL TEMPORAL PROFILES AND BEST MANAGEMENT PRACTICES

Fish

- Giant Manta Ray
- Gulf Sturgeon
- Oceanic Whitetip Shark
- Smalltooth Sawfish
- Coastal Fishes (Mackerels, Cobia, Red drum, Menhaden)
- Highly Migratory Fish Species
- Reef Fish Complex
- Sharks

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Giant Manta Ray		Status	Threatened (2018)	83 FR 2916
Scientific Name	*Manta birostris*	Critical Habitat		None

Appearance: Giant mantas are the world's largest ray, with a wingspan of up to 9 m. They have a diamond-shaped body with wing-like pectoral fins, ventrally placed gill plates and a terminal mouth with cephalic lobes. They can have dark brown to black backs with a white belly or be all black in color. They have a caudal thorn and a rough skin appearance.

Diet: Giant manta rays are filter feeders who prefer zooplankton such as euphausiids, copepods, mysids, decapod larvae, and shrimp. Some studies have shown them to prey upon small fish as well. When feeding, mantas hold their cephalic lobes in an "O" shape and open their mouths wide, creating a funnel that pushes water and prey through their mouth and over their gill rakers. They may prefer shallow depths less than 10 m in which to feed during the day while plunging to depths between 200-450 m during nocturnal foraging. Field studies suggest that there is a critical zooplankton density threshold that triggers feeding (11.2 mg m^{-3} along the Great Barrier Reef) (Armstrong et al., 2016).

Population: There are no current or historical abundance estimates available for the giant manta ray; however, the regional populations are thought to be between approximately 100-1,500 individuals. Giant manta rays are at risk for population decline and depletion due to overfishing and bycatch, with low likelihood of recovery due to their low reproductive output.

Distribution/Habitat/Migration (see map for distribution in the GOM): Information on life history was obtained from NMFS and Florida Fish and Wildlife species profiles.
Giant manta rays are found offshore in oceanic waters of varying temperatures (tropical, subtropical, temperate) worldwide. They also use productive nearshore coastal areas such as estuarine waters, inlets, bays, and intercoastal waterways typically near coral and rocky reefs. On the U.S east coast, they are found in waters between 19-22°C. They are widespread within the Gulf of Mexico, and Flower Garden Banks National Marine Sanctuary has been identified as juvenile nursery habitat. They are highly migratory with tagged individuals traveling up to 1,500 km in distance. They show diversity in depths they occupy, occurring at depths less than 10 m and plunging to depths in excess of 1,000 m during nighttime dives. They are generally solitary but have been observed aggregating at cleaning sites near offshore reefs and while feeding in shallow waters.

Vulnerabilities and Sensitivities to Oiling: Little is known about the impacts of spilled oil on manta rays. Their feeding behavior–filtering water over their gill rakers at depths of less than 10 m to up to 450 m water depths–puts them at risk of uptake of oil in the form of oil droplets mixed into the water column, either naturally or from use of chemical dispersants, both at the surface and via subsea injection. They have the ability to metabolize oil, like all fish, though the rate is not known. Laboratory studies with sting rays, also an elasmobranch, showed that exposure to oil at 0.01% of a high-energy water accommodated fraction of oil from the *Deepwater Horizon* spill impacted olfactory function, which would detrimentally impact fitness, could lead to premature death, and could cause additional cascading effects through lower trophic levels (Cave and Kajiura, 2018). Similar laboratory studies showed reduced electrosensory capabilities, which could reduce fitness (Cave and Kajiura, 2020). Elasmobranchs use their electrosensory and olfactory systems to detect prey, mates, and predators (Cave and Kajiura, 2018), and possibly to mediate orientation to the earth's magnetic field for navigation (Cave and Kajiura, 2020).

BMPs for Offshore Operations:
General: Secure all materials on vessels to prevent inadvertent loss overboard.
Skimming and Booming: Maintain control of all materials to prevent inadvertent release and sinking.
Burning: No specific BMPs at this time.
Aerial Dispersant: No specific BMPs at this time.
Subsea Dispersants: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	X	X	X	X	X

References:

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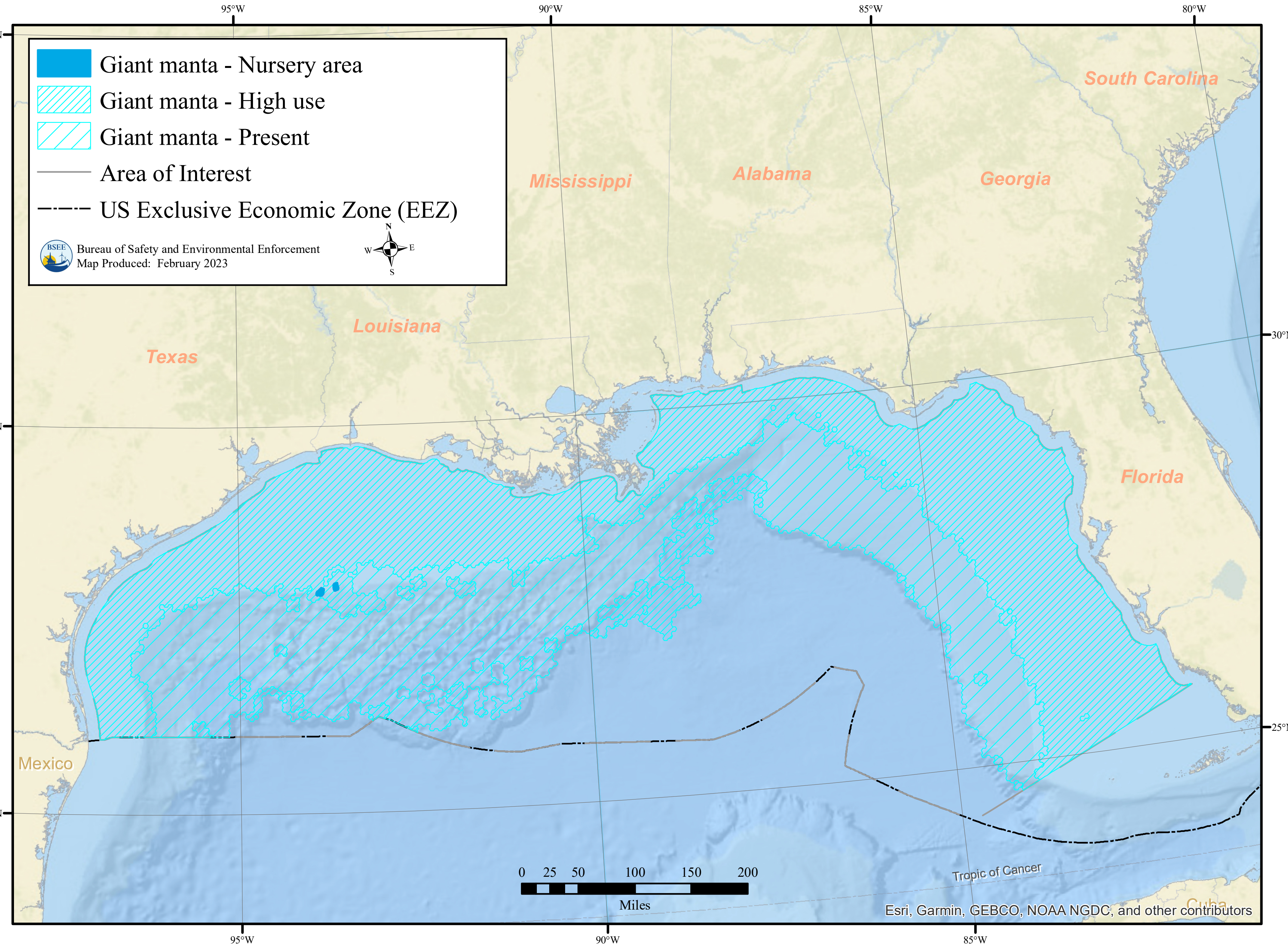

This map represents the approximate range of giant manta ray in the Gulf of Mexico.

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Gulf Sturgeon		Status	Threatened (1991)	56 CFR 49653
Scientific Name	*Acipenser oxyrinchus desotoi*	**Critical Habitat**		Final (2003)

Appearance: The Gulf sturgeon is a subspecies of the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Gulf sturgeon are almost cylindrical fish with an extended snout, vertical mouth, five rows of scutes (bony plates surrounding the body), four chin barbels (slender, whisker-like feelers extending from the head used for touch and taste), and a heterocercal (upper lobe is longer than lower) tail. Adults range from 2-2.5 m in length and weigh up to 90 kg; females grow larger than males. Gulf sturgeon are bluish-black or olive brown on their dorsal side (or back), with paler sides and a white belly.

Diet: Gulf sturgeon are opportunistic and indiscriminate benthivores bottom feeders that change their diets and foraging areas during different life stages. Gulf sturgeon use specialized snout parts that look like whiskers, called barbels, to feel around on the bottom for food that includes invertebrates such as crustaceans, worms, and mollusks.

Subadults and adults do not feed when they are in the river during the summer and fall months. In the fall, both subadults and adults move into estuarine waters and feed extensively. Adults will move into marine waters in the winter, but younger size classes remain in the estuarine and freshwater habitats until about age 2 or 3. Large subadults and adults feed primarily on lancelets, brachiopods, amphipods and other crustaceans, polychaetes, and gastropods. Small Gulf sturgeon feed on benthic infauna such as amphipods, grass shrimp, isopods, oligochaetes, polychaetes, and sometimes intertidal invertebrates, such as chironomid and ceratopogonid larvae.

Population: Populations appear to be stable or slightly increasing throughout the range of the Gulf Sturgeon. Based on current data, populations continue to reproduce in seven river systems (Pearl, Pascagoula, Escambia, Yellow/Blackwater, Choctawhatchee, Apalachicola, and Suwannee rivers).

Distribution/Habitat/Migration (see map for distribution in the GOM): Most of this information was taken from NMFS 2020 and references therein.

Gulf sturgeon can be found from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi east to the Suwannee River in Florida. Gulf sturgeon are anadromous, making annual migrations between overwintering estuarine and marine habitats to spawning grounds in freshwater rivers.

Gulf sturgeon move from the Gulf of Mexico into coastal rivers in early spring (March to May). Spawning occurs in the upper reaches of rivers in the spring. Eggs sink and adhere to the bottom. After hatching, juvenile Gulf sturgeon generally disperse downstream of spawning sites, and move into estuarine feeding areas for the winter months. Juveniles remain in spawning rivers until the age of 2 or 3, at which point they begin using estuarine and marine habitats. Adults and subadults do not feed while in riverine environments, and are known to lose up to 30 percent of their body weight during these migrations.

Adults and subadults move from rivers into estuaries and associated bays between September and November. Most subadult and adults spend the cool winter months (October/November to March/April) in bays, estuaries, and the nearshore Gulf of Mexico, in waters from 2-30 m deep. Tagged fish have been found in well-oxygenated shallow water areas that support burrowing macro invertebrates. These areas may include shallow shoals (1.5-2 m), deep holes near passes, unvegetated sand habitats such as sandbars, and intertidal and subtidal energy zones. Gulf sturgeon use the Gulf marine waters during the winter months primarily for feeding and inter-river migrations. They tend to spend most of their time in specific areas within estuaries and are continuously feeding while in marine habitats. Several feeding concentration areas have been identified in nearshore waters. Both adults and subadults are known to lose up to 30 percent of their total body weight during freshwater migrations, and subsequently compensate the loss during winter feeding in marine areas. Critical habitat is designated and includes coastal waters in Louisiana, Mississippi, Alabama, and Florida.

Vulnerabilities and Sensitivities to Oiling: Gulf sturgeon are demersal benthic feeders so are most at risk to oil occurring in sediments or at the bottom of the water column. Gulf sturgeon exclusively feed in estuarine and marine environments during the winter (they fast while in riverine environments); therefore, exposure to oil in these feeding grounds or trophic impacts (e.g. reduced availability of benthic prey) could have long-lasting implications to their health. Little is known about the impacts of spilled oil on Gulf sturgeon, so the following information is taken from studies conducted on other sturgeon species.

Gulf sturgeon are often found in shallow waters and are at risk of exposure to oil mixed into the water column in those environments. A substantial number Gulf sturgeon were potentially exposed to *Deepwater Horizon* oil in the nearshore areas of the northern Gulf of Mexico. Exposure to oil has been found in sturgeon populations following other spills, such as the Columbia River spill (Krahn et al., 1986). Exposure to DWH oil in the water column damaged DNA and DNA repair systems and impaired the immune system of shovelnose sturgeon, *Scaphirhynchus platorynchus*, which was used as a surrogate for Gulf sturgeon during the *Deepwater Horizon* damage assessment (DWH-NRDA, 2015). In other sturgeon species, exposure leads to gill damage (Jahanakhshi and Hedayati, 2013) and abnormalities in blood tissues and blood chemistry (Khoshbavar and Soltani, 2016). They have the ability to metabolize oil, like all fish, though the rate is not known.

BMPs for Offshore Operations:

General: All vessel crew members must be instructed to watch for and avoid collisions with wildlife. Report all sightings and all distressed or dead Gulf sturgeon to the appropriate state hotline.

Secure all materials on vessels to prevent inadvertent loss overboard.

Skimming and Booming: Maintain control of all materials to prevent inadvertent release and sinking.

Burning: No specific BMPs at this time.

Aerial Dispersant: No specific BMPs at this time.

Subsea Dispersants: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
			X	**X**	**X**

References:

DWH-NRDA. 2015. *Deepwater Horizon* Natural Resource Damage Assessment (NRDA), Section 4. Injury to Natural Resources. DWH-NRDA, 685 p.

Jahanbakhshi A and Hedayati A. 2013. Gill histopathological changes in great sturgeon after exposure to crude and water-soluble fraction of diesel oil. Comparative Clinical Pathology 22:1083-1086. doi: 10.1007/s00580-012-1531-5

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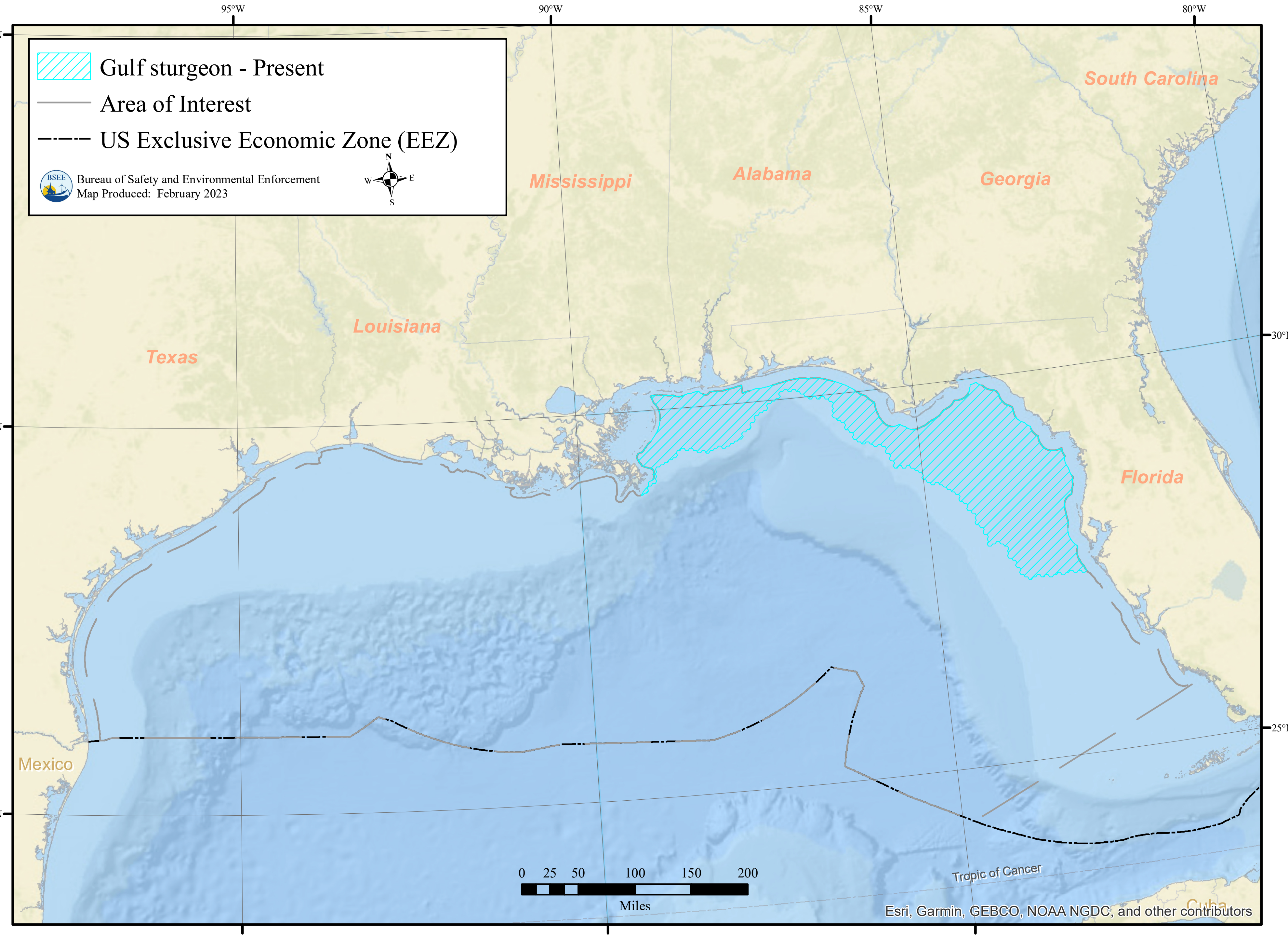

This map represents the approximate range of Gulf sturgeon in the Gulf of Mexico.

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Oceanic Whitetip Shark		ESA Status	Threatened (2018)	83 FR 4153
Scientific Name	*Carcharhinus longimanus*	**Critical Habitat**		None

Appearance: Distinctive mottled white markings ('whitetip') on dorsal, pectoral, and tail fins. The dorsal fins are rounded, and the pectoral fins are long and paddle-like. Variable regional coloration, but generally grayish bronze to brown with whitish undersides. Some display a yellow tinge on underside.

Diet: Oceanic whitetip sharks are opportunistic top-level predators in pelagic ecosystems. Their diets are thought to include mainly bony fish and cephalopods, although some reports show that they will prey on sea birds, marine mammals, other sharks, rays, mollusks, crustaceans, and even garbage.

Population: Best available science shows significant population declines for the oceanic whitetip shark throughout a large portion of its range. Data from the NW Atlantic/Gulf of Mexico region show large historical declines (88% decline in the Gulf of Mexico) due to commercial fishing.

Distribution/Habitat/Migration (see map for distribution in the GOM): Oceanic whitetip sharks are distributed in tropical/subtropical waters worldwide. In the western Atlantic, they occur from Maine to Argentina, including the Caribbean and Gulf of Mexico. They are an epipelagic offshore open-ocean species that can be found on the outer continental shelf in waters from the surface to at least 184 m depth. These sharks prefer the surface mixed layer in warm waters above 20°C (and thus are considered a surface-dwelling shark), but can occur between 15°C and 28°C and for short periods down to 7.75°C. Information regarding movement patterns or migration paths is limited; however, this species is highly migratory, traveling long distances across jurisdictional boundaries. Nursery grounds are not well known but thought to be oceanic. Data collected from the southeastern coast of the U.S. suggest nursery areas occur in pelagic waters over the continental shelf.

Vulnerabilities and Sensitivities to Oiling: There have been no reported direct impacts to sharks as a result of exposure to spilled oil. Their high mobility, range in prey items, and ability to metabolize ingested oil reduces their risk of adverse impacts. With parturition and nursery areas not well known but in pelagic waters, impacts of oil or dispersed oil on early life stages are likely to be limited. Because they are considered a surface-dwelling shark, they could be at risk of higher exposures to oil and dispersed oil following application of dispersants to the water surface.

No studies documenting effects of oil exposure to oceanic whitetip sharks are available. However, in the study by Pulster et al. (2020), shortfin mako sharks showed notable decreases in biliary polycyclic aromatic hydrocarbons over the period 2011-2018. These findings were contrary to observations in co-occurring fish species, suggesting there were differences in shark's migration and movement patterns that reduced their exposure to oil in the Gulf of Mexico relative to other species that shared similar habitats.

BMPs for Offshore Operations:
<u>General</u>: All vessel crew members must be instructed to watch for and avoid collisions with wildlife. Report all sightings and all distressed or dead sharks to the appropriate state hotline.
Secure all materials on vessels to prevent inadvertent loss overboard.
<u>Skimming and Booming</u>: Maintain control of all materials to prevent inadvertent release and sinking.
<u>Burning</u>: No specific BMPs at this time
<u>Aerial Dispersant</u>: No specific BMPs at this time.
<u>Subsea Dispersants</u>: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

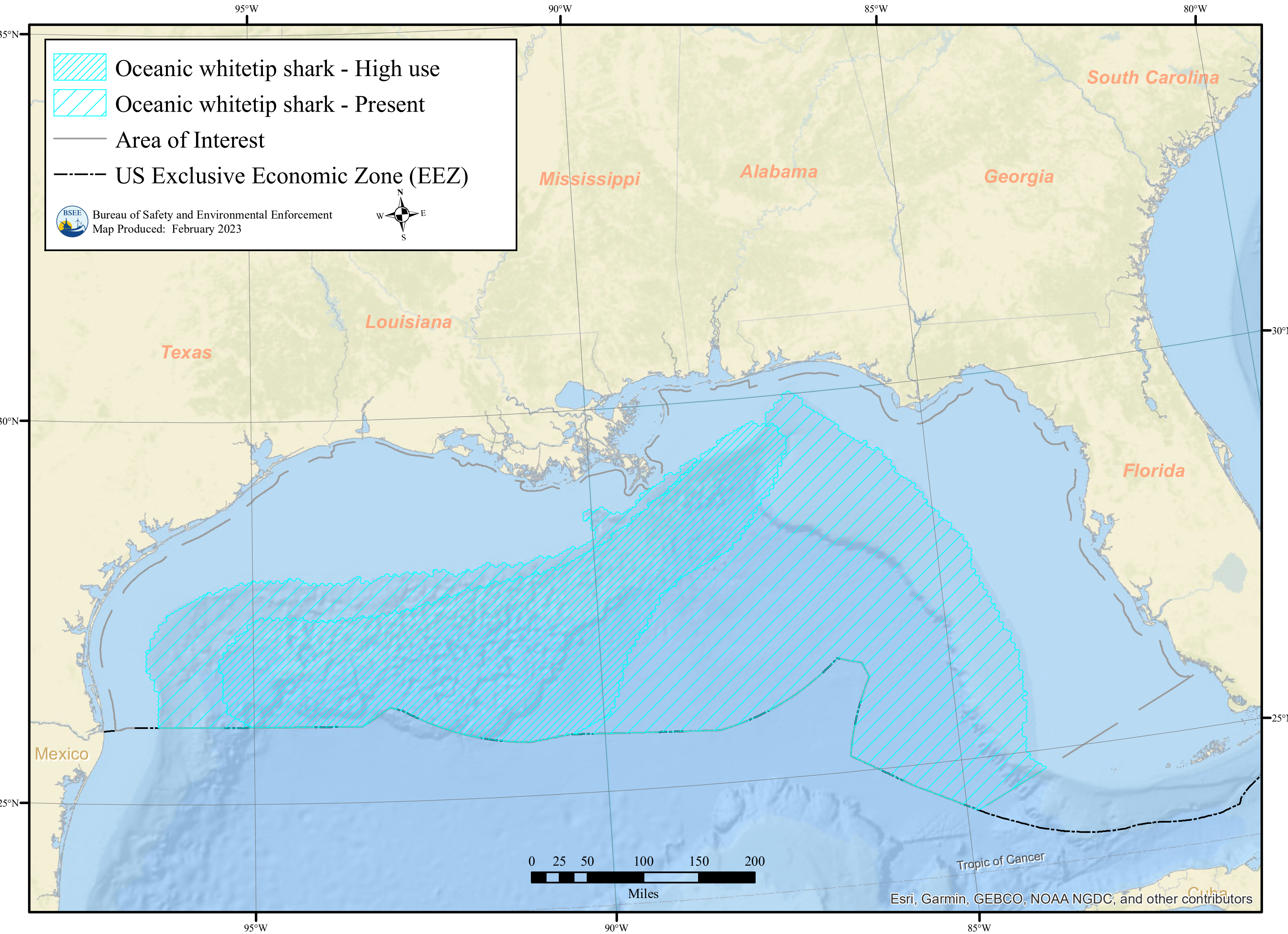
Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

References:

NMFS. 2017. Endangered Species Act Status Review Report: Oceanic Whitetip Shark (*Carcharhinus longimanus*).

NMFS. 2018. Oceanic Whitetip Shark Overview. Available at: https://www.fisheries.noaa.gov/species/oceanic-whitetip-shark#overview.

Pulster EL, Gracia A, Armenteros M, Toro-Farmer G, Snyder SM, Carr BE, Schwaab MR, Nicholson TJ, Mrowicki J, Murawski SA. 2020. A first comprehensive baseline of hydrocarbon pollution in Gulf of Mexico fishes. Scientific Reports 10(1):1-14.



This map represents the approximate range of oceanic whitetip shark in the Gulf of Mexico.

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Smalltooth Sawfish		ESA Status	Endangered (2003)	68 FR 15674
Scientific Name	*Pristis pectinata*	**Critical Habitat**		Final (2009)

Appearance: Smalltooth sawfish are a type of ray that have an elongated, toothed snout. Sawfish are olive gray to brown on top and have a white underside. They are named after their rostrum, which has 22 to 29 teeth on each side of their snout. Sawfish are around 60 cm long at birth and can grow to be upwards of 5.5 m long.

Diet: Smalltooth sawfish primarily eat fish but also consume invertebrates. They use their rostrum to stun and impale prey, slashing it from side to side through schools of fish. They have electro-sensitive organs which can be used to detect nearby prey in turbid waters.

Population: The U.S. distinct population segment of smalltooth sawfish has been listed as Endangered under the ESA since 2003 because its abundance is at an extremely low level relative to historic levels. Despite some encouraging signs, there has been no significant change in the range of smalltooth sawfish since the listing in 2003. Population levels have not been estimated but abundance appears to be stabilizing or slightly increasing as of 2018 (Wiley and Brame, 2018). Smalltooth sawfish are considered critically endangered by the IUCN.

Distribution/Habitat/Migration (see map for distribution in the GOM): All information from Wiley and Brame (2018) and references therein.
Smalltooth sawfish inhabit shallow coastal waters, estuaries, and rivers of the tropics and subtropics, down to a maximum depth rarely exceeding 100 m. They are often associated with mangrove and seagrass habitats. Parturition can occur year-round, but peaks from March through July, and occurs in shallow, estuarine habitats. These habitats serve as nursery areas for young-of-year animals (YOY), who take shelter in mangrove roots to avoid predation. As juveniles grow, they undergo habitat shifts, moving from shallow water with protected shorelines to more open water environments. Large juvenile and adult sawfish occur in coastal marine waters, with larger individuals occurring further offshore. Poulakis and Seitz (2004) reported that nearly half of the encounters with adult-sized sawfish in Florida Bay and the Florida Keys occurred in depths of 70 to 122 m.

In the western Atlantic, smalltooth sawfish historically ranged from Brazil to the mid-Atlantic coast of the U.S. but are currently only known to occur in the U.S., Bahamas, Cuba, Honduras, and Belize (Carlson et al., 2013). Sawfish were historically common throughout the Gulf of Mexico, but at present their range is restricted to coastal waters in south and southwest Florida, primarily from Charlotte Harbor through the Dry Tortugas. Sawfish do not make regular, seasonal migrations; however, aggregations of mature animals occur in the spring, presumably to mate.

Sawfish designated critical habitat encompasses areas known to be coastal nursery habitats in southwest Florida in Charlotte Harbor and the Ten Thousand Islands. Additional concentration areas for adults and juveniles have been identified in southern Charlotte Harbor, the Ten Thousand Islands, Florida Bay, the Atlantic side of the Florida Keys, and off St. Lucie in southeast Florida (Waters et al., 2014).

Vulnerabilities and Sensitivities to Oiling: There have been no reported impacts to smalltooth sawfish as a result of exposure to spilled oil and no studies documenting effects of oil exposure to smalltooth sawfish; however, it is unknown if sawfish have been exposed to significant amounts of spilled oiled in their natural habitats. YOY and early juveniles could come into contact with oil if it impacts shallow, shoreline habitats. Juveniles and adults have high mobility, a range in prey items, and ability to metabolize ingested oil, which reduces their risk of adverse impacts. However, impacts to juveniles and adults are possible if they come into contact with oil in the water column. Effects from oil in the water column are likely to occur due to impacts to sensory systems. Laboratory studies with other elasmobranchs (i.e., sting rays) showed that exposure to oil at 0.01% of a high-energy water accommodated fraction of oil from the *Deepwater Horizon* spill impacted olfactory function, which could detrimentally impact fitness and lead to premature death (Cave and Kajiura, 2018). Similar laboratory studies showed reduced electrosensory capabilities due to oil exposure, which could reduce fitness, as elasmobranchs use their electrosensory and olfactory systems to detect prey, mates, and predators; and possibly for navigation (Cave and Kajiura, 2020).

BMPs for Offshore Operations:
General: All vessel crew members must be instructed to watch for and avoid collisions with wildlife. Report all sightings and all distressed or dead smalltooth sawfish to the appropriate state hotline.
Secure all materials on vessels to prevent inadvertent loss overboard.
Skimming and Booming: Maintain control of all materials to prevent inadvertent release and sinking.
Burning: No specific BMPs at this time
Aerial Dispersant: No specific BMPs at this time.
Subsea Dispersants: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
					X

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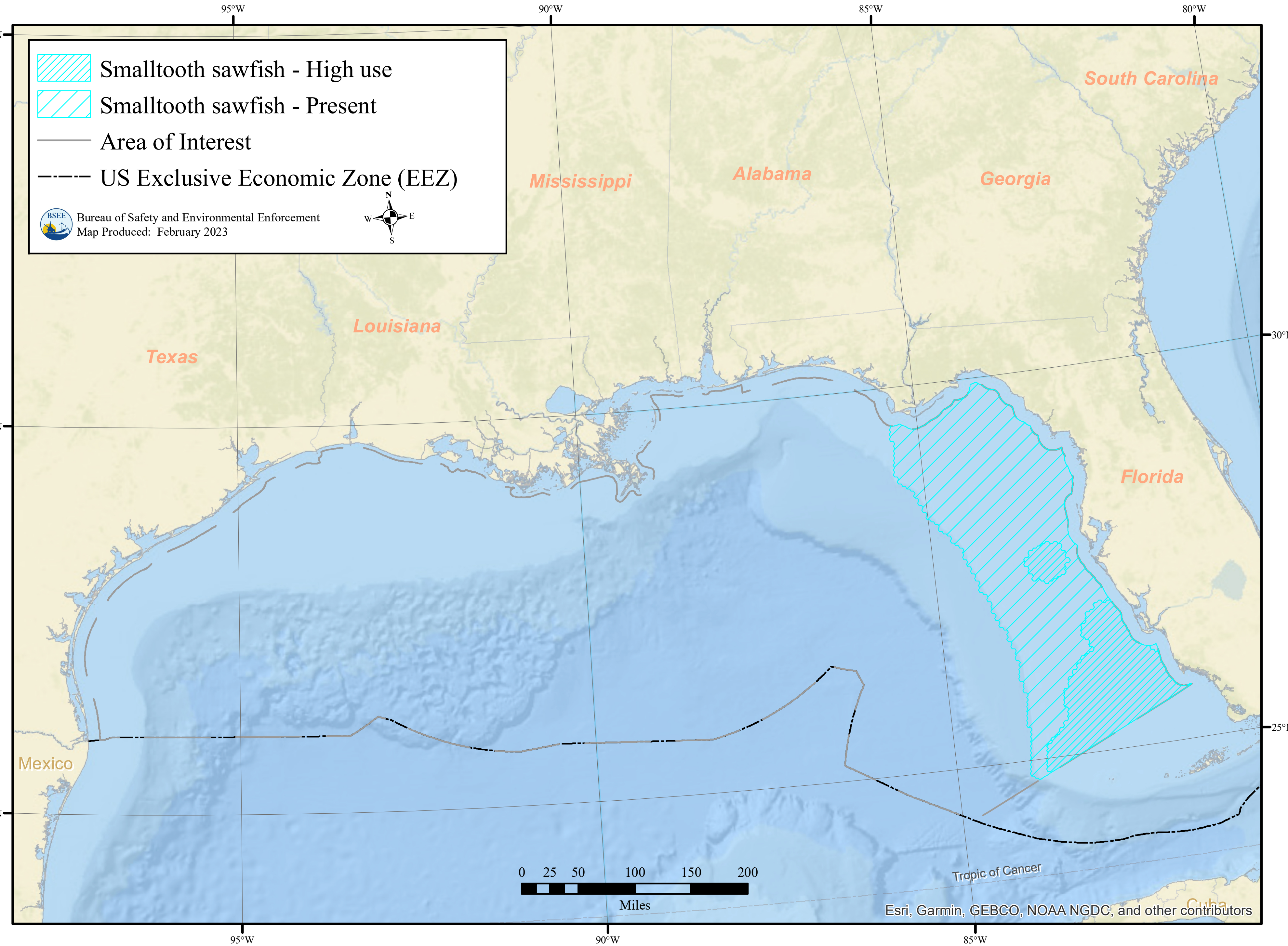

This map represents the approximate range of smalltooth sawfish in the Gulf of Mexico.

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Coastal Fishes (Mackerels, Cobia, Red drum, Menhaden)		**ESA Status**	None
Scientific Name	Spanish mackerel (*Scomberomorus maculatus*) King mackerel (*Scomberomorus cavalla*) Cobia (*Rachycentron canadum)* Menhaden species (*Brevoortia* spp.) Red drum (*Sciaenops ocellatus)*	**Critical Habitat**	None
Appearance: Spanish mackerel are greenish black with silver sides and belly. They have yellow-green spots all over with very small scales. They can be differentiated from king mackerel by their smaller size and lack of lateral line found just below the second dorsal fin in king mackerels. King mackerel are gray on back with silver sides and belly. They have pale to dusky colored fins. Juveniles may have yellow spots. Cobia are dark brown in color with a whitish belly, a single dorsal fin, and are often mistaken for sharks or remoras. Their bodies are long and slim with a depressed head. They have a dark, lateral stripe from eye to tail and an underbite. Young cobia have alternating black and white stripes. Red drum have a copper-bronze body with lighter belly and usually one or more dark spots at the tail base. They have large scales and powerful teeth for crushing oysters and shellfish. Menhaden Gulf menhaden (*Brevoortia patronus*) is the primary species of menhaden found in the Gulf of Mexico; however, there are two other species of menhaden that also occur in the Gulf (Finescale menhaden, *B. gunteri*; and yellowfin menhaden, *B. smithi*). Menhaden are relatively small, silver, fish, typically growing up to about 30 cm in length.			
Diet: Spanish mackerel, king mackerel, and cobia are aggressive predators known to feed on a variety of fish including herring, menhaden, sardines, mullet, and needlefish. They also feed on invertebrates such as shrimp, crabs, and squid to a lesser degree. Menhaden filter phytoplankton and zooplankton from the water column. Juveniles may feed on detritus while in estuarine nursery habitats and adults are filter feeders. Red drum typically feed near the bottom of the water column, eating fish and invertebrates.			
Population: According to most recent stock assessments, Spanish mackerel (2013), king mackerel (2020), and cobia (2020), were not found to be overfished or subject to overfishing. The menhaden fishery is the largest, by volume, of any Gulf of Mexico Species, and is not found to be overfished or undergoing overfishing as of the most recent stock assessment (SEDAR 63, 2021 update). Red drum (2017) was not found to be overfished or subject to overfishing.			

Distribution/Habitat/Migration (see map for distribution in the GOM): Information on life histories was obtained from the Gulf of Mexico Fishery Management Council Essential Fish Habitat Descriptions (GMFMC 2016) and SEDAR 63 (Gulf menhaden).

Spanish mackerel, king mackerel, and cobia make seasonal migrations between coastal habitats in the northern and southern Gulf of Mexico. Red drum and menhaden move between estuarine and offshore habitats seasonally to spawn in the nearshore Gulf of Mexico.

Spanish mackerel in the Gulf of Mexico can be found inshore, nearshore, and offshore with a preference for habitats of grass beds or reefs. Spanish mackerel spawn May to September on the inner continental shelf in water depths of <50 m, and the eggs are pelagic. Juveniles move into estuarine and coastal waters. Adults seasonally migrate in response to changes in water temperature, migrating north in the spring and south after water temperatures drop below 70°F. In the eastern Gulf of Mexico, they migrate west of Cape San Blas, Florida, remaining in the northern Gulf of Mexico until they migrate south in the fall.

The Gulf of Mexico population of king mackerel is common in coastal and offshore areas. King mackerel spawn May to October in water depths of 35-180 m, and the eggs are pelagic. Larvae and juveniles are present from inshore to the outer continental shelf. They are reported to occasionally frequent deep waters and aggregate around piers. King mackerel migrate from south Florida waters in winter and northward in the spring.

Cobia in the Gulf of Mexico live in nearshore and inshore waters including inlets and bays, and are known to be found around buoys, pilings, and wrecks. They spawn in coastal bays and estuaries from April to September, releasing their eggs to the top meter of the water column. Cobia occur in south Florida waters during winter then migrate to the northeast Gulf of Mexico in summer.

Vulnerabilities and Sensitivities to Oiling: Early life stages are the most sensitive to oil exposure. Cobia, red drum, and menhaden are more vulnerable than the other species because they spawn in coastal waters where oil exposures are often higher than in the open offshore. Mackerels and cobia are in constant motion, where large quantities of water are in contact with gill surfaces. Murawski et al. (2014) suggested that this behavior could have resulted in direct exposure to dissolved polycyclic aromatic hydrocarbons (PAH) (and perhaps microdroplets of oil), which would explain elevated levels of PAH and their metabolites in fish muscle and liver, respectively, in 2011. They also found higher frequencies of skin lesions in fish collected from 140-180 m water depths in July-August 2010, suggesting exposure to oil in the water column. Studies on the effects of oil exposure on juvenile cobia showed significant decreases in cardiovascular performance, oxygen consumption, and swim performance (Nelson et al., 2017). These studies show that even short-term oil exposures can have long-lasting effects on coastal pelagic species that have to avoid predation, capture prey, and sustain themselves on long-distance migrations (Murawski et al., 2021).

In a gulf-wide study of PAH exposure, red drum had the third highest biliary PAH of 33 fish species sampled in 2011 to 2018 (Pulster et al., 2020), suggesting chronic exposures to oil throughout the Gulf of Mexico. Following the *Deepwater Horizon* oil spill, studies documented reduced growth for red drum juveniles (Baker et al., 2017). Studies on the effects of oil exposure on young adult red drum showed significant impairment to cardiovascular systems and swim performance that persisted for six weeks after a 24-hour exposure (Johansen and Eshbaugh, 2017). Additionally, larval exposure to oil was shown to cause cardiac defects, reduced visual function, and reduced survival in red drum (Khursigara et al., 2017, Magnuson et al., 2018). These studies show that even short-term oil exposures can have long-lasting effects on coastal pelagic species that have to avoid predation, capture prey, and sustain themselves on long-distance migrations (Murawski et al., 2021).

Menhaden have been shown to show impacts when exposed to oil. Studies following *Deepwater Horizon* showed an increase in occurrence and severity of lesions in exposed fish (Bentivegna et al., 2015) along with the presence of PAH-derived particulates in heart and stomach (Millemann et al., 2015) and elevated PAHs, including carcinogenic and mutagenic compounds, in tissues following the spill (Olson et al., 2016).

BMPs for Offshore Operations: General: Secure all materials on vessels to prevent inadvertent loss overboard. Skimming and Booming: Maintain control of all materials to prevent inadvertent release and sinking. Burning: No specific BMPs at this time Aerial Dispersant: No specific BMPs at this time. Subsea Dispersants: Spill-specific BMPs to be followed.					
Potential Range by Area Contingency Planning Area					
Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

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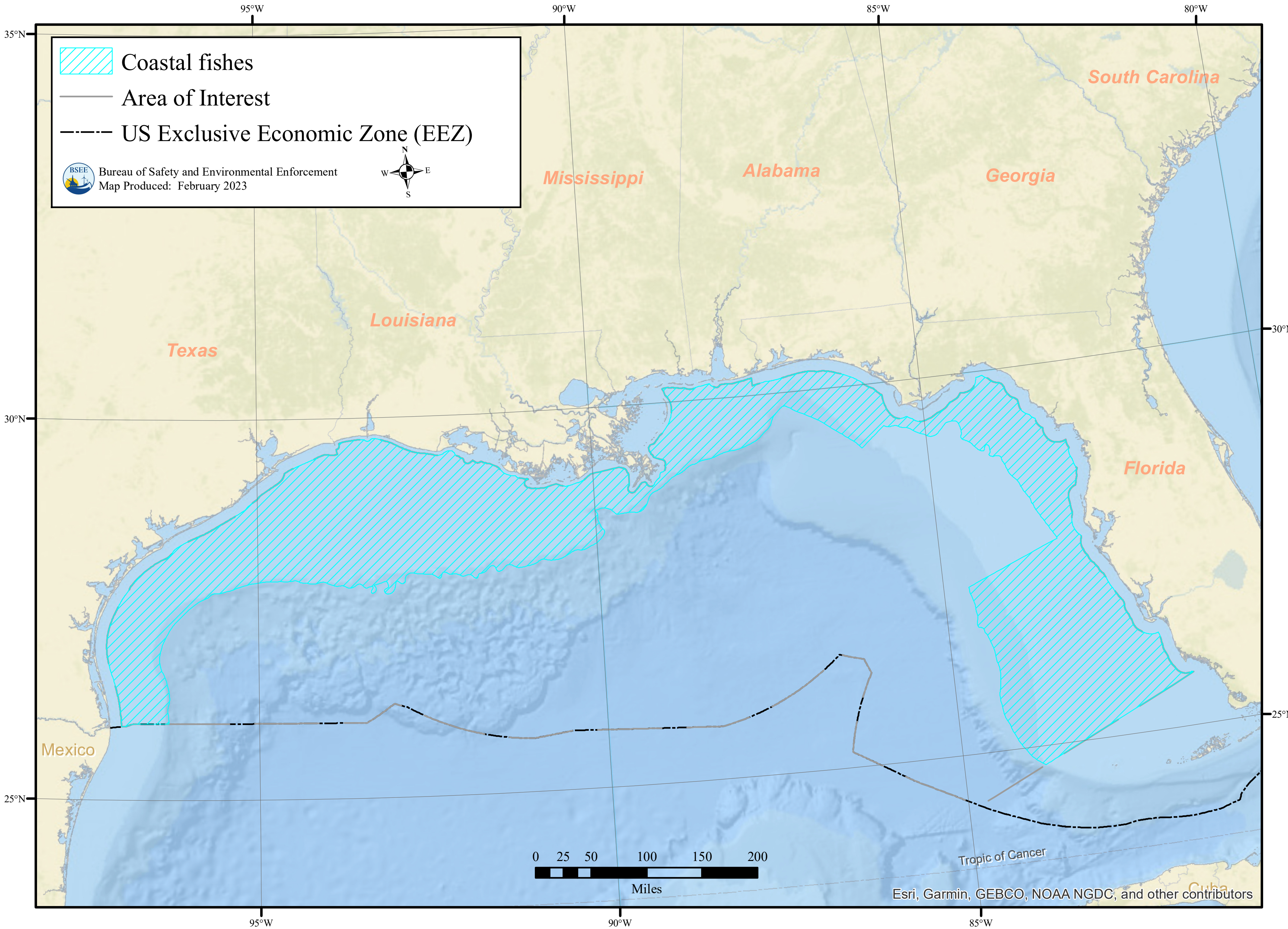

This map represents the approximate range of coastal fishes (mackerels, cobia, red drum, menhadens) in the Gulf of Mexico.

Highly Migratory Fish Species		ESA Status	None
Scientific Name	**Swordfish** (*Xiphias gladius)* **Billfish:** Blue Marlin (*Makaira nigricans)* White Marlin (*Kajikia albida)* Sailfish (*Istiophorus platypterus)* Roundscale spearfish (*Tetrapturus georgii*) Longbill spearfish (*Tetrapturus pfluegeri)* **Tuna:** Albacore tuna (*Thunnus alalunga)* Bigeye tuna (*Thunnus obesus)* Blackfin tuna (*Thunnus atlanticus*) Bluefin tuna (*Thunnus thynnus)* Yellowfin tuna (*Thunnus albacares)* Skipjack tuna (*Katsuwonus pelamis)* **Dolphin/Wahoo:** Mahi mahi (*Coryphaena hippurus*) Wahoo (*Acanthocybium solandri*)	**Critical Habitat**	None
Appearance: Swordfish have a long, flat bill resembling a sword. They have a stout, rounded body, large eyes, and a crescent-shaped tail. They are generally black or brown and lighter below. Billfish generally have blue bodies with silver coloration on the belly. One of the largest billfish species in the world is the blue marlin, and one of the smaller species is the white marlin. The white marlin's first dorsal fin is high but lobed as compared to the pointed dorsal fin of the blue marlin. Roundscale spearfish and white marlin are morphologically similar. The longbill spearfish and sailfish have very distinctive identifying characteristics such as the prolonged spear-like upper jaw and sail-like dorsal fin, respectively. Tunas are generally metallic dark blue on the back with a silvery, white coloration on the belly. Bluefin tuna is the largest tuna species, distinguishable by yellow ventral finlets and a pectoral fin that does not reach the second dorsal fin. Yellowfin are distinguished by having bright yellow dorsal and anal fins. Skipjack can be distinguished from other tunas by the presence of 4-6 prominent, longitudinal stripes on the lower belly. Bigeye are known for their large eyes and albacore are known for their long pectoral fins. Blackfin tuna is the smallest of the 8 tunas in its genus. Mahi mahi has a brightly colored back that is an electric greenish blue, lower body that is gold or sparkling silver, and sides that have a mixture of dark and light spots. Adult males have a square head and females have a rounded head. Wahoo are steel blue above and pale blue below. They are covered with small scales and have a series of 25 to 30 irregular blackish-blue vertical bars on their sides that fade rapidly after death. They have large mouths with strong, triangular, compressed, and finely serrated teeth.			
Diet: Swordfish feed on squid and small pelagic fish during the day and move deeper in the water column at night, feeding on larger pelagic fish that they can stun with their slashing bill. Billfish feed on squid, octopus, cuttlefish, and bony fish (blue runners, mackerels, flying fish, bonitos, tuna, mullet, and needlefish). Tunas generally consume fish, crustaceans, and cephalopods. Mahi mahi feed in surface water on small pelagic fish, juvenile tuna, invertebrates, billfish, jacks, pompano, and pelagic larvae. Wahoo feed on squid, frigate mackerel, butterfish, porcupine fish, and round herring.			
Population: Based on the 2022 end of year stock status update, both the swordfish and tuna species listed are reported as not overfished, except for the bigeye tuna, which is listed as overfished and bluefin tuna, which is listed as unknown. For billfish, the blue and white marlin and roundscale spearfish are listed as overfished, while longbill spearfish and sailfish are unknown or not overfished, respectively. Mahi mahi were reported as not overfished. No formal stock assessment has been conducted for wahoo.			

Distribution/Habitat/Migration (see map for distribution in the GOM): Information on life histories was obtained from NMFS species profiles, HMS Management plans, Florida Fish and Wildlife and Florida Museum species profiles, and Ward et. al, 2017.

Highly migratory species occupy offshore oceanic environments, with most venturing to warmer waters to spawn. Swordfish, billfish, and tunas are widely distributed around the world in tropical and temperate waters of the Atlantic, Indian, and Pacific Oceans. Swordfish, blue/white marlin, longbill spearfish, and sailfish are all found in waters greater than 200 m in depth.

Swordfish are deep-sea fish found from the surface down below 600 m. The Gulf of Mexico is considered a nursery area for swordfish, and they spawn near the northernmost arc of the Loop Current.

The Gulf of Mexico is used by the blue marlin year-round, spawning from May – November with peak months during May and June off the coast of Florida. White marlin spawn in the Gulf of Mexico during June. Roundscale spearfish spawning activity and environmental associations (e.g., salinity and temperature) are assumed to be similar to those of white marlin until further studies are conducted. Both longbill spearfish and sailfish are associated with waters from the Florida Keys to the continental shelf off southern Texas. Sailfish spawn in these waters from May to September.

Bluefin tuna migrate to the Gulf of Mexico to spawn, with peak occupancy from 15 March to 31 May, and peak spawning from 15 April and 20 May (Hazen et al., 2016). There is a Habitat Area of Particular Concern for bluefin tuna in the Gulf of Mexico, which covers spawning habitat. Data are limited for bigeye tuna since they are rarely caught in the Gulf of Mexico. They generally inhabit waters deeper than other tunas, from 300-500 m in depth. They are thought to spawn in the NW tropical Atlantic region with a peak during June and July. Blackfin tuna occupy a more limited range than other tunas, preferring neritic waters near coastlines. They are present in the Gulf of Mexico during autumn, winter, and spring, migrating to temperate waters during summer. They spawn from April to November off the coast of Florida. Yellowfin tuna can be found down to 100 m in depth and approximately 75 km or more offshore, spawning in the Gulf of Mexico from May to November. Skipjack tuna are thought to feed in surface waters but have been caught as bycatch at depths down to 260 m. Peak spawning for the skipjack in the Gulf of Mexico is April to May. Albacore tuna are typically found in surface waters but can forage down to depths of 500 m or greater. They spawn during spring and summer in the western tropical Atlantic.

Mahi mahi are batch spawners and have a protracted spawning season. In the northern Gulf of Mexico, spawning occurs from at least April through December, while spawning takes place throughout the year in the southern Gulf of Mexico; oceanic waters are preferred over shelf waters. Larvae, juveniles, and adults are closely associated with floating objects and *Sargassum*. They are typically restricted to waters warmer than 20°C from April through August in the Gulf of Mexico. Wahoo occur in tropical and subtropical waters. Both sexes are capable of reproducing during the first year of life. Spawning in the Gulf of Mexico takes place from June to August. There is pronounced seasonal variance in wahoo abundance in some locations, but they are caught in the Gulf of Mexico year-round.

Vulnerabilities and Sensitivities to Oiling: Pelagic species are at risk from exposure to oil in the water column, especially to eggs and larvae. The *Deepwater Horizon* spill is the most comprehensively studied large oil spill affecting pelagic species. The distribution of the oil overlapped with spawning habitat for bluefin tuna, affecting 5% of predicted spawning habitat during the week of peak oil dispersal (Hazen et al., 2016). Though laboratory studies found cardiac and cranio-facial deformities in early life stages of bluefin and yellowfin tuna exposed to the spilled oil (Incardona et al., 2014), impacts to these species have not been detected at the population level.

Impacts to adult fish are also possible. Yellowfin tuna had the highest mean biliary polycyclic aromatic hydrocarbons (PAH) of 24 species that were analyzed over the period 2011-2018 (Pulster et al., 2020), which was unexpected. The yellowfin tuna collected in 2018 were collected from the northcentral Gulf region, where there are high densities of oil and gas production. They hypothesized that the high levels may be attributed to high surface level sources (e.g., produced waters) combined with increased gill uptake as a result of high swim speeds.

Based on the lack of impacts and tagging data showing animal movement, it is thought that many of these species avoided oiled areas (Ainsworth et al., 2018; Rooker et al., 2013). Beyer et al. (2016) noted that there were no documented pelagic fish kills during the *Deepwater Horizon* spill, which they attributed in part to avoidance behavior and patchiness of surface oil. However, large releases at different times and locations could have different outcomes, particularly if the oil spread over larger areas of spawning habitat during peak spawning periods.

BMPs for Offshore Operations:
General: Secure all materials on vessels to prevent inadvertent loss overboard.
Skimming and Booming: Maintain control of all materials to prevent inadvertent release and sinking.
Burning: No specific BMPs at this time
Aerial Dispersant: No specific BMPs at this time.
Subsea Dispersants: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

References:

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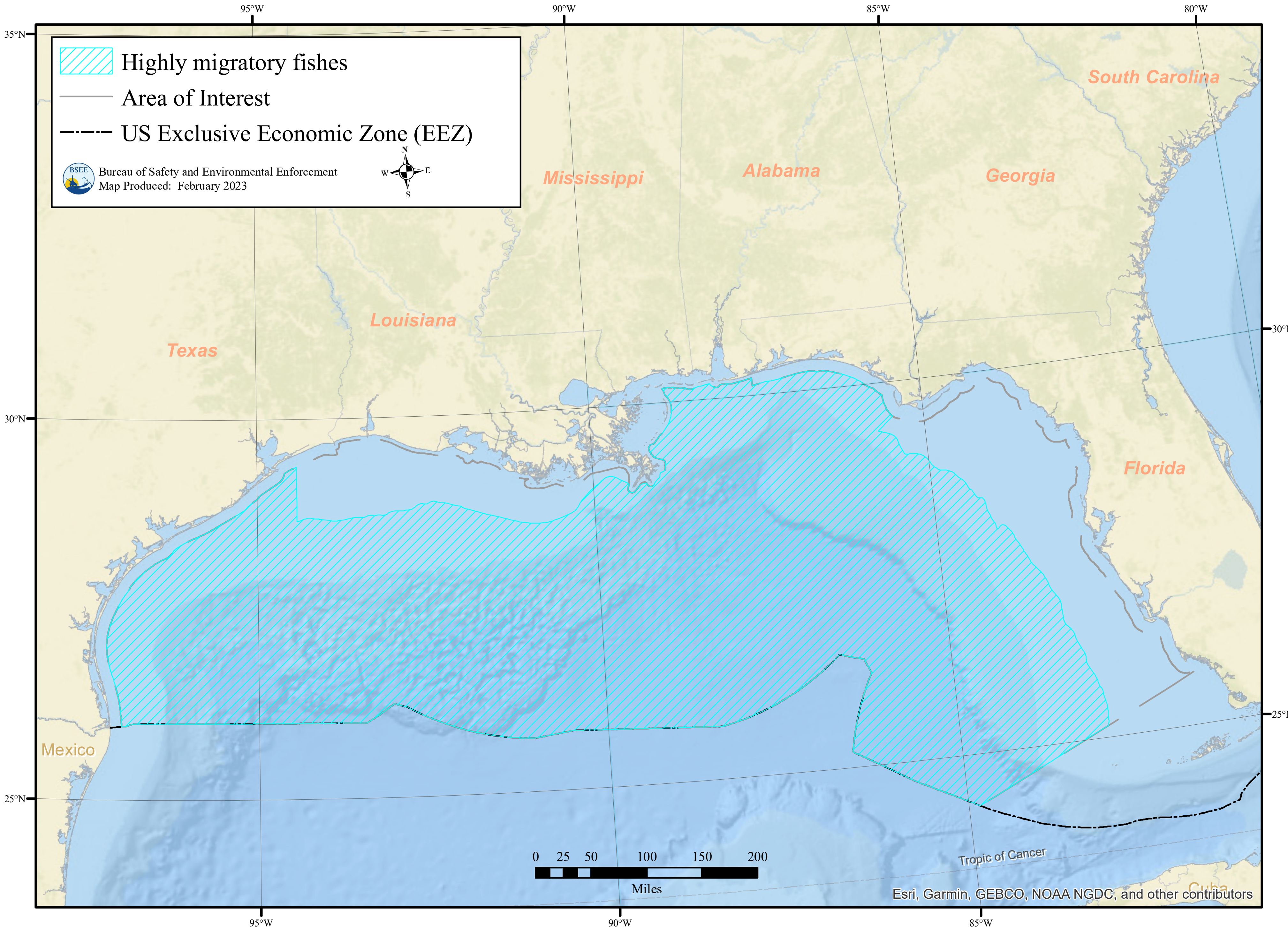

This map represents the approximate range of highly migratory fishes (marlins, tunas, swordfish, sailfish, spearfishes, wahoo) in the Gulf of Mexico.

<table>
<tr><th colspan="2">Reef fish species*</th><th>Status</th><th>None</th></tr>
<tr><td>Common and Scientific Name</td><td>Groupers
Atlantic goliath grouper (Epinephelus itajara)
Black grouper (Mycteroperca bonaci)
Gag (Mycteroperca microlepis)
Red grouper (Epinephelus morio)
Scamp (Mycteroperca phenax)
Speckled hind (Epinephelus drummondhayi)
Snowy grouper (Hyperthordus niveatus)
Yellowedge grouper (Hyperthordus flavolimbatus)
Yellowmouth grouper (M ycteroperca interstitialis)

Snappers
Blackfin snapper (Lutjanus buccanella)
Cubera snapper (Lutjanus cyanopterus)
Gray snapper (Lutjanus griseus)
Mutton snapper (Lutjanus analis)
Queen snapper (Etelis oculatus)
Red snapper (Lutjanus campechanus)
Silk snapper (Lutjanus vivanus)
Vermilion snapper (Rhomboplites aurorubens)

Jacks
Greater amberjack (Seriola dumerili)

Tilefishes
Blueline tilefish (Caulolatilus microps)
Golden tilefish (Lopholatilus chaemaeleonticeps)
Goldface tilefish (Caulolatilus chrysops)

*All of these species are part of the federally-managed reef fish complex; however, not all of the species in the federally-managed reef fish complex are mapped or described here</td><td>Critical Habitat</td><td>None</td></tr>
<tr><td colspan="4">Appearance:
Groupers:
<u>Atlantic goliath grouper</u> is the largest grouper species in western Atlantic waters. Its body is brownish yellow, gray, or olive colored with irregular dark bars on its sides and small spots on its head and fins. It has a very broad head with small eyes. Max weight: 300 kg. Max length: 250 cm.
<u>Black grouper</u> has an olive or gray body, with black blotches and brassy spots. It has a protruding lower jaw and the bottom of the cheek (preopercle) is gently rounded with no notch. Max weight: 100 kg. Max length: 150 cm.
<u>Gag</u> have long, compressed bodies. Large gag are dark brownish-gray above and paler below, with traces of dark wavy markings on the sides. Max weight: 37 kg. Max length: 145 cm.
<u>Red grouper</u> has a robust body, a large mouth with a lower jaw that often projects beyond their upper jaw, with bands of slender, sharp teeth. Max weight: 23 kg. Max length: 125 cm.
<u>Scamp</u> is grayish brown with clustered darker spots. The tail fin is concave with elongated fin rays and appears more raggedy when compared to other grouper tails. Max weight: 14 kg. Max length: 107 cm.
<u>Snowy grouper</u> is a uniform dark brown color. Max weight: 30 kg. Max length: 122 cm.</td></tr>
</table>

Speckled hind is varying shades of dark to reddish brown with a dense covering of small white specks. Max weight: 30 kg. Max length: 110 cm. Yellowedge grouper is tan to grayish brown on its back and sides, fading to a pale white below. A thin blue line extends from the eyes to the corner of the bottom edge of the cheek. Max weight: 22 kg. Max length: 115 cm. Yellowmouth grouper has a pale tan to brownish body with small scattered, but close-set, brown spots on its back and sides. Its distinctive feature is the prominent yellow coloration at the corners and inside of the mouth. Max weight: 10 kg. Max length: 84 cm. **Snappers:** Blackfin snapper is a deep red color at the top and pale reddish to silver on the sides. Its most prominent feature is a black blotch at the base of the pectoral fin and its eyes are yellow to orange. Max weight: 14 kg. Max length: 75 cm. Cubera snapper is is dark to pale reddish gray. This fish tends to be more slender-bodied than other snappers. Max weight: 57 kg. Max length: 160 cm. Gray snapper (mangrove snapper) is generally dark gray and brown on the upper half, with pink and orange coloration on the lower half. The tail is broad and slightly forked. Max weight: 22 kg. Max length: 90 cm. Mutton snapper is an olive color, progressing from darker to lighter in color from top to bottom. Distinguishing features include blue lines below and behind the eyes with a small black spot present on both sides. Max weight: 14 kg. Max length: 96 cm. Queen snapper is dark red to pinkish red above its midline with a long, slender body. The dorsal fin is spiny with a deep notch in the middle. The tail fin is deeply forked. Max weight: 13 kg. Max length: 100 cm. Red snapper in deeper waters tend to be redder than those caught in shallower waters. They have a long triangular face and enlarged canine teeth. Max weight: 23 kg. Max length: 100 cm. Silk snapper is a rosy pink to red color on its sides and back, fading to a pinkish silvery color below. Max weight: 6 kg. Max length: 84 cm. Vermilion snapper have streamlined bodies. They are pale to silvery white below and vermilion (orange-red) above. Max weight: 3 kg. Max length: 64 cm. **Jacks:** Greater amberjack has a dark amber stripe on the head, extending from the nose to the first dorsal fin, which becomes more defined when the fish is excited or feeding; brownish or bluish-grey back, a silvery-white belly, and an amber horizontal strip along the middle of the body. Max weight: 80 kg. Max length: 147 cm. **Tilefishes:** Blueline tilefish have a narrow gold stripe underlined in blue that runs from their snout to the tip of their eye. Max weight: 6.8 kg. Max length: 89 cm. Golden tilefish have a large crest on their head. They are iridescent blue-green on the back, with numerous spots of bright yellow and gold. Their bellies are white; their heads are rosy with blue under the eyes. Max weight: 30 kg. Max length: 110 cm. Goldface tilefish have a violet body with a pale yellow tint on the back and upper flanks; the lower flanks have a silvery sheen, becoming pearly white on the abdomen. Max weight: unknown. Max length: 60 cm.
Diet: Groupers: fishes, crabs, shrimps, cephalopods (octopus and squid), and benthic crustaceans residing in shallow grass beds. Snappers: squid, fishes, shrimps, crabs, gastropods, octopus, plankton. The more aggressive, carnivorous snapper species (e.g., Cubera snapper) feed primarily on fishes, crabs, lobsters. Jacks: benthic and pelagic fishes, squid, crustaceans, crabs, gastropods, sea urchins, amphipods. Tilefishes: shrimp, crabs, clams, snails, worms, anemones, sea cucumbers.

Population: Based on the 2022 year-end stock update, both gag and greater amberjack are overfished and overfishing is occurring. Harvest prohibited: Goliath grouper (overfished status unknown) Red snapper: below target population level in Gulf of Mexico. Golden tilefish, gag, red grouper, black grouper, vermilion snapper: above target population levels in Gulf of Mexico. Population size of all other species unknown, stable or presumed stable.
Distribution/Habitat/Migration (see map for distribution in the GOM): Information on life histories was obtained from the Gulf of Mexico Fishery Management Council Essential Fish Habitat descriptions (GMFMC 2016) and the NMFS Species Profiles for each species. **Species common in shelf waters (<200 m)** Gray snapper occurs in tropical, subtropical, and warm temperate waters throughout the Gulf of Mexico up to 180 m depths. Spawning occurs primarily in the summer months, May-September. As juveniles, gray snappers settle nearshore in estuaries, seagrass beds or shallow reefs, and gradually move offshore as they grow larger. Adults are often reef- or structure-associated. Gag adults prefer coastal water structures such as reefs and rocky bottoms at depths up to 150 m. Adults can be solitary or school in groups of up to 50 individuals. Gag is commonly seen on rocky ledges in the Gulf of Mexico. Gag form spawning aggregations offshore in winter and early spring. Females do not remain offshore year-round but, instead, will form groups to migrate offshore to the males when it is time to spawn. Juveniles are found in inshore habitats (seagrasses, mangroves, and oyster reefs) and move offshore as they grow. Cubera snapper is rarely seen north of Florida in the Gulf of Mexico. Adults are solitary reef-associated fish, inhabiting nearshore rocky ledges and overhangs at up to 85 m depths. They aggregate over deep water to release their eggs. Peak spawning is Apr-Jul. Greater amberjack are found in temperate to tropical waters. Peak spawning occurs in March and April in the Gulf. After a brief pelagic stage, newly hatched larvae and small juveniles often associate with floating *Sargassum*. Larger juveniles shift to demersal habitats, where they congregate around reefs, rocky outcrops, and wrecks up to 187 m in depth. Adult greater amberjacks are found on both artificial and natural reefs. Scamp prefer rocky bottoms and ledges up to 100 m, but can be found to depths of 189 m. Juveniles are found around jetties and mangroves. Spawning season occurs from January to June with peaks in March and April; however, the spawning patterns of scamp, much like other species of grouper, are complex. During spawning, males may defend spawning sites. Atlantic goliath grouper adults live in shallow waters up to 100 m over wrecks, corals or muddy or rocky bottoms. Adults are territorial and occupy limited home ranges. Juvenile and young adults can be found around estuarine mangroves and oyster bars. The typical spawning season is June-October; peak spawning within the Gulf of Mexico occurs July-September. Spawning occurs at night during a new moon. Black grouper prefers rocky bottoms and coral reefs at depths up to 150 m. Juveniles inhabit inshore areas in seagrass beds and mangroves and move into deeper waters as they mature. Adults are solitary but they do form spawning aggregations. Spawning occurs during winter months from November to May but varies by region. Yellowmouth grouper prefers coral reefs and rocky bottoms up to approximately 150 m. In the Gulf of Mexico, yellowmouth grouper appears to spawn year-round with peak spawning in April and May. Red grouper can be found on hardbottom or reef habitat at depths of 5-200 m. It is a bottom-dwelling fish; during spawning season, males are territorial and somewhat sedentary, excavating holes as home territories. The spawning season occurs anywhere from January to early June depending on the area. Generally, peak spawning occurs from March to May. Vermilion snapper is abundant over rocky reefs, gravel, and sand bottoms on the continental shelf (80-100 m). Adults form large schools. Although the spawning behavior of vermilion snapper is poorly studied, adults spawn

within large schools near structure throughout the year. In the Gulf of Mexico, vermilion snapper spawn from April to September; peak spawning occurs June to August. Red snapper is generally found at 10-190 m deep in the Gulf of Mexico. Spawning occurs May-October. Blackfin snapper is very common in the Caribbean. Adults prefer deeper waters (60-90 m) over sandy or rocky bottoms near ledges; juveniles prefer rocky areas near reefs in shallower waters (35-50 m). Adults spawn most of the year, with a peak in April and September. **Species common in deeper waters** Queen snapper is found on shelf edge/slope habitats. Adult and spawning adult depth range is from 95-680 m. It reproduces throughout the year but, peak spawning is October-November. Silk snapper is common in tropical areas offshore in deep water (90-200 m) over sandy, rocky, and coral bottoms. Younger fish are more common in shallower waters. They spawn throughout the year with seasonal peaks occurring in the spring and summer months, depending on the location. Speckled hind is found offshore over rocky bottoms typically between 60-120 m. Courtship behavior has been observed on *Oculina* reefs where scamp and gag are known to aggregate for spawning. In the Gulf of Mexico, the spawning season is estimated to occur from April through September. Snowy grouper adults are found offshore over rocky bottoms at depths of 30-525 m. Both juveniles and adults can be found over reefs and hardbottom habitats. It is thought to form resident spawning aggregations in areas with ridges and steep drop-offs. Within the Gulf of Mexico, snowy grouper is estimated to spawn April-August. Tilefish are deep-water residents, occurring from 60-450 m depth. Tilefish larvae are pelagic; juveniles settle to benthic habitat. Juveniles and adults construct burrows in soft sediments. Spawning: Golden tilefish: January-June; Blueline tilefish: March-September; Goldface tilefish: unknown. Yellowedge grouper, as a solitary species, prefers rocky, sandy, muddy bottoms or reefs at depths of 180-300 m. In habitats with soft bottoms, this fish has been observed to dig and occupy burrows. Juvenile fish are found in shallower water and move out to deeper depths as they grow older. It spawns February-November in the Gulf of Mexico, with peak spawning March-September.
Vulnerabilities and Sensitivities to Oiling: Reef fish are less likely to be impacted by a surface oil spill than a subsurface release, as these species are primarily found on or near the bottom of the ocean. If juvenile and adult habitats were impacted, such as if reefs were physically damaged during response operations or oil was entrained in reef sediments and sediments of adjacent habitats (e.g., seagrass beds), impacts to reef/hardbottom-associated fish species may be possible. For species that aggregate to spawn, if an oil spill were to correspond spatially and temporally with these aggregations, impacts are possible, as eggs and larvae are more sensitive to toxicity from oil in the water column than juveniles and adults. Many species have pelagic larvae that remain in the water column while developing; exposure to oil in the water column during larval development can cause impacts to these species. Some species are dependent on estuarine or coastal habitats for portions of their life cycles; these species are vulnerable to oil exposures from offshore spills that are transported into coastal habitats where exposures can be higher and more persistent. The same could be true for species/life stages that associate with floating *Sargassum* if surface oiling were to impact floating aquatic vegetation. Secondary effects from spills can occur if prey species are impacted (e.g., Tarnecki and Patterson, 2015). These demersal species are at greater risk of oil exposure and impacts from subsurface oil releases and subsea dispersant applications. After the *Deepwater Horizon* spill, impacts to reef fish communities showed declines in biodiversity and shifts in community structure, decreases in biometrics and health indices such as gonadosomatic index, evidence of exposure to oil (elevated PAH metabolites and skin lesions), and slower growth in spill-affected populations; however, large-scale population impacts were not detected (Pulster et al., 2020; Herdter et al., 2017; Murawski et al., 2014; Snyder et al., 2015; Szedlmayer et al., 2019; Tarnecki and Patterson, 2015); Rooker et al., 2013). Golden tilefish live in burrows and were especially impacted by the *Deepwater Horizon* spill. Tilefish had the highest frequency of lesions of all species collected in 2011 (Murawski et al., 2014). Snyder et al. (2015) documented levels of biliary metabolites in 2011-2013 in golden tilefish that were higher than other species

surveyed and among the highest concentrations measured globally; they attributed these findings to their burrowing lifestyle and ingestion of contaminated sediment and prey. This oil exposure has continued through 2018, with tilefish having the second highest biliary polycyclic aromatic hydrocarbons (PAH) of 31 species collected from 2011-2018 (Pulster et al., 2020). Subsequent studies indicated continuing exposure in tilefish populations, consistent with a decline in body condition for at least 7 years following the spill (Snyder et al. 2019).

BMPs for Offshore Operations:
General: Secure all materials on vessels to prevent inadvertent loss overboard.
Skimming and Booming: Maintain control of all materials to prevent inadvertent release and sinking.
Burning: No specific BMPs at this time
Aerial Dispersant: No specific BMPs at this time.
Subsea Dispersants: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

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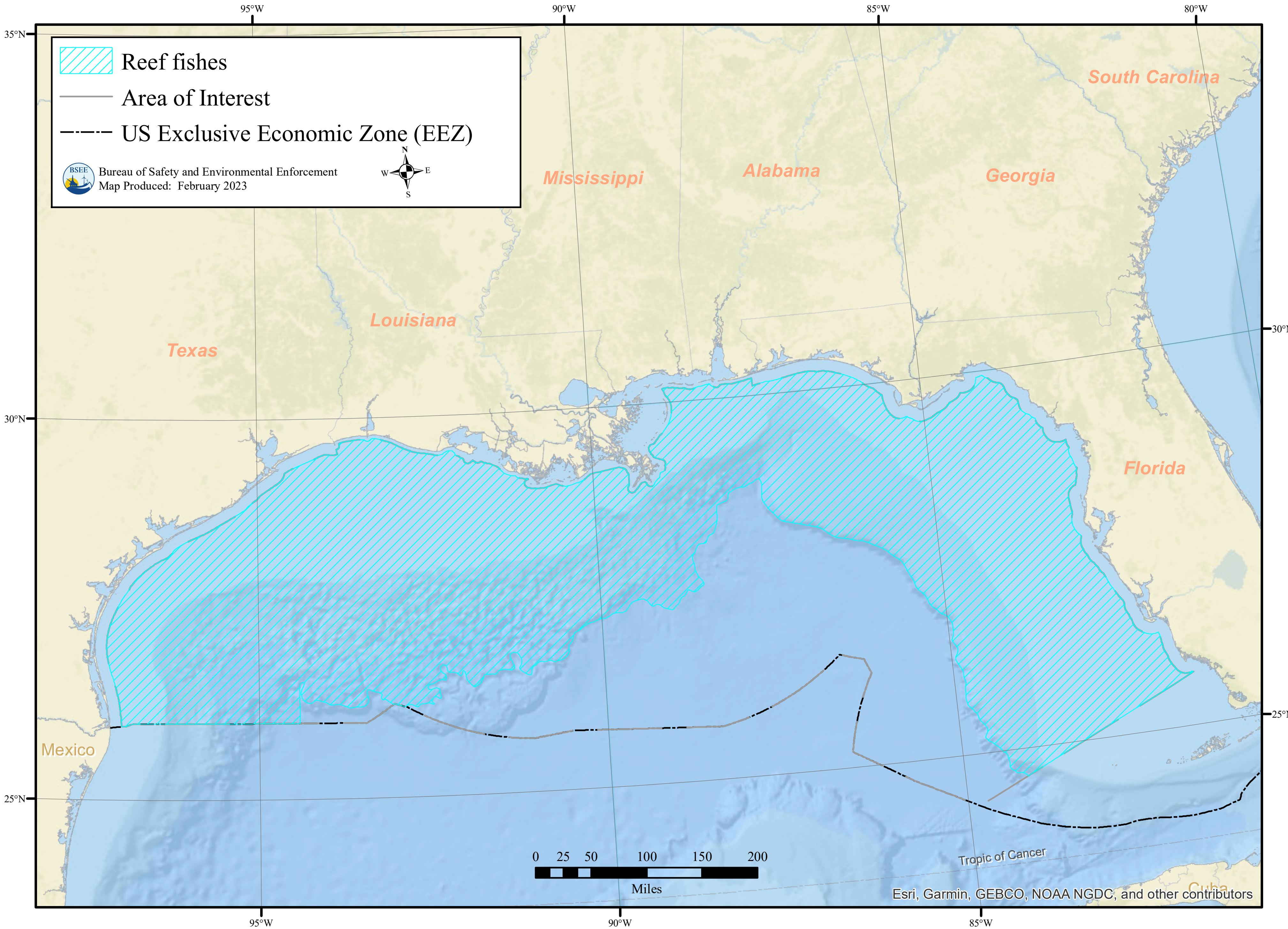

This map represents the approximate range of reef fishes (snappers, groupers, amberjacks, tilefishes) in the Gulf of Mexico.

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<table>
<tr><th colspan="2">Sharks</th><th>ESA Status</th><th>None</th></tr>
<tr><td>Scientific Name</td><td>Coastal:
Atlantic sharpnose shark (Rhizoprionodon terraenovae)
Blacknose shark (Carcharhinus acronotus)
Blacktip shark (Carcharhinus limbatus)
Finetooth shark (Carcharhinus isodon) *
Bonnethead (Sphyrna tiburo)
Bull shark (Carcharhinus leucas)
Great hammerhead (Sphyrna mokarran)
Scalloped hammerhead (Sphyrna lewini)
Nurse shark (Ginglymostoma cirratum) *
Lemon shark (Negaprion brevirostris)

Pelagic:
Spinner shark (Carcharhinus brevipinna)
Bigeye thresher shark (Alopias superciliosus)
Dusky shark (Carcharhinus obscurus)
Night shark (Carcharhinus signatus)
Sandbar shark (Carcharhinus plumbeus)
Shortfin mako shark (Isurus oxyrinchus)
Silky shark (Carcharhinus falciformis)
Smoothhound shark complex (Mustelus spp.) *
Tiger shark (Galeocerdo cuvier)
Longfin mako shark (Isurus paucus)
Whale shark (Rhincodon typus)
*Note: species with asterisks adjacent to names did not have adequate spatial data to include in the Offshore ESI.</td><td>Critical Habitat</td><td>None</td></tr>
<tr><td colspan="4">Appearance: Coastal sharks typically are streamlined/torpedo-shaped with pointed snouts and grayish-brown bodies, white/pale bellies, and gill slits. Coastal sharks lack interdorsal ridges. Departures from the common appearance of coastal sharks include the hammerhead (Great and scalloped) and bonnethead sharks with their hammer and shovel-shaped heads, respectively. Most coastal sharks are, on average, smaller than pelagic sharks at their maximum length.
Pelagic sharks are typically blue to gray and whitish underneath with most having interdorsal ridges. Their pectoral fins are often as long as their heads and broad, providing lift as they swim in deep waters. An exception is the whale shark with its wide, flat body. The appearance of the bigeye thresher shark is also different, with its wide caudal keels and very large eyes adapted for low light environments.</td></tr>
<tr><td colspan="4">Diet: Coastal sharks prey upon small fish (e.g., croakers, menhaden, and mullet) and invertebrates (e.g., crabs, shrimp, and mollusks). Exceptions are the diets of bull, lemon, and scalloped hammerhead sharks which may prey upon other sharks. Bull and lemon sharks are also reported to consume sea birds.
Pelagic sharks are top predators, feeding mainly on pelagic fish, mollusks, crustaceans, and occasionally other sharks. An exception to this diet is the filter-feeding whale shark, feeding primarily on plankton but also known to consume jellyfish, squid, and crabs that are small in size.</td></tr>
<tr><td colspan="4">Population: Coastal sharks listed above are thought to be either abundant, not subjected to overfishing, or of least concern, except for the bull and lemon sharks, which appear on the International Union for Conservation of Nature (IUCN) Red List as near threatened. Some populations of scalloped hammerhead are listed as threatened under the Endangered Species Act; however, the Northwest Atlantic and Gulf of Mexico populations are not listed.</td></tr>
</table>

The pelagic sharks listed above are mostly IUCN-red listed as either vulnerable, near threatened, or endangered with decreasing population trends. The smoothhound sharks present in the Gulf of Mexico are data deficient and no population trend or status could be ascertained. According to the NOAA 2020 Stock Assessment and Fishery Evaluation report, the following species are listed as overfished: dusky, sandbar, and shortfin mako sharks. Atlantic sharpnose, blacktip, finetooth, and the smoothhound shark complex are listed as not overfished. The status of the blacknose and bonnethead sharks was unknown.
Distribution/Habitat/Migration (see map for distribution in the GOM): Information on life histories was obtained from NMFS species profiles, HMS management plans, Florida Fish and Wildlife, the Shark Research Institute, Fishbase, and the Florida Museum of Natural History Species Profiles. Nursery area information was obtained from Hueter and Tyminski (2007). Coastal sharks are present throughout the Gulf of Mexico. They prefer habitats that are generally shallower and more nearshore than pelagic sharks; however, they will use offshore waters of varying temperature ranges. Adults usually congregate in specific areas to mate, and females travel to specific nursery areas to pup. Juveniles generally occupy inshore areas with late-stage juveniles and adults venturing to deeper, more pelagic waters. Finetooth and bonnethead sharks tend to prefer more nearshore, shallower areas with mud flats. Primary nursery areas have not been identified for finetooth sharks but are presumed to be in the northern Gulf of Mexico. Pregnant bonnetheads have been observed in Florida waters off Yankeetown, Tampa Bay, and Charlotte Harbor during July and August (Hueter & Tyminski 2007). Lemon sharks are found in nearshore, estuarine systems with mangroves or reefs but, like the bull shark, can venture into freshwater systems, with the bull shark reported to travel the farthest into these systems. Lemon shark neonates are found in the shallow grass flats of Tampa Bay in the month of May. Primary nursery areas for bull sharks are areas with lower salinities near river mouths, with neonates being found specifically in the Florida areas of Yankeetown, Tampa Bay, Charlotte Harbor, Ten Thousand Islands, and Texas from May to August. Atlantic sharpnose, blacknose, and blacktip sharks are all found in coastal areas such as bays or lagoons. Atlantic sharpnose shark pupping grounds are not well known, but neonates have been found in Yankeetown and Tampa Bay, Florida, from May to July and along the coast of Texas in July. Blacknose neonates have been associated with gulf beaches near Tampa Bay during the month of June, as are young of the year (YOY) with the addition of nearshore waters off Charlotte Harbor. Known blacktip nursery areas include Yankeetown, Charlotte Harbor, Tampa Bay, Ten Thousand Islands, and the Florida Keys. The nurse shark is a slow-moving bottom dweller and can be found near reefs and mangroves. Primary nursery areas for nurse sharks are not well known and neonates have been infrequently observed; however, older juveniles have been caught during field observation in Tampa Bay, Charlotte Harbor, Ten Thousand Islands, and the Florida Keys from April to November. The scalloped hammerhead is associated with the continental and insular shelves as well as adjacent deep waters. Young scalloped hammerhead neonates have been observed using waters adjacent to the lower Texas coast during spring to early summer and less frequently in waters near Yankeetown, Tampa Bay, and Charlotte Harbor. Coastal sharks are highly migratory, with females seeking nearshore/inshore areas in which to give birth. Most coastal sharks migrate south within the Gulf of Mexico during the winter to escape cooler water temperatures. Pelagic sharks are globally distributed in tropical and subtropical waters. Most pelagic sharks live in the open ocean at considerable depths, especially the night and dusky sharks, which can be found on the continental and insular shelves at depths to 365 meters. The shortfin/longfin mako sharks are epipelagic in deep waters while the sandbar and smoothhound sharks are bottom dwellers, generally preferring shallower waters than other pelagic species. The sandbar shark typically occupies depths from 20 – 55 m, and occasionally down to 200 m. Neonates have been observed in the northern gulf, particularly in the waters off of Yankeetown, Florida. Smoothhound sharks are found inshore down to 200 m. Tiger sharks are associated with the shallows, especially river mouths, shallow bays, and seagrass habitats, but they will venture into the open ocean. The bigeye thresher spends most of its time in the open ocean and generally inhabits depths from 200-500 m by day and 10-130 m by night. The spinner shark is found inshore less than 30 m depth to 130 m, and they can be found inshore and offshore in areas of high salinity. Adult spinner sharks are typically not found in inland bays or bayous. Neonates have been

observed in Charlotte Harbor during June as well as Tampa Bay and Yankeetown, Florida. Whale sharks are found mainly in warm waters. Pelagic sharks are highly migratory, traveling in some cases across oceans. Females come inshore to birth young and tend to migrate south in winter for warmer waters.

Vulnerabilities and Sensitivities to Oiling: There have been no reported direct impacts to sharks as a result of exposure to spilled oil. Their high mobility, range in prey items, and ability to metabolize any ingested oil reduces their risk of adverse impacts. Coastal species would be at most risk, with juveniles likely to be most sensitive. In a study by Pulster et al. (2020), sharks were the only species out of 33 species of fish analyzed that showed notable decreases in biliary polycyclic aromatic hydrocarbons over the period 2011-2018, suggesting there were differences in shark's migration and movement patterns, or perhaps their prey, that reduced their exposure.

BMPs for Offshore Operations:
General: All vessel crew members must be instructed to watch for and avoid collisions with wildlife. Report all sightings and all distressed or dead sharks to the appropriate state hotline.
Secure all materials on vessels to prevent inadvertent loss overboard.
Skimming and Booming: Maintain control of all materials to prevent inadvertent release and sinking.
Burning: No specific BMPs at this time
Aerial Dispersant: No specific BMPs at this time.
Subsea Dispersants: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

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Hueter RE and Tyminski JP. 2007. Species-specific distribution and habitat characteristics of shark nurseries in Gulf of Mexico waters off peninsular Florida and Texas. American Fisheries Society Symposium 50:193-223.

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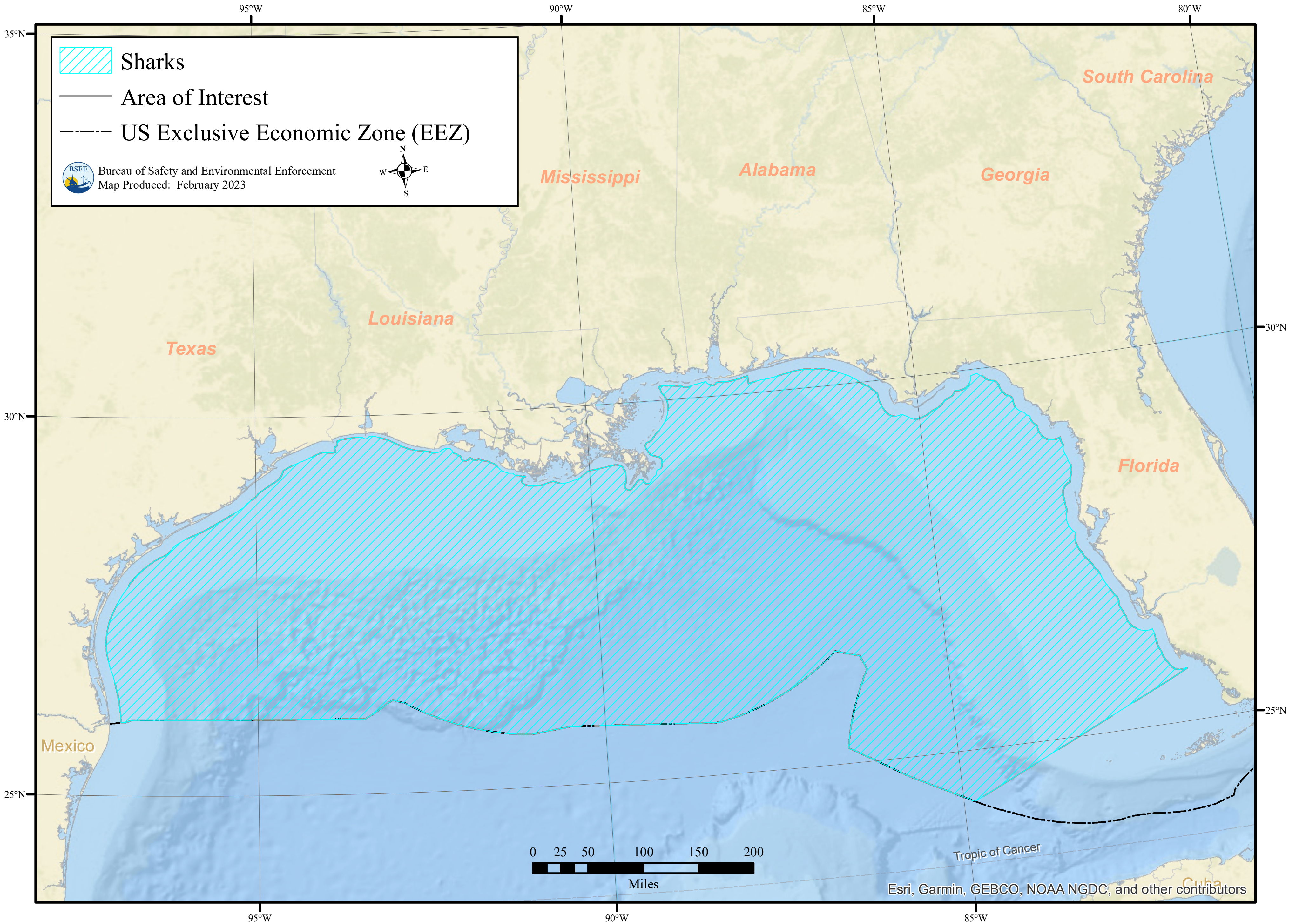

This map represents the approximate range of sharks (all species) in the Gulf of Mexico.

SPATIAL TEMPORAL PROFILES AND BEST MANAGEMENT PRACTICES

Invertebrates

- Caribbean Spiny Lobster
- Shrimp (Brown, Pink, White, and Royal Red)

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<table>
<tr><td colspan="2">Caribbean Spiny Lobster</td><td colspan="2">ESA Status</td><td colspan="2">None</td></tr>
<tr><td>Scientific Name</td><td>Panulirus argus</td><td colspan="2">Critical Habitat</td><td colspan="2">None</td></tr>
<tr><td colspan="6">Appearance: Variable in color, spiny lobsters can appear almost white to dark reddish brown. They have long antennae over their eyes to ward off predators and smaller antennules for sensing movement in water. Distinguishing characteristics include forward-pointing spines covering their bodies, two large cream-colored spots on top of their second tail segment, and the lack of large front claws.</td></tr>
<tr><td colspan="6">Diet: Young spiny lobsters generally prefer soft-bodied plankton. Juveniles and adults are primarily carnivorous, feeding on a variety of foods including snails, crabs, and clams.</td></tr>
<tr><td colspan="6">Population: The South Atlantic/Gulf of Mexico (SA/GOM) stock of Caribbean spiny lobster is not undergoing overfishing. Population levels are relatively unknown for the SA/GOM stock but assumed stable.</td></tr>
<tr><td colspan="6">Distribution/Habitat/Migration (see map for distribution in the GOM): Spiny lobsters are found along the continental shelf of the southeastern U.S. from North Carolina to Texas, in Bermuda, throughout the Caribbean, and south to Brazil. They generally inhabit shallow waters and occasionally venture as deep as 90 m. Habitat preferences include rocks, reefs, and seagrass beds. They are characterized by a long planktonic larval phase where lobsters are carried by currents until they reach a young benthic stage where they inhabit clumps of red algae, mangrove roots, seagrass banks, or sponges. Once settled, spiny lobsters then move into more shallow nearshore environments.</td></tr>
<tr><td colspan="6">Vulnerabilities and Sensitivities to Oiling: Because spiny lobsters are demersal, they are less at risk of exposure to floating oil in offshore areas. However, there can be high mortalities if the oil is mixed into the water column. Following the T/B North Cape oil spill of 19,700 bbl of home heating oil in the surf zone during a storm off Rhode Island, an estimated 8-9 million American lobsters (mostly juveniles) in the nearshore zone adjacent to the release were killed (McCay, 2003). Similarly, following the T/V Amoco Cadiz grounding close to shore off Brittany, France, the crude oil mixed into the water column, high lobster mortalities were noted and there was a decrease in the percent of egg-bearing females for at least 1 year (Conan, 1982). Furthermore, if bottom sediments become contaminated, there could be chronic exposures that can result in reduced growth and production. After the T/V Braer grounding, where 610,000 bbl of a light crude were released to nearshore waters during a large storm, lobsters showed high levels of PAH concentration. In the common lobster, which is epibenthic, PAH returned to normal within 2 months, but persisted for more than 6 years in the burrowing Norway lobster (Kingston, 1999). Lobsters can readily uptake oil from water and sediment and eliminate oil more slowly than fish. In addition, sediment-associated oil can have more of the higher-molecular weight PAHs that are more persistent and are eliminated more slowly (Yender et al., 2002). Thus, lobsters can be killed outright if exposed to high concentrations of oil in the water column. There can be chronic impacts from contaminated sediments, and tainting can persist for years.</td></tr>
<tr><td colspan="6">BMPs for Offshore Operations:
<u>General</u>: Secure all materials on vessels to prevent inadvertent loss overboard.
<u>Skimming and Booming</u>: Maintain control of all materials to prevent inadvertent release and sinking.
<u>Burning</u>: No specific BMPs at this time.
<u>Aerial Dispersant</u>: No specific BMPs at this time.
<u>Subsea Dispersants</u>: Spill-specific BMPs to be followed.</td></tr>
<tr><td colspan="6">Potential Range by Area Contingency Planning Area</td></tr>
<tr><td>Corpus Christi</td><td>Houston/ Galveston</td><td>Port Arthur</td><td>New Orleans/ Houma</td><td>Mobile</td><td>St. Petersburg</td></tr>
<tr><td></td><td>X</td><td></td><td></td><td></td><td>X</td></tr>
</table>

References:

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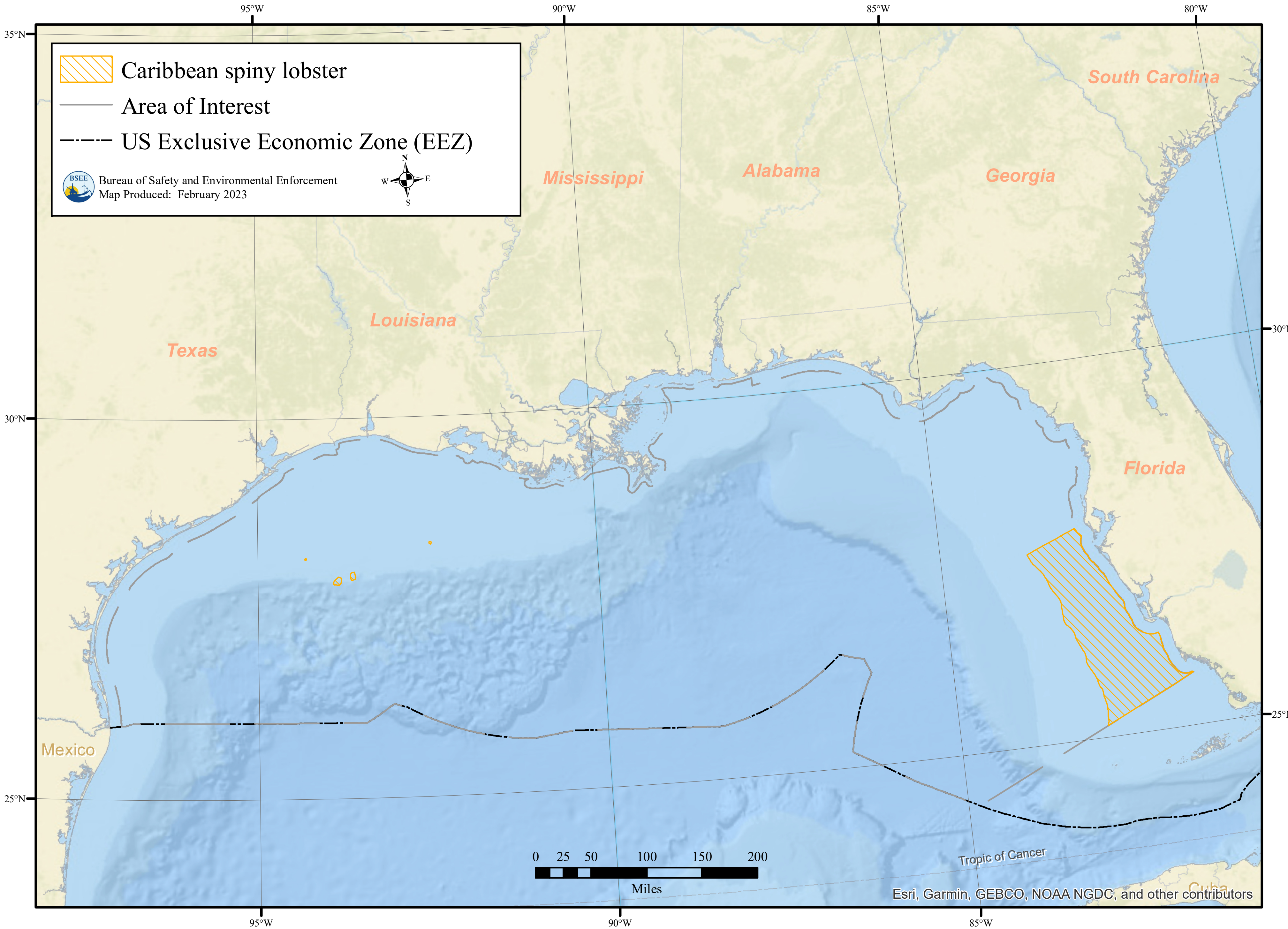

This map represents the approximate range of Caribbean spiny lobster in the Gulf of Mexico.

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<table>
<tr><th colspan="2">Shrimp (Brown, Pink, White, and Royal Red)</th><th>ESA Status</th><th>None</th></tr>
<tr><td>Scientific Name</td><td>Brown shrimp (Farfantepenaeus aztecus)
White shrimp (Litopenaeus setiferus)
Pink shrimp (Farfantepenaeus duorarum)
Royal red shrimp (Pleoticus robustus)</td><td>Critical Habitat</td><td>None</td></tr>
<tr><td colspan="4">Appearance: All shrimp species are crustaceans with ten long, slender walking legs and five pairs of swimming legs on the front surface of the abdomen. Brown shrimp tails are usually red, dark green, or light blue in color. White shrimp are lighter in color than brown or pink shrimp. Tail flippers on white shrimp are black near the base with bright yellow and green on edges. Pink shrimp have a light purplish-blue tail and a dark red spot on the side of their abdomen. Both brown and pink shrimp have grooves along the upper midline of their heads and upper midline of the lower abdomens. Grooves on the pink shrimp are narrower than brown shrimp while white shrimp lack grooves. White shrimp generally have longer antennae and a long rostrum. Royal red shrimp are differentiated by short hairs on the body and a toothless ventral margin. Royal red shrimp are generally red and may have white strips; however, their coloration can vary diurnally.</td></tr>
<tr><td colspan="4">Diet: Larvae of all shrimp species feed on plankton. All species are bottom-feeding omnivores during juvenile and adult phases. Brown shrimp are typically found feeding in deep waters at night as opposed to white shrimp that tend to feed in shallower waters. Brown shrimp prefer microscopic animals, worms, and various types of organic debris, while the cannibalistic white shrimp feeds on microorganisms, macroinvertebrates, and small fish. Pink shrimp feed on copepods, mollusks, diatoms, algae, plant detritus, bacterial films, slime molds, and yeast. Royal red shrimp are scavengers, feeding on small benthic organisms.</td></tr>
<tr><td colspan="4">Population: As of December 2022, stocks of brown, white, and pink shrimp populations are not overfished or at risk or overfishing. It is unknown if royal red shrimp are overfished, but overfishing is not thought to be occurring.</td></tr>
<tr><td colspan="4">Distribution/Habitat/Migration (see map for distribution in the GOM): <u>Brown shrimp</u> spawn in offshore waters deeper than 18 m to 109 m throughout the year, although April to May and September to November appear to be peak spawning times. After fertilization, the demersal eggs become planktonic larvae (Turner and Brody, 1983). Post-larval distributions encompass all Gulf of Mexico estuaries from Apalachicola Bay, Florida, to the Mexican border. Post-larval and juvenile brown shrimp occupy shallow, vegetated estuarine habitats generally less than 50 m depth but up to 100 m. They may use silt, sand, and non-vegetated mud bottoms. Adults inhabit marine waters from the low tide line out to the edge of the continental shelf. <u>White shrimp</u> release eggs near the ocean floor in waters from 7 to 31 m when offshore ocean bottom water temperatures increase (Turner and Brody, 1983), generally from March through September in the Gulf of Mexico. Juveniles are common in all Gulf estuaries from Texas to Suwannee River, Florida. Post-larval and juvenile white shrimp occur on bottoms, such as mud or peat, with copious amounts of decaying organic matter or vegetative cover. Demersal adults are situated in nearshore soft-bottom Gulf waters to depths of approximately 80 m. <u>Pink shrimp</u> spawn in waters 4 to 50 m deep and occur year round on the Tortugas Shelf, though larvae tend to be more abundant in spring, summer, and fall (Bielsa et al., 1983). Eggs, early larval, and post-larval phases are demersal as they are transported toward estuarine nursery areas. Juvenile pink shrimp occur in every U.S. estuary in the Gulf but most abundantly in Florida. Juveniles prefer estuarine habitats with seagrass where they burrow into the substrate by day, emerging at night. Adults can be found in offshore marine waters from 10 to 30 m. Both brown and pink shrimp migrate to deeper, higher salinity waters at approximately 12 cm in length during periods of high population concentration; otherwise, they migrate when they are approximately 15 cm in length. <u>Royal red shrimp</u> spend their entire lifecycle in open Gulf waters and are most common between 250 and 475 m depth. Adults occupy multiple different habitats throughout the southeastern U.S. Spawning occurs year-round on shelf edge/slope habitats.</td></tr>
<tr><td colspan="4">Vulnerabilities and Sensitivities to Oiling: Early life stages are the most sensitive to oil exposure. Because shrimp eggs are demersal, they are less at risk of exposure to floating oil in offshore areas. However, if bottom sediments become contaminated, there could be localized chronic exposures that could result in increased mortality of eggs, post-larval stages, and juveniles before they are transported into estuarine habitats. Their widespread distribution in Gulf waters would limit impacts of oil exposure in offshore areas. Most of the studies</td></tr>
</table>

of impacts from the *Deepwater Horizon* spill on shrimp were conducted on juveniles in nearshore waters adjacent to oiled marsh shorelines, finding reduced growth along heavily oiled marshes (Rozas et al., 2014; Baker et al., 2017). van der Ham et al. (2014) found that brown and white shrimp were more abundant in basins that were affected by the *Deepwater Horizon* spill, while mean shrimp size either did not change after the spill or increased in both affected and unaffected basins. They attributed these results in part to fishing closures established immediately after the spill (thus reducing mortality). Notably, shrimp abundance returned to normal in 2012 and through 2018 (Murawski et al., 2021).

BMPs for Offshore Operations:
General: Secure all materials on vessels to prevent inadvertent loss overboard.
Skimming and Booming: Maintain control of all materials to prevent inadvertent release and sinking.
Burning: No specific BMPs at this time
Aerial Dispersant: No specific BMPs at this time.
Subsea Dispersants: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

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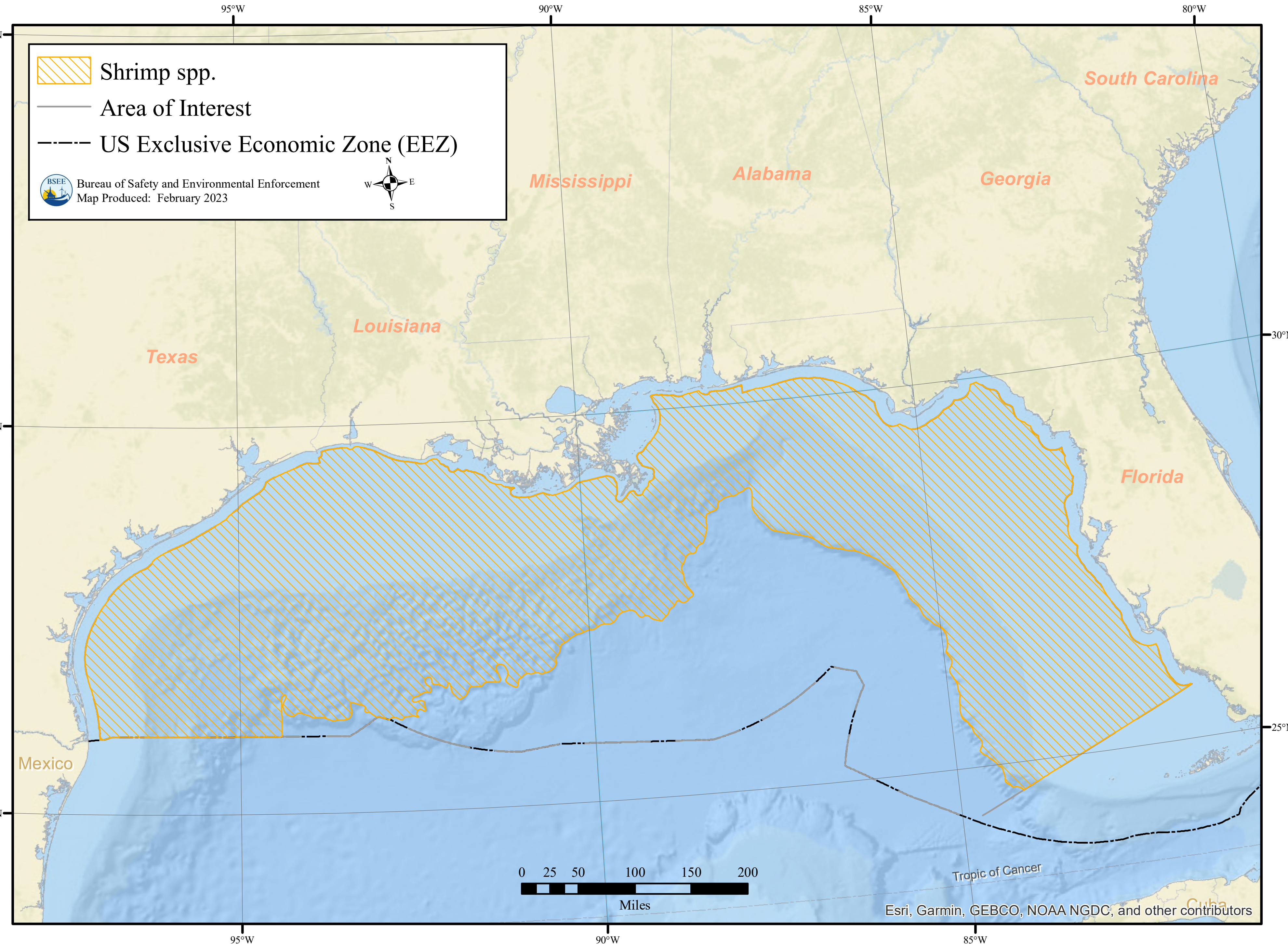

This map represents the approximate range of shrimp species (brown shrimp, white shrimp, pink shrimp, and royal red shrimp) in the Gulf of Mexico.

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SPATIAL TEMPORAL PROFILES AND BEST MANAGEMENT PRACTICES

Marine Mammals

- Rice’s Whale
- Sperm Whale
- West Indian Manatee
- Beaked Whales
- Bottlenose Dolphin
- Oceanic Dolphins
- Small Whales

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Rice’s Whale (formerly Bryde’s whale)	ESA Status	Gulf of Mexico species Endangered (2019)	86 FR 47022
Scientific Name	*Balaenoptera ricei*	**Critical Habitat**	Non determinable

Appearance: Grayish to dark brown on dorsal surface and light to pinkish ventrally. The Rice’s whale (Gulf of Mexico species) has a streamlined, sleek body shape with a somewhat pointed, flat rostrum with three prominent ridges in front of the blowhole. Their heads make up approximately one-quarter of their body length, with a broad fluke and large, falcate dorsal fin.

Diet: There is little information on diet of the Gulf of Mexico species. Generally, Rice’s whales feed primarily on schooling fish, including anchovy, sardine, mackerel, and herring, using baleen to filter prey from the water. They will also feed on small crustaceans. Rice’s whales appear to deep dive during the day and are recorded at depths up to 271 m, foraging at the deepest part of the dive, and prefer shallow diving at night. They appear to forage at or near the sea floor (Soldevilla et al., 2017). They spend most of their time within 15 m of the surface.

Population: The Gulf of Mexico’s Bryde's whale was recently recognized as a separate species from *Balaenoptera edeni* and thus is designated as Rice's whale (*B. ricei*). This species is thought to be at high risk of extinction with a 2020 NMFS estimated population of 51 whales present in the Gulf of Mexico region, coupled with its restriction to a very defined habitat area in the DeSoto Canyon region in the northeastern Gulf of Mexico.

Distribution/Habitat/Migration (see map for distribution in the GOM): Rice’s whales can be found in warm, temperate oceans including the Atlantic, Pacific, and Indian Oceans. The Gulf of Mexico species is found primarily in a small area in the northeastern Gulf, near DeSoto Canyon in waters between the depths of 100-400 m and along the continental shelf break. This is the only baleen whale species to inhabit the Gulf of Mexico region year-round (Rosel et al., 2020). The Gulf of Mexico species occurs both inshore and offshore with the offshore population shown to undertake migrations, but these migrations are relatively short for baleen whales. Little is known about the life history of these whales in the Gulf of Mexico, though there is evidence that they are breeding there (Rosel et al., 2020).

Vulnerabilities and Sensitivities to Oiling: All whales can be exposed to oil through dermal contact (e.g., skin, mucous membranes), inhalation, water and prey ingestion, and aspiration. Because they forage at or near the sea floor, they could be exposed to oil deposited in sediments. Studies have shown that baleen did not adsorb oil; oil was readily rinsed from baleen by flowing water, especially from moving fringes; filter porosity is not appreciably affected, but oil ingestion risks remain (Werth et al., 2019). Thus, baleen whales may be at increased risk of oil ingestion at depths, such as from a subsea release. The restricted distribution of Rice’s whales in the Gulf of Mexico puts them at higher vulnerability if exposed to oil. Detrimental effects of exposure to dispersants or chemically dispersed oil on the skin of Rice’s whales are not likely because the dermal shield is a highly effective barrier to the toxic compounds found in oil. It has been shown that marine mammals may not avoid surface oil on the water (Geraci, 1990; Frasier et al., 2020); thus, they can be exposed when swimming through floating oil or in a dispersed oil plume in the water column.

Use of dispersants, either at the surface or via subsea injection, reduces the direct impacts of spilled oil on Rice’s whales. Because they shallow dive at night for food, there could be indirect impacts from a possible reduction in the quantity of prey from chemically dispersed oil-related mortality from large-scale and continuous releases of oil.

BMPs for Offshore Operations:
General: Watch for and avoid collisions with marine mammals and report all distressed or dead marine mammals to the Wildlife Hotline (If no hotline is yet operating, call 877-942-5343 (877-WHALEHELP)). NOAA’s Vessel Strike Avoidance Measures and Reporting for Mariners should be implemented to reduce the risk associated with vessel strikes or disturbance of protected species to discountable levels. If marine mammals are sighted oiled or swimming in oil, call 877-WHALEHELP.
Skimming: To avoid entangling marine mammals, a trained observer or crew member is required for all skimming operations.

Booming: Make efforts to reduce slack in boom lines and if possible, use stiff, non-tangling material. If a marine mammal is observed trapped or entangled in a boom, open the boom carefully until the animal leaves on its own, and call to report at 877-942-5343 (877-WHALEHELP). Burning: Watch for and avoid marine mammals while operating vessels or aircraft involved directly or in support of in-situ burn operations. Marine species observers on the ignition vessel will monitor 3 areas prior to the burn (the area in front of the tow boats, oil concentrated in the boom, and any oil trailing behind the boom). A survey should be conducted in the burn area after the burn is complete and any distressed or dead marine mammals should be counted and reported to 877-942-5343 (877-WHALEHELP). Surface Dispersant: No surface dispersant application within 2 nautical miles of sighted marine mammals. Subsea Dispersant: Spill-specific BMPs to be followed.					
Potential Range by Area Contingency Planning Area					
Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

References:

DWH NRDA Trustees (Deepwater Horizon Natural Resource Damage Assessment Trustees). 2016. *Deepwater Horizon* oil spill: final programmatic damage assessment and restoration plan and final programmatic environmental impact statement. https://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan.

Engelhardt FR. 1983. Petroleum effects on marine mammals. Aquatic Toxicology 4(3):199-217.

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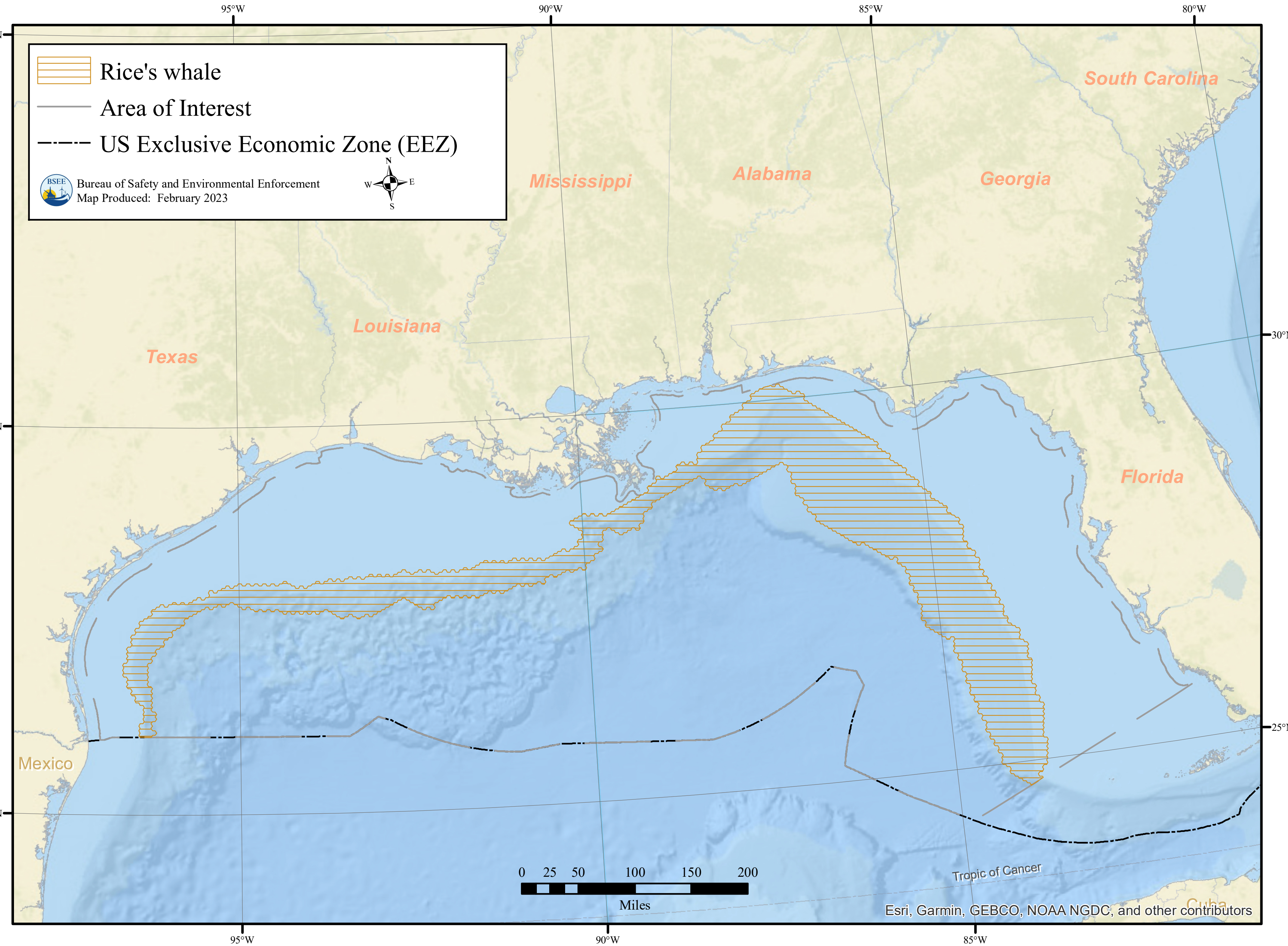

This map represents the approximate range of Rice's whale in the Gulf of Mexico.

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Sperm Whale		ESA Status	Endangered (1970)	35 FR 18319
Scientific Name	*Physeter microcephalus*	**Critical Habitat**	None	

Appearance: Mostly dark gray, though some have white patches on the belly, with an extremely large head that takes up about 1/3 of its total body length.

Diet: Sperm whales are toothed whales and feed on large organisms, such as squid, in water depths of 300-1,000 m. They also feed on octopus and medium- and large-sized demersal fish, such as rays, sharks, and many teleosts. They feed throughout the year and can consume 3.0-3.5% of their body weight per day. The wide range of prey means that there are available food sources for the sperm whale throughout its range, but both sperm whale and its primary prey are more likely to occur in deep water outside of the continental shelf.

Population: The NMFS 2020 stock assessment for the sperm whale population present in the Gulf of Mexico is 1,180.

Distribution/Habitat/Migration (see map for distribution in the GOM): Sperm whales inhabit all oceans of the world in areas with water depths of 600 m or more but are uncommon in waters less than 300 m. Female sperm whales are generally found in deep waters (at least 1,000 m) in the Gulf of Mexico. They breed in tropical waters. Sperm whale migrations are not as predictable or well understood as migrations of most baleen whales. In tropical and temperate areas, there appears to be no obvious seasonal migration. In the Gulf of Mexico, most sightings are along the continental slope southeast of the Mississippi River delta. Passive acoustic monitoring of sperm whales from 2010-2016 showed that this species was most abundant 10 km away from the *Deepwater Horizon* release area (compared to the unoiled Green Canyon and Dry Tortugas areas), and tagged females had long residence times and appeared to use it as core habitat (Frasier et al., 2020).

Vulnerabilities and Sensitivities to Oiling: Cetaceans that experience exposure to oil through direct contact, inhalation, ingestion, and/or aspiration of oil can experience severe damage to internal organs and disruption of reproductive processes, resulting in long-term population impacts. Inhalation of toxic vapors can cause inflammation of mucous membranes of the eyes and airways, lung congestion, and possibly pneumonia. Laboratory studies on cetaceans have shown multiple effects from exposure, including liver damage in captive bottlenose dolphins that had crude oil added to their tank; skin lesions in a number of captive delphinid species where oil was applied to their skin; and skin lesions after oil was applied to the skin of a live, stranded sperm whale. As deep divers, sperm whales are less likely to be exposed to oil via consumption of prey. Studies focused on the health or survival of cetaceans following oil spills are limited except for the *Exxon Valdez* and *Deepwater Horizon* spills. Carnivorous cetaceans such as sperm whales, which are typically apex predators, will suffer from an oil spill that results in effects on fish and invertebrate populations. After a long, deep dive, sperm whales come to the ocean surface to breathe and recover for approximately 9 minutes. Thus, they are at risk of aspiration of oil if they encounter oil slicks on the surface. During the *Deepwater Horizon* oil spill, 33 sperm whales were observed swimming in surface oil on 16 occasions. Passive acoustic monitoring during the spill indicated that sperm whales did not avoid the area around the *Deepwater Horizon* release site (Frasier et al., 2020)

Detrimental effects of exposure of dispersants or chemically dispersed oil on the skin of sperm whales are not likely because the dermal shield is a highly effective barrier to the toxic compounds found in oil. Use of dispersants, either at the surface or via subsea injection, reduces the direct impacts of spilled oil on sperm whales. Sperm whales feed at depth and on mobile prey unlikely to be entrained within the top few meters of the water column (i.e., squid, sharks, skates, etc.) that could be affected by dispersant application on surface slicks. Only prey entrained within the top few meters of the water column in the approximate footprint of the treatment area may be affected by chemically dispersed surface oil, likely representing a small fraction of the available food source.

BMPs for Offshore Operations:
General: Watch for and avoid collisions with marine mammals and report all distressed or dead marine mammals to the Wildlife Hotline (If no hotline is yet operating, call 877-942-5343 (877-WHALEHELP)). NOAA's Vessel Strike Avoidance Measures and Reporting for Mariners should be implemented to reduce the risk associated with vessel strikes or disturbance of protected species to discountable levels. If marine mammals are sighted oiled or swimming in oil, call 877-WHALEHELP.
Skimming: To avoid entangling marine mammals, a trained observer or crew member is required for all skimming operations.
Booming: Make efforts to reduce slack in boom lines and if possible, use stiff, non-tangling material. If a marine mammal is observed trapped or entangled in a boom, open the boom carefully until the animal leaves on its own, and call to report at 877-942-5343 (877-WHALEHELP).
Burning: Watch for and avoid marine mammals while operating vessels or aircraft involved directly or in support of in-situ burn operations. Marine species observer on the ignition vessel will monitor 3 areas prior to the burn (the area in front of the tow boats, oil concentrated in the boom, and any oil trailing behind the boom). A survey should be conducted in the burn area after the burn is complete and any distressed or dead marine mammals should be counted and reported to 877-942-5343 (877-WHALEHELP).
Surface Dispersant: No surface dispersant application within 2 nautical miles of sighted marine mammals.
Subsea Dispersant: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

References:

DWH NRDA Trustees (Deepwater Horizon Natural Resource Damage Assessment Trustees). 2016a. *Deepwater Horizon* oil spill: final programmatic damage assessment and restoration plan and final programmatic environmental impact statement. https://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan.

Engelhardt FR. 1983. Petroleum effects on marine mammals. Aquatic Toxicology. 4(3):199-217.

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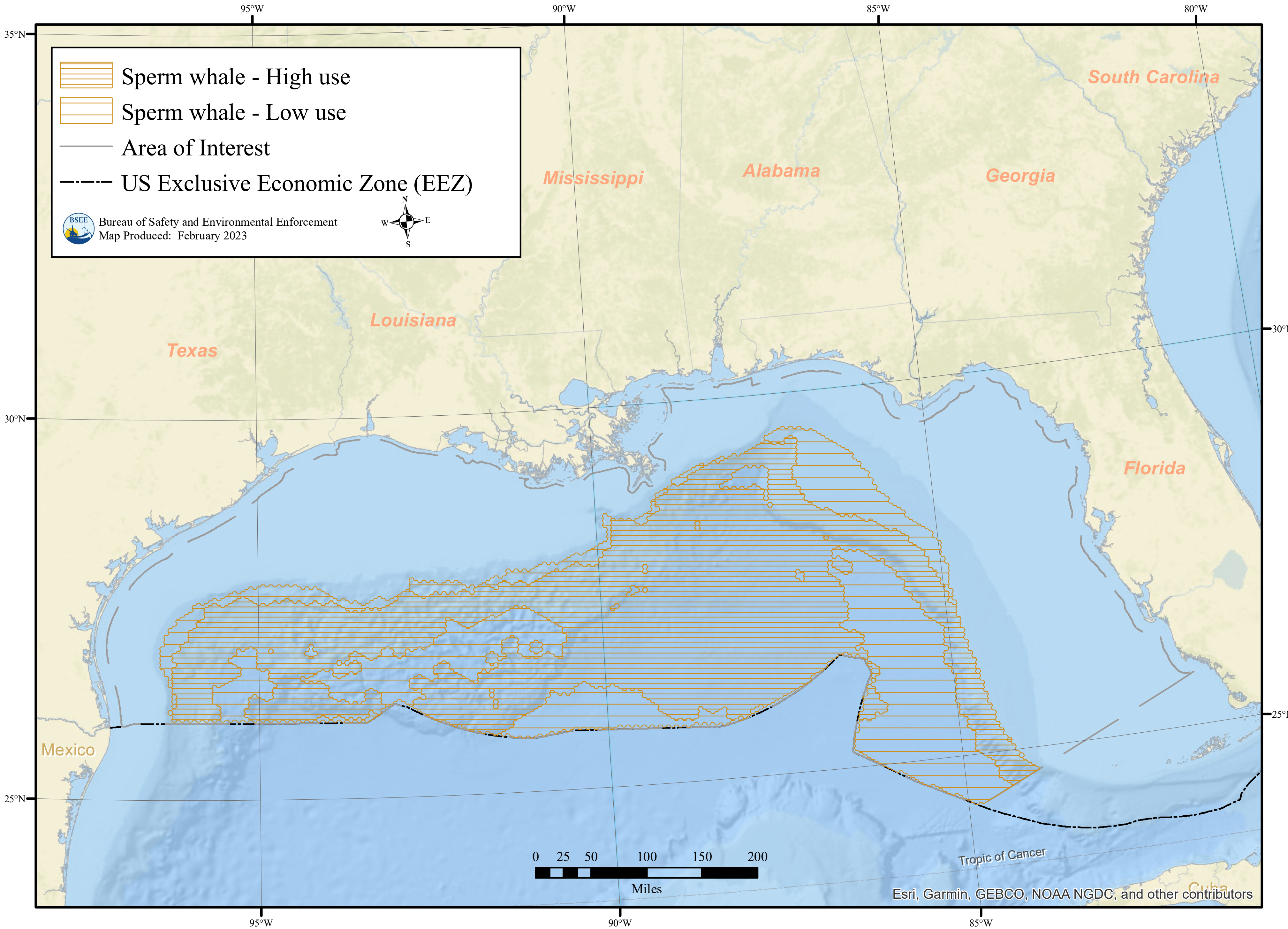

This map represents the approximate range of sperm whale in the Gulf of Mexico.

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<table>
<tr><td colspan="2">West Indian Manatee*</td><td>ESA Status</td><td>Threatened (2017)</td></tr>
<tr><td>Scientific Name</td><td>Trichechus manatus latirostris
*Data to map manatees were not available, and they typically do not occur in the Area of Interest. However, manatees do occur nearby (e.g., in coastal areas from Texas to Florida).</td><td>Critical Habitat</td><td>50 CFR 17.95</td></tr>
<tr><td colspan="4">Appearance: Most adult manatees are about 3 m long and weigh 360 to 550 kg; they can be larger than 4 m and as much as 1,600 kg. Manatees have tough, wrinkled brown-to-gray skin.</td></tr>
<tr><td colspan="4">Diet: Manatees are herbivores. They consume 4-9% of their body weight each day, spending 5 to 8 hours a day eating typically non-native water hyacinths and hydrilla, along with native aquatic plants such as Vallisneria or eelgrass. Shallow grass beds with ready access to deep channels are preferred feeding areas in coastal and riverine habitats.</td></tr>
<tr><td colspan="4">Distribution/Habitat/Migration: The West Indian manatee in the Gulf of Mexico is most often found along the coast of Florida, but can be present in seagrass habitats as far west as Texas. The manatee often rests suspended just below the water’s surface with only the snout above water. It feeds underwater but must surface periodically to breathe. Manatees move between freshwater, brackish, and saltwater environments. They prefer large, slow-moving rivers, river mouths, and shallow coastal areas such as coves and bays. They may travel great distances as they migrate between winter and summer grounds. During winter, manatees congregate around warm springs and industrial water discharges of warm water. Manatees may occur in offshore areas during migrations between winter and summer grounds.</td></tr>
<tr><td colspan="4">Vulnerabilities and Sensitivities to Oiling:
Manatee distributions are typically limited to inshore, low-energy habitats that support the growth of seagrasses. Thus, the feeding behaviors of manatees would suggest that ingestion is likely by either incidentally eating tarballs or eating contaminated vegetation in these habitats.

There are no field or laboratory studies on the impacts to manatees during an actual spill. Manatee exposure to oil would most likely cause short-term irritation of the eyes and sensitive mucous membranes with not much harm to the thick epidermis. Response workers responded to manatees in contaminated waters during the Deepwater Horizon spill; however, there was not enough information collected on exposure and injury to quantify the injury (DWH Natural Resource Trustees, 2016).</td></tr>
<tr><td colspan="4">BMPs for Offshore Operations:
<u>General</u>: All response personnel shall be instructed about the presence of manatees and the need to avoid collisions with and injury to manatees. Advise all response personnel that there are civil and criminal penalties for harming, harassing, or killing manatees. No operation of any moving equipment is allowed within 50 feet of a manatee, or if contact seems likely or imminent. Activities will not resume until the manatee(s) has departed the project area on its own, or by direction from the appropriate resource protection manager. Animals must not be herded away or harassed into leaving
<u>Skimming</u>: To avoid entangling manatees, a trained observer is required for all skimming operations.
<u>Booming</u>: If a manatee is observed trapped or entangled in a boom, open the boom carefully until the animal leaves on its own.
<u>Burning</u>: Watch for and avoid manatees while operating vessels or aircraft involved directly or in support of in-situ burn operations. Marine species observer on the ignition vessel will monitor 3 areas prior to the burn (the area in front of the trawlers, oil concentrated in the boom, and any oil trailing behind the boom). A survey should be conducted in the burn area after the burn is complete and any distressed or dead manatees should be counted.
<u>Surface Dispersant</u>: No surface dispersant application within 2 nautical miles of sighted manatees.
<u>Subsea Dispersant</u>: Spill-specific BMPs to be followed.</td></tr>
<tr><td colspan="4">Potential Range by Area Contingency Planning Area</td></tr>
</table>

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

References:

DWH NRDA Trustees (Deepwater Horizon Natural Resource Damage Assessment Trustees). 2016. *Deepwater Horizon* oil spill: final programmatic damage assessment and restoration plan and final programmatic environmental impact statement. https://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan.

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<table>
<tr><td colspan="2">Beaked Whales</td><td>ESA Status</td><td>None</td></tr>
<tr><td>Scientific Name</td><td>Blainville’s beaked whale (Mesoplodon densirostris)
Cuvier’s beaked whale (Ziphius cavirostris)
Gervais’ beaked whale (Mesoplodon europaeus)</td><td>Critical Habitat</td><td>None</td></tr>
</table>

Appearance: Beaked whales have a single blowhole, prominent rostrum (beak), and teeth emerging from the lower jaws in adult males. They have round, robust bodies with triangular, falcate, wide-based dorsal fins. Their coloring is usually dark gray to brown/blue/black dorsally with pale undersides. They tend to have scarring on their skin. The Blainville’s beaked whale is known as the ‘dense beaked whale’, Cuvier’s is known as the ‘goose-beaked whale’, and Gervais’ is known as the ‘Antillean’ or ‘Gulf Stream beaked whale.’ They are skittish and cryptic, making it hard to discern between species, often only identified to genus. The Cuvier’s male has a pair of teeth protruding at the tip of its beak, while the other two species have their protruding teeth around the mid-section of their beaks.

Diet: Beaked whales are deep divers, commonly inhabiting waters greater than 150 m. They feed using suction while diving, preferring squid, mysid shrimp, and/or small fish found in deep waters up to 1,000 m.

Population: Based on NMFS marine mammal assessment reports, the Cuvier's beaked whale population is 18, Blainville's beaked whale population is 98, and Gervais' beaked whale population is 20 in the northern Gulf of Mexico. They are Least Threatened according to the International Union for Conservation of Nature (IUCN) Red List for 2020.

Distribution/Habitat/Migration (see map for distribution in the GOM): Beaked whales can be found in deep tropical, subtropical, warm, and temperate waters worldwide. In the Atlantic, they are found roughly from Nova Scotia to Trinidad and the Gulf of Mexico. The most sighted species in the U.S. Atlantic coast and Gulf of Mexico area is the Gervais’ beaked whale. They prefer deep waters offshore of the continental shelf with steep underwater geologic features such as banks, canyons, and seamounts. Based on passive acoustic monitoring, Cuvier’s presence off the mouth of the Mississippi River is strongly seasonal, with highest occurrence during winter months (Frasier et al., 2020). Beaked whales travel individually or in small groups reaching sexual maturity at around 7-11 years, with females bearing a single calf per cycle. The lifespans of the Gervais’ and Cuvier’s beaked whales are 48 and 60 years, respectively; the lifespan is relatively unknown for the Blainville’s beaked whale.

Vulnerabilities and Sensitivities to Oiling: Cetaceans that experience exposure to oil through direct contact, inhalation, ingestion, and/or aspiration of oil can experience severe damage to internal organs and disruption of reproductive processes, resulting in long-term population impacts. Inhalation of toxic vapors can cause inflammation of mucous membranes of the eyes and airways, lung congestion, and possibly pneumonia. Laboratory studies on cetaceans have shown multiple effects from exposure, including liver damage in captive bottlenose dolphins that had crude oil added to their tank; skin lesions in several captive delphinid species where oil was applied to their skin; and skin lesions after oil was applied to the skin of a live, stranded sperm whale. Use of dispersants, either at the surface or via subsea injection, reduces the direct impacts of spilled oil on oceanic dolphins. It has been shown that marine mammals may not avoid surface oil on the water (Geraci, 1990; Frasier et al., 2020); thus, they can be exposed when swimming through floating oil or in a dispersed oil plume in the water column.

Studies focused on the health or survival of cetaceans following oil spills are limited except for the *Exxon Valdez* and *Deepwater Horizon* spills. It is noted that relatively low numbers of marine mammal carcasses are reported following spills. Williams et al. (2011) estimated historical carcass-detection rates for 14 cetacean species in the northern Gulf of Mexico, which suggested that Cuvier’s beaked whale carcasses are recovered at a rate of 6.2%. Thus, the true impacts to these species from offshore spills are difficult to quantify.

BMPs for Offshore Operations:
General: Watch for and avoid collisions with marine mammals and report all distressed or dead marine mammals to the Wildlife Hotline (If no hotline is yet operating, call 877-942-5343 (877-WHALEHELP). NOAA’s Vessel Strike Avoidance Measures and Reporting for Mariners should be implemented to reduce the

risk associated with vessel strikes or disturbance of protected species to discountable levels. If marine mammals are sighted oiled or swimming in oil, call 877-WHALEHELP.

Skimming: To avoid entangling marine mammals, a trained observer or crew member is required for all skimming operations.

Booming: Make efforts to reduce slack in boom lines and, if possible, use stiff, non-tangling material. If a marine mammal is observed trapped or entangled in a boom, open the boom carefully until the animal leaves on its own, and call to report at 877-942-5343 (877-WHALEHELP).

Burning: Watch for and avoid marine mammals while operating vessels or aircraft involved directly or in support of in-situ burn operations. Marine species observers on the ignition vessel will monitor 3 areas prior to the burn (the area in front of the tow boats, oil concentrated in the boom, and any oil trailing behind the boom). A survey should be conducted in the burn area after the burn is complete and any distressed or dead marine mammals should be counted and reported to 877-942-5343 (877-WHALEHELP).

Surface Dispersant: No surface dispersant application within 2 nautical miles of sighted marine mammals.

Subsea Dispersant: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

References:

DWH NRDA Trustees (Deepwater Horizon Natural Resource Damage Assessment Trustees). 2016a. *Deepwater Horizon* oil spill: final programmatic damage assessment and restoration plan and final programmatic environmental impact statement. https://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan.

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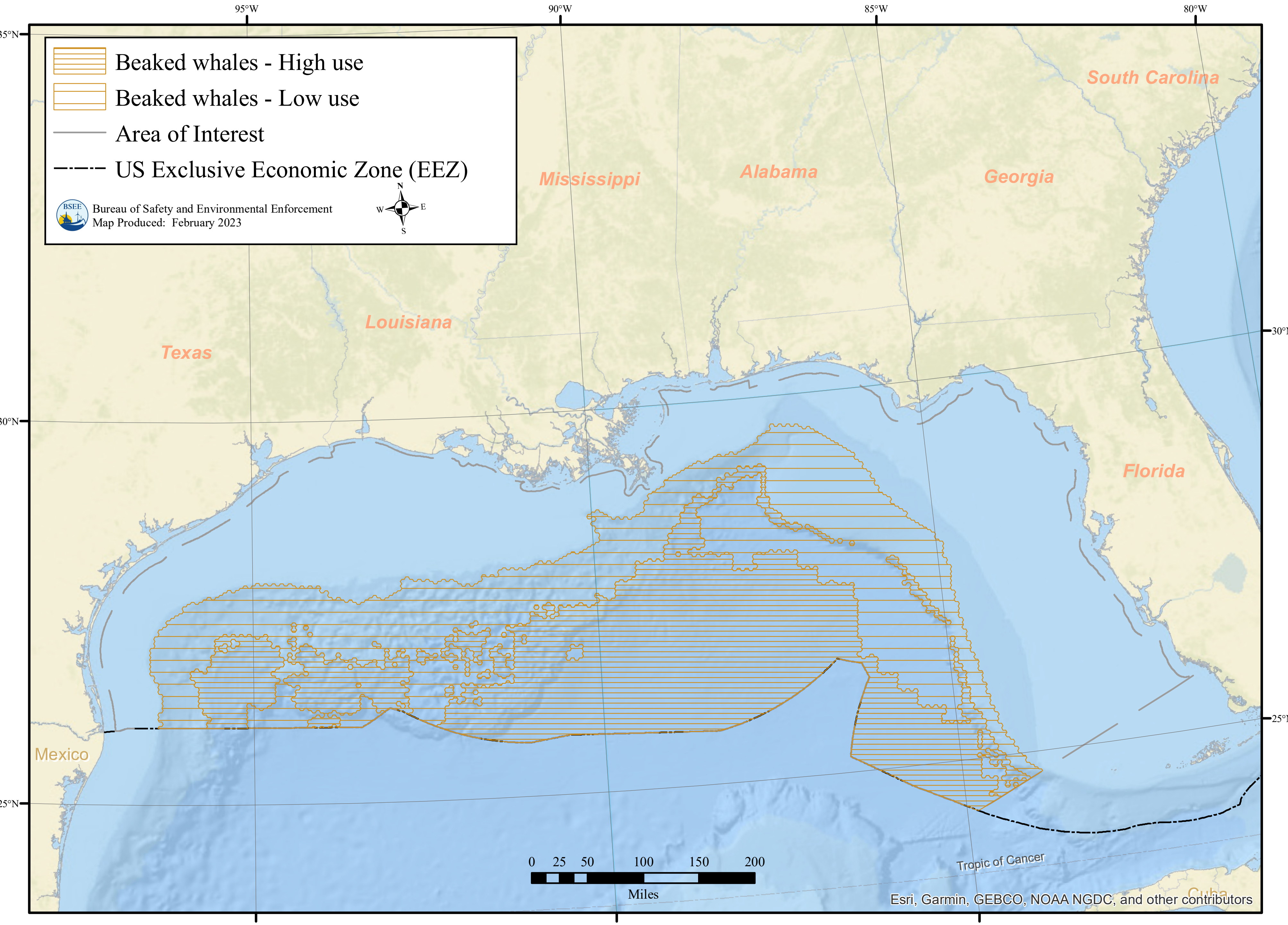

This map represents the approximate range of beaked whales in the Gulf of Mexico.

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Bottlenose Dolphin		ESA Status	None
Scientific Name	*Tursiops truncatus*	**Critical Habitat**	None

Appearance: Light gray to black dorsally and light gray to white on the undersides with a short, thick snout and total length between 2 to 4 m. Coloration is dependent on distance the individual lives from shore, as lighter colored individuals have been associated with occupying coastal waters and darker individuals more offshore.

Diet: Bottlenose dolphins feed by swallowing prey, preferring crustaceans (crabs, shrimp), cephalopods (squid), and a variety of fish. They use echolocation to search for prey, either individually or by herding and/or trapping food against sandbars and seawalls as a group effort.

Population: The NMFS 2020 marine mammal stock assessment on population estimates for bottlenose dolphin stocks in the Gulf of Mexico are: Continental Shelf: 51,192; Eastern Coastal: 12,388; Northern Coastal: 7,185; Western Coastal: 20,161; and Oceanic: 7,462. They are Least Threatened according to the International Union for Conservation of Nature (IUCN) Red List for 2019. The NMFS stock assessment report also includes inshore water population estimates, though these were not updated in 2020.

Distribution/Habitat/Migration (see map for distribution in the GOM): Bottlenose dolphins are distributed throughout coastal and estuarine waters, in harbors, bays, gulfs, estuaries, as well as offshore in temperate and tropical waters around the world. In the U.S. they are found along the East Coast from Massachusetts to Florida, throughout the Gulf of Mexico, and in the Caribbean. They are social animals, traveling with just a few individuals in a pod to over 100. Communication between animals is mainly through touch, showing behaviors such as aggression, playing, breeding, or rubbing other dolphins. Individuals display sexual maturity between 5 and 15 years of age with an average of 1 year gestation, calving every 3-6 years, and a lifespan between 40-60 years. Migration patterns are not well known, but Gulf of Mexico residents have been observed moving into coastal waters during fall/winter and returning inshore during summer.

Vulnerabilities and Sensitivities to Oiling: Dolphins can be exposed to oil through dermal contact (e.g., skin, mucous membranes), inhalation, water and prey ingestion, and aspiration. Inhalation of toxic vapors can cause inflammation of mucous membranes of the eyes and airways, lung congestion, and possibly pneumonia. Laboratory studies on cetaceans have shown multiple effects from exposure, including liver damage in captive bottlenose dolphins that had crude oil added to their tank; skin lesions in a number of captive delphinid species where oil was applied to their skin; and skin lesions after oil was applied to the skin of a live, stranded sperm whale. Impacts from oil spills have been documented mostly for dolphins that were resident in semi-enclosed waterbodies that were heavily oiled. Following the *Deepwater Horizon* spill, dolphins experienced substantial and long-lasting impacts, including reduced reproduction and increased disease and mortality. Bottlenose dolphins were the most studied and reported cetacean impacted by the *Deepwater Horizon* spill and there were many advances in understanding the effects of oil exposure. Oiled dolphins suffered from lung disease, adrenal disease, poor body condition, and other adverse health effects caused by oil exposure. Animals that were oiled due to the *Deepwater Horizon* spill contributed to the largest and longest marine mammal unusual mortality event on record in the Northern Gulf of Mexico. The Barataria Bay and Mississippi Sound bottlenose dolphin populations were among the hardest hit, with 52% and 62% maximum reduction in their population size, respectively. Researchers found that more than 80% of common bottlenose dolphin pregnancies in those two waterbodies were unsuccessful in the years following the spill. Field studies demonstrated that coastal bottlenose dolphins also suffered from adrenal gland diseases and dysfunction as a result of exposure to *Deepwater Horizon* oil. Population sizes of bottlenose dolphins in the region may be impacted for decades because bottlenose dolphins are long lived, give birth to one calf every few years, and are slow to reach reproductive maturity. Several models and studies estimate that recovery could take approximately 40 years to return this population to pre-spill numbers. Offshore populations are less likely to experience long-term oil exposure and thus would be at less risk. Use of dispersants, either at the surface or via subsea injection, is thought to reduce the direct impacts of spilled oil on dolphins.

BMPs for Offshore Operations:
General: Watch for and avoid collisions with marine mammals and report all distressed or dead marine mammals to the Wildlife Hotline (If no hotline is yet operating, call 877-942-5343 (877-WHALEHELP)).

NOAA's Vessel Strike Avoidance Measures and Reporting for Mariners should be implemented to reduce the risk associated with vessel strikes or disturbance of protected species to discountable levels. If marine mammals are sighted oiled or swimming in oil, call 877-WHALEHELP. Skimming: To avoid entangling marine mammals, a trained observer or crew member is required for all skimming operations. Booming: Make efforts to reduce slack in boom lines and if possible use stiff, non-tangling material. If a marine mammal is observed trapped or entangled in a boom, open the boom carefully until the animal leaves on its own, and call to report at 877-942-5343 (877-WHALEHELP). Burning: Watch for and avoid marine mammals while operating vessels or aircraft involved directly or in support of in-situ burn operations. Marine species observers on the ignition vessel will monitor 3 areas prior to the burn (the area in front of the tow boats, oil concentrated in the boom, and any oil trailing behind the boom). A survey should be conducted in the burn area after the burn is complete and any distressed or dead marine mammals should be counted and reported to 877-942-5343 (877-WHALEHELP). Surface Dispersant: No surface dispersant application within 2 nautical miles of sighted marine mammals. Subsea Dispersant: Spill-specific BMPs to be followed.					
Potential Range by Area Contingency Planning Area					
Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

References:

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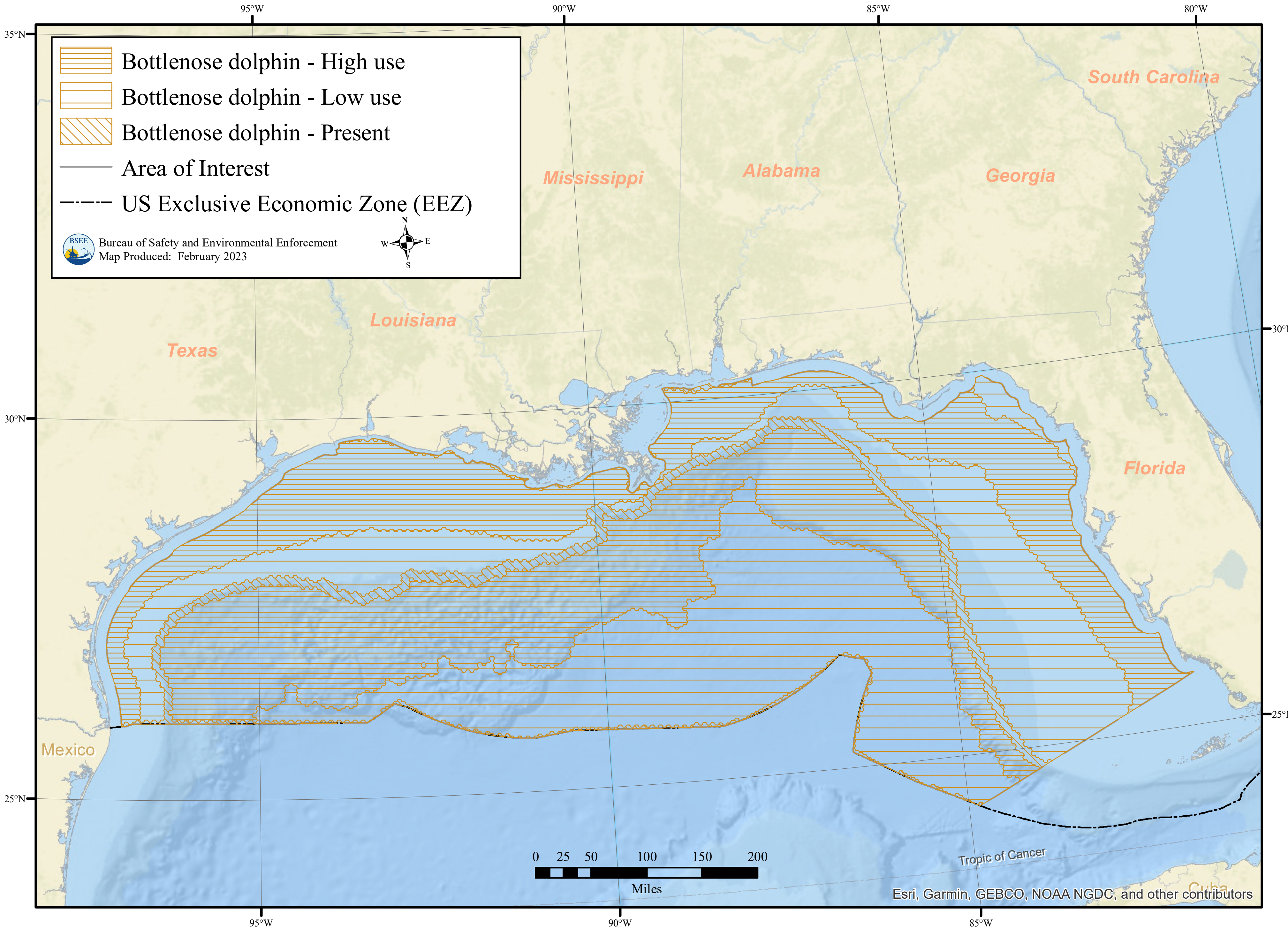

This map represents the approximate range of bottlenose dolphin in the Gulf of Mexico.

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Oceanic Dolphins		**ESA Status**	None
Scientific Names	Clymene dolphin (*Stenella clymene)* Striped dolphin (*Stenella coeruleoalba*) Spinner dolphin (*Stenella longirostris*) Pantropical spotted dolphin (*Stenella attenuata*) Atlantic spotted dolphin (*Stenella frontalis*) Risso's dolphin (*Grampus griseus*) Fraser's dolphin (*Lagenodelphis hosei*) Rough-toothed dolphin (*Steno bredanensis*)	**Critical Habitat**	None

Appearance: Clymene and spinner dolphins both have tripartite coloration, with darker grey/black coloration on top, transitioning to lighter grey with light undersides. The Clymene can be differentiated by its shorter beak and dorsal fin that is less erect and triangular than that of the spinner. The spinner has a very elongated rostrum. The striped dolphin has light blue or grey on top, with white, blue, or pink undersides. It has two defining black bands encircling the eyes, running across to its flipper with two black stripes behind the ear. The pantropical spotted and Atlantic spotted dolphins look similar, but the Atlantic is more robust in size. Adult Atlantic spotted dolphins show more homogeneous spotting including the dorsal fin, and the pantropical spotted dolphin has a dark gray dorsal fin and dark jaws separated by white, thin lips. Some populations of the pantropical spotted dolphin, such as in the Gulf of Mexico, may be spot-free as adults. Risso's dolphin is grey to mostly white as adults, with a large anterior body, tapering dorsally to a narrow tail. Its bulbous head has a crease at the front. Rough-toothed dolphin is large, with the most visible characteristics being its conical head, slender nose, and distinctive teeth with roughened surfaces and irregular ridges. It is common for both Risso's and rough-toothed dolphins to show scarring on their bodies. Fraser's dolphin is gray-blue to gray-brown on top with cream on its flanks, outlined by black. It has a stocky build, with small fins, flippers, and dorsal fin in proportion to its body. The most noticeable difference among these species is that the Risso's dolphin does not have a beak, the Fraser's dolphin has an unnoticeable beak, the rough-toothed dolphin has a very short beak.

Diet: Oceanic dolphins feed on a variety of small fish and cephalopods (squid and octopuses), and invertebrates (shrimp and crabs). Oceanic dolphins typically dive for prey, some deeper than others with the Atlantic spotted dolphin diving down to 60 m, while Fraser's dolphins can dive down to 600 m. Clymene and Risso's dolphins tend to feed more on the surface where prey gather at night, while the striped dolphin feeds throughout the water column. Pantropical dolphins prefer to feed in the mesopelagic zone as well as the Fraser's and rough-toothed dolphins who inhabit deeper oceanic waters. Spinner dolphins also inhabit deeper waters but will feed in shallow waters while resting.

Population: The NMFS 2020 stock assessments for the oceanic dolphins listed in the Gulf of Mexico are Clymene dolphin: 20; Fraser's dolphin: 213; striped dolphin: 1,817; spinner dolphin: 2,991; pantropical spotted dolphin: 37,195; Atlantic spotted dolphin: unknown; Risso's dolphin: 1,974; and rough-toothed dolphin: unknown.

Distribution/Habitat/Migration (see map for distribution in the GOM): Oceanic dolphins tend to travel in groups, organized by sex, age, and/or breeding status. They are found in the Gulf of Mexico along the continental shelf, and particularly seaward of the shelf. These dolphins inhabit mainly epipelagic to mesopelagic waters down to 1,000 m, with Clymene dolphins traveling down to 5,000 m to the bathypelagic zone. Atlantic spotted dolphins are found in shallower waters around 10-200 m down to approximately 500 m. Risso's dolphins can be found in shallower waters as well as spinner dolphins while resting. Fraser's dolphins prefer deeper waters particularly near upwellings. Sexual maturity is reached somewhere between 5-15 years. Passive acoustic monitoring from 2010-2016 showed that *Stenella* species and Risso's dolphins are present year-round in the northern Gulf of Mexico, with peaks in summer (Frasier et al., 2020).

Vulnerabilities and Sensitivities to Oiling: There are very limited data on how oil could affect oceanic dolphins. Inhalation of toxic vapors can cause inflammation of mucous membranes of the eyes and airways, lung congestion, and possibly pneumonia. Laboratory studies on cetaceans have shown multiple effects from exposure, including liver damage in captive bottlenose dolphins that had crude oil added to their tank; skin lesions in a number of captive delphinid species where oil was applied to their skin; and skin lesions after oil was applied to the skin of a live, stranded sperm whale (Geraci and St Aubin, 1990). Studies focused on the health or survival of cetaceans following oil spills are limited except for the *Exxon Valdez* and *Deepwater Horizon* spills. It has been shown that dolphins may not avoid surface oil on the water (Geraci, 1990; Frasier et al., 2020); thus, they can be exposed when swimming through floating oil or in a dispersed oil plume in the water column.

Oceanic dolphins are less likely to experience adverse effects of brief oil exposure because of their high mobility and movement to feed. Species that feed on the surface (e.g., Clymene and Risso's dolphins) would be more vulnerable to exposure to floating oil and dispersants and dispersed oil from surface application than species that feed at depth. It is noted that relatively low numbers of marine mammal carcasses are reported following spills. Williams et al. (2011) estimated historical carcass-detection rates for 14 cetacean species in the northern Gulf of Mexico, which suggested that oceanic dolphin carcasses are recovered at 0.05-4.4%. Thus, the true impacts to these species from offshore spills are difficult to quantify.

BMPs for Offshore Operations:

General: Watch for and avoid collisions with marine mammals and report all distressed or dead marine mammals to the Wildlife Hotline (If no hotline is yet operating, call 877-942-5343 (877-WHALEHELP)). NOAA's Vessel Strike Avoidance Measures and Reporting for Mariners should be implemented to reduce the risk associated with vessel strikes or disturbance of protected species to discountable levels. If marine mammals are sighted oiled or swimming in oil, call 877-WHALEHELP.

Skimming: To avoid entangling marine mammals, a trained observer or crew member is required for all skimming operations.

Booming: Make efforts to reduce slack in boom lines and if possible use stiff, non-tangling material. If a marine mammal is observed trapped or entangled in a boom, open the boom carefully until the animal leaves on its own, and call to report at 877-942-5343 (877-WHALEHELP).

Burning: Watch for and avoid marine mammals while operating vessels or aircraft involved directly or in support of in-situ burn operations. Marine species observer on the ignition vessel will monitor 3 areas prior to the burn (the area in front of the tow boats, oil concentrated in the boom, and any oil trailing behind the boom). A survey should be conducted in the burn area after the burn is complete and any distressed or dead marine mammals should be counted and reported to 877-942-5343 (877-WHALEHELP).

Surface Dispersant: No surface dispersant application within 2 nautical miles of sighted marine mammals.

Subsea Dispersant: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

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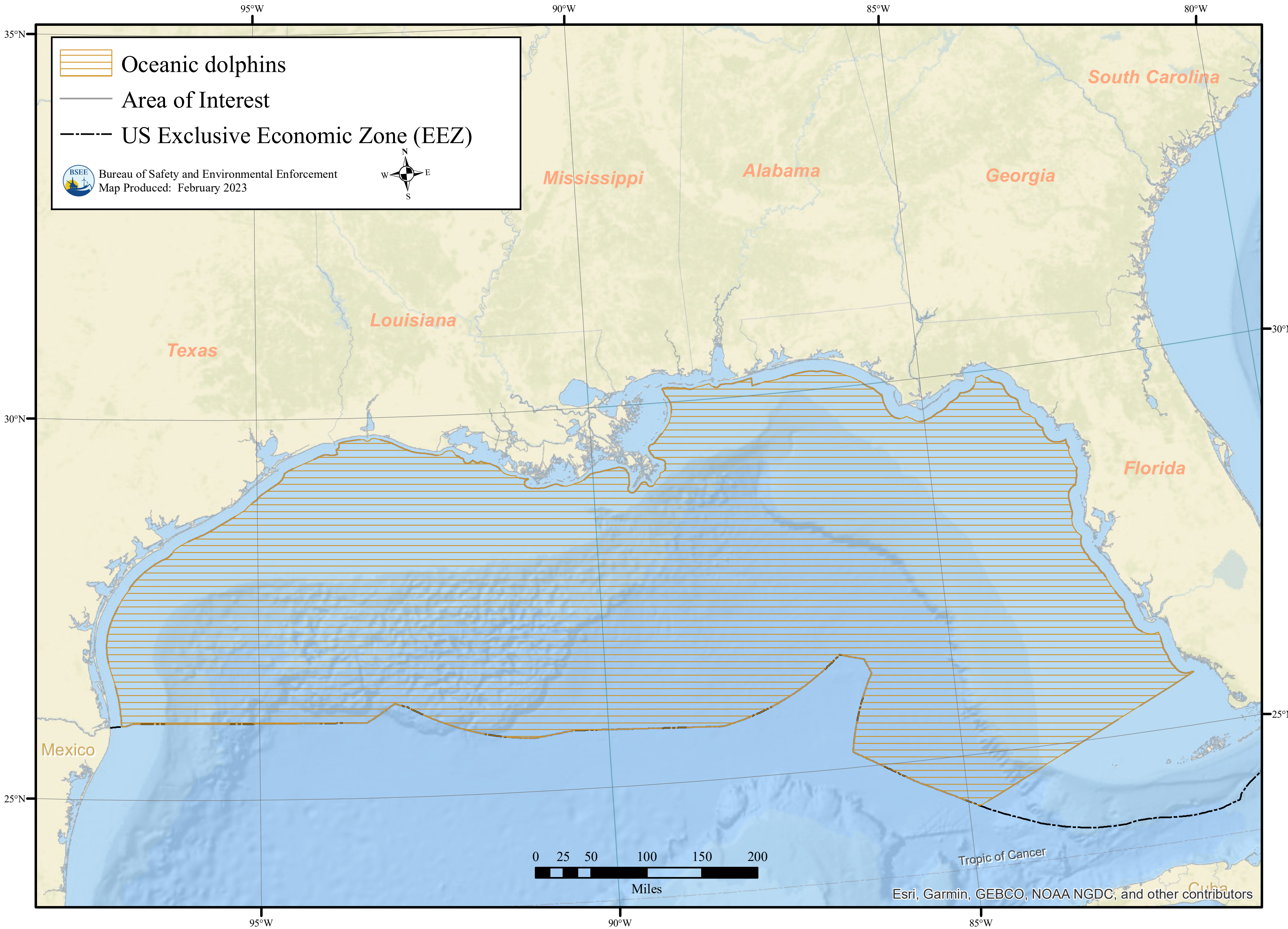

This map represents the approximate range of oceanic dolphins in the Gulf of Mexico.

<table>
<tr><th colspan="2">Small Whales</th><th>ESA Status</th><th>None</th></tr>
<tr><td>Scientific Name</td><td>Blackfish
False killer whale (Pseudorca crassidens)
Pygmy killer whale (Feresa attenuata)
Melon-headed whale (Peponocephala electra)
Small Whales
Pygmy sperm whale (Kogia breviceps)
Dwarf sperm whale (Kogia sima)
Short-finned pilot whale (Globicephala macrorhynchus)
Killer whale (Orcinus orca)</td><td>Critical Habitat</td><td>None</td></tr>
<tr><td colspan="4">Appearance: Killer whales and blackfish (false, pygmy, and killer whales) have dark gray to black bodies with lighter undersides. All have a curved dorsal fin located mid-back with small heads and no discernible rostrum (beak). The false killer whale has a conical head while the pygmy killer whale has a melon shaped forehead extending in front of the mouth. The killer whale has the characteristic white patches near the eyes and grey/white saddle patch behind its large dorsal fin. Pygmy killer whales can resemble melon-headed whales but are distinguished by paired white tooth rakes and a division line separating the pygmy’s darker cape from its lighter lateral coloration.
Kogia whales (pygmy sperm and dwarf sperm whales) are blue/gray on top with white to pink undersides, with small compact bodies and a small round dorsal fin located mid-back. Their heads and backs appear flat with pointed snouts and narrow underslung lower jaws resembling sharks. Both have false gill markings behind their eye. The pygmy sperm whale has no upper jaw teeth while the dwarf sperm whale has teeth on both jaws.
Melon-headed whales (blackfish) have dark bodies with a dorsal covering on their backs and dark areas on the sides of their face. Their heads are small in the shape of a rounded melon with no discernible rostrum, large dorsal fins, and pointed pectoral fins.
Short-finned pilot whales are black or dark brown with a large gray covering behind the dorsal fin. They have bulbous melon-shaped heads with no discernible rostrum and long-based dorsal fins set forward on their bodies.</td></tr>
<tr><td colspan="4">Diet: Killer whales and blackfish (false, pygmy, and killer whales) are top predators and very gregarious social animals, often hunting in natal pods (birth groups) of a few individuals up to several hundred. Diving as deep as 300-500 m for food, they feed primarily on fish and squid, but can expand to marine mammals.
Kogia whales (pygmy sperm and dwarf sperm whales) can hunt individually or in groups up to 16, spending very little time at the surface, diving to at least 300 m. Both use squid tactics to evade predation, releasing ink into the water column in defense. They feed on cephalopods (squid, octopuses), crustaceans (shrimp, crabs), and a variety of fish using echolocation.
Melon-headed whales (blackfish) travel in groups of 100s to 1,000s, often breaking off into smaller subgroups. They are nocturnal feeders, making fast low leaps while swimming, feeding on fish, squid, cuttlefish, and shrimp.
Short-finned pilot whales travel in groups of 25 to 50 and are known for their high-speed dives at depths greater than 300 m in pursuit of squid. They also eat fish and octopus.</td></tr>
<tr><td colspan="4">Population: The NMFS 2020 stock assessments for small whales present in the Gulf of Mexico are: Kogia; 336; killer whale: 267; false killer whale: 494; pygmy killer whale: 613; melon-headed whale: 1,749; and pilot whale: 1,321. All small whales listed here are Least Threatened according to the International Union for Conservation of Nature (IUCN) Red List for 2017-2020, with one exception, the false killer whale listed as Near Threatened in 2018.</td></tr>
<tr><td colspan="4">Distribution/Habitat/Migration (see maps for distribution in the GOM): Small whales can be found mostly in deeper waters offshore in tropical, subtropical, and temperate ocean waters worldwide. In the U.S. they are found in Hawaii, the western North Atlantic, and Gulf of Mexico. Sperm whales are also found in the waters of the Pacific Northwest. Killer whales (false, pygmy, and killer whales) reach sexual maturity between 7 and 15 years with an average lifespan from 30 to 60 years; sperm whales mature faster at around 2.5 to 5 years and have a shorter lifespan of about 22 years. Melon-headed whales and short-finned pilot whales both reach maturity at around 7 to 15 years with lifespans of around 45 years. Passive acoustic monitoring from 2010-2016 showed that</td></tr>
</table>

Kogia species are present year-round in the northern Gulf of Mexico, with peaks in summer (Frasier et al., 2020).
Vulnerabilities and Sensitivities to Oiling: Cetaceans that experience exposure to oil through direct contact, inhalation, ingestion, and/or aspiration of oil can experience severe damage to internal organs and disruption of reproductive processes, resulting in long-term population impacts (Geraci and St Aubin, 1990). Inhalation of toxic vapors can cause inflammation of mucous membranes of the eyes and airways, lung congestion, and possibly pneumonia. Laboratory studies on cetaceans have shown multiple effects from exposure, including liver damage in captive bottlenose dolphins that had crude oil added to their tank; skin lesions in a number of captive delphinid species where oil was applied to their skin; and skin lesions after oil was applied to the skin of a live, stranded sperm whale (Geraci, 1990). It has been shown that marine mammals may not avoid surface oil on the water (Geraci, 1990; Frasier et al., 2020); thus, they can be exposed when swimming through floating oil or in a dispersed oil plume in the water column. Studies focused on the health or survival of cetaceans following oil spills are limited with the exception of the *Exxon Valdez* and *Deepwater Horizon* spills. Impacts from oil spills have been documented mostly for cetaceans that were resident in semi-enclosed waterbodies that were heavily oiled. Wide-ranging oceanic species are at less risk of exposure. Use of dispersants, either at the surface or via subsea injection, is expected to reduce the direct impacts of spilled oil on whales.
BMPs for Offshore Operations: General: Watch for and avoid collisions with marine mammals and report all distressed or dead marine mammals to the Wildlife Hotline (If no hotline is yet operating, call 877-942-5343 (877-WHALEHELP)). NOAA's Vessel Strike Avoidance Measures and Reporting for Mariners should be implemented to reduce the risk associated with vessel strikes or disturbance of protected species to discountable levels. If marine mammals are sighted oiled or swimming in oil, call 877-WHALEHELP. Skimming: To avoid entangling marine mammals, a trained observer or crew member is required for all skimming operations. Booming: Make efforts to reduce slack in boom lines and if possible use stiff, non-tangling material. If a marine mammal is observed trapped or entangled in a boom, open the boom carefully until the animal leaves on its own, and call to report at 877-WHALEHELP. Burning: Watch for and avoid marine mammals while operating vessels or aircraft involved directly or in support of in-situ burn operations. Marine species observer on the ignition vessel will monitor 3 areas prior to the burn (the area in front of the tow boats, oil concentrated in the boom, and any oil trailing behind the boom). A survey should be conducted in the burn area after the burn is complete and any distressed or dead marine mammals should be counted and reported to 877-WHALEHELP. Surface Dispersant: No surface dispersant application within 2 nautical miles of sighted marine mammals. Subsea Dispersant: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area					
Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

References:

DWH NRDA Trustees (Deepwater Horizon Natural Resource Damage Assessment Trustees). 2016a. *Deepwater Horizon* oil spill: final programmatic damage assessment and restoration plan and final programmatic environmental impact statement. https://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan.

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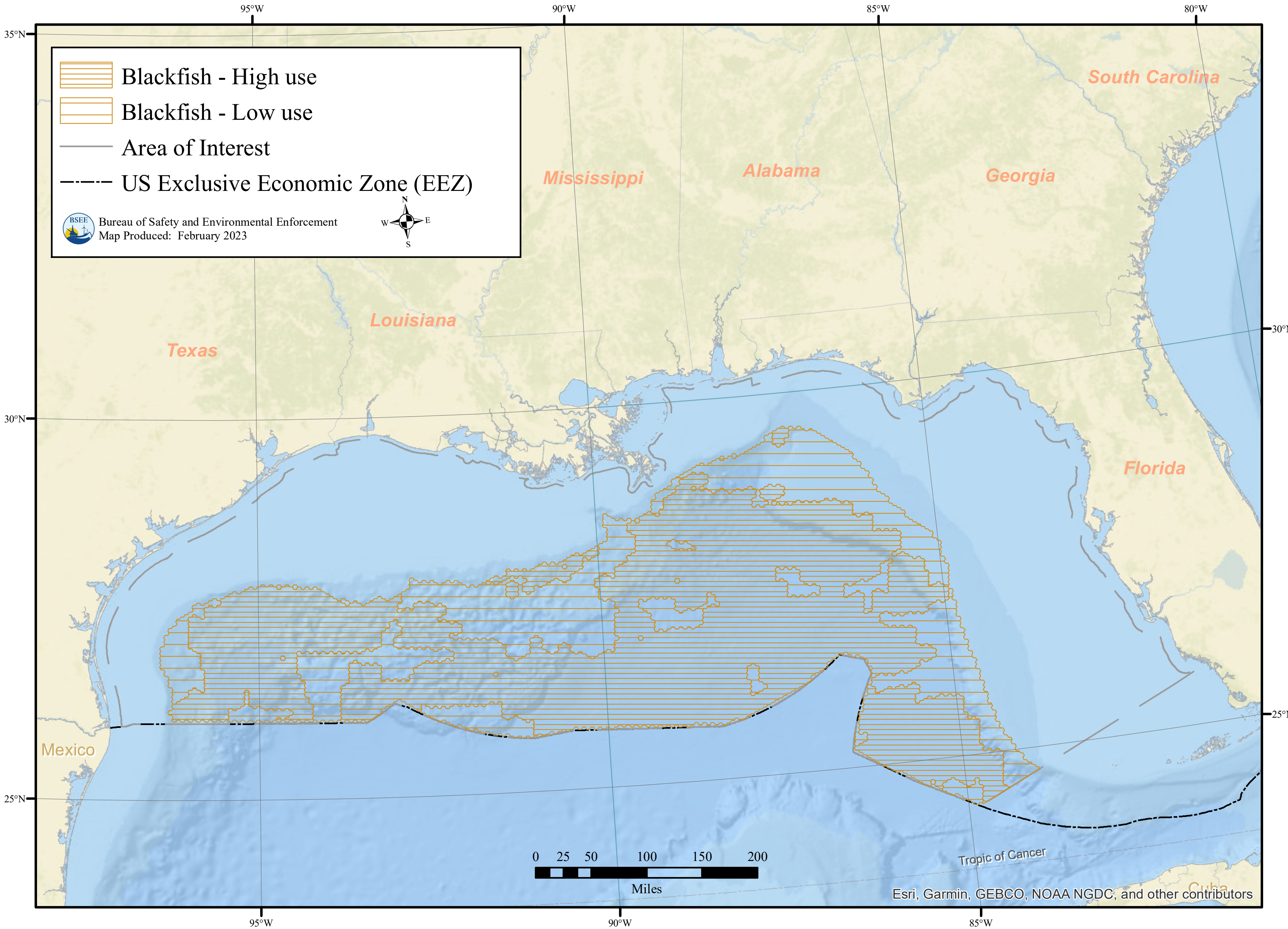
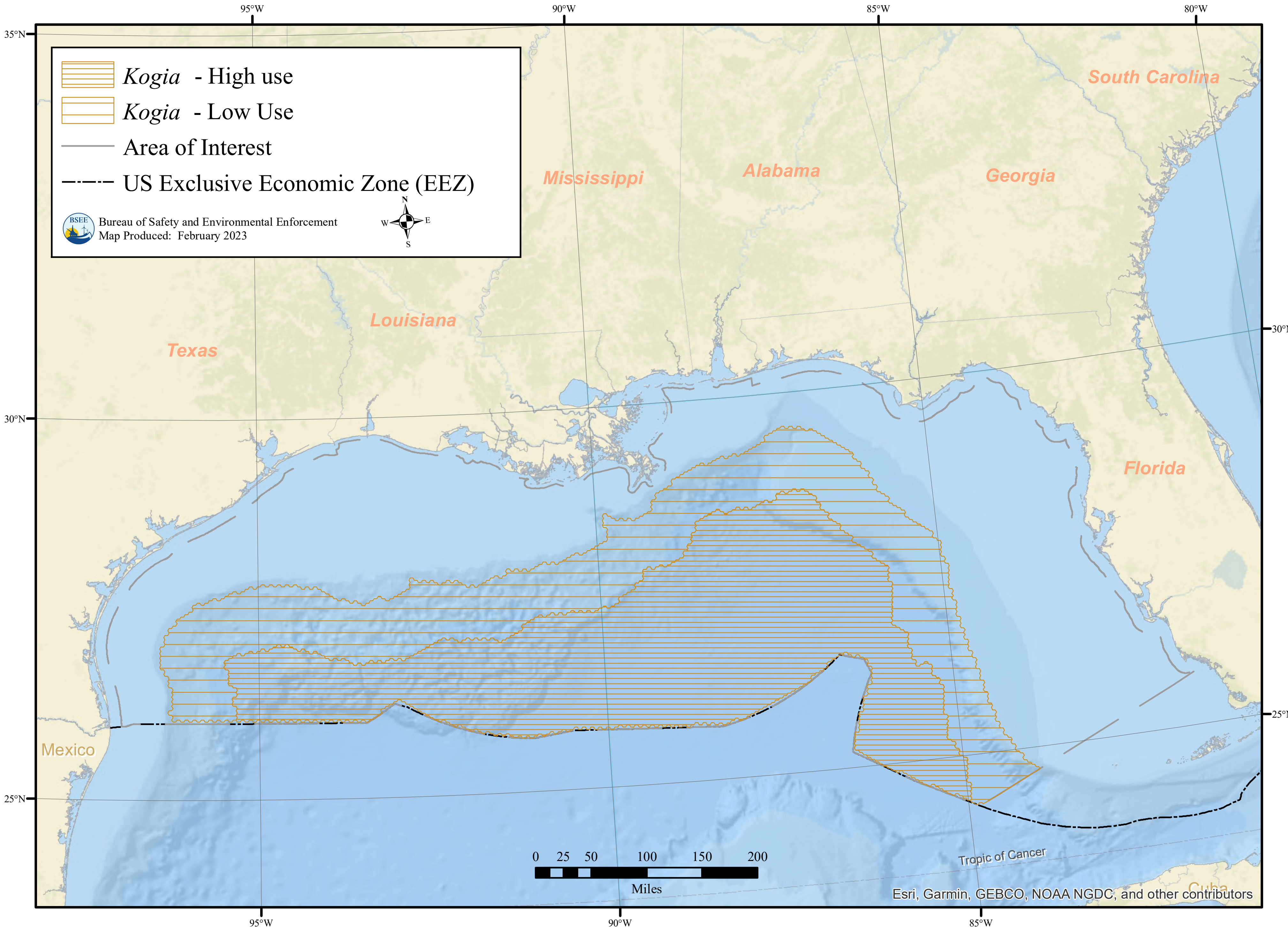
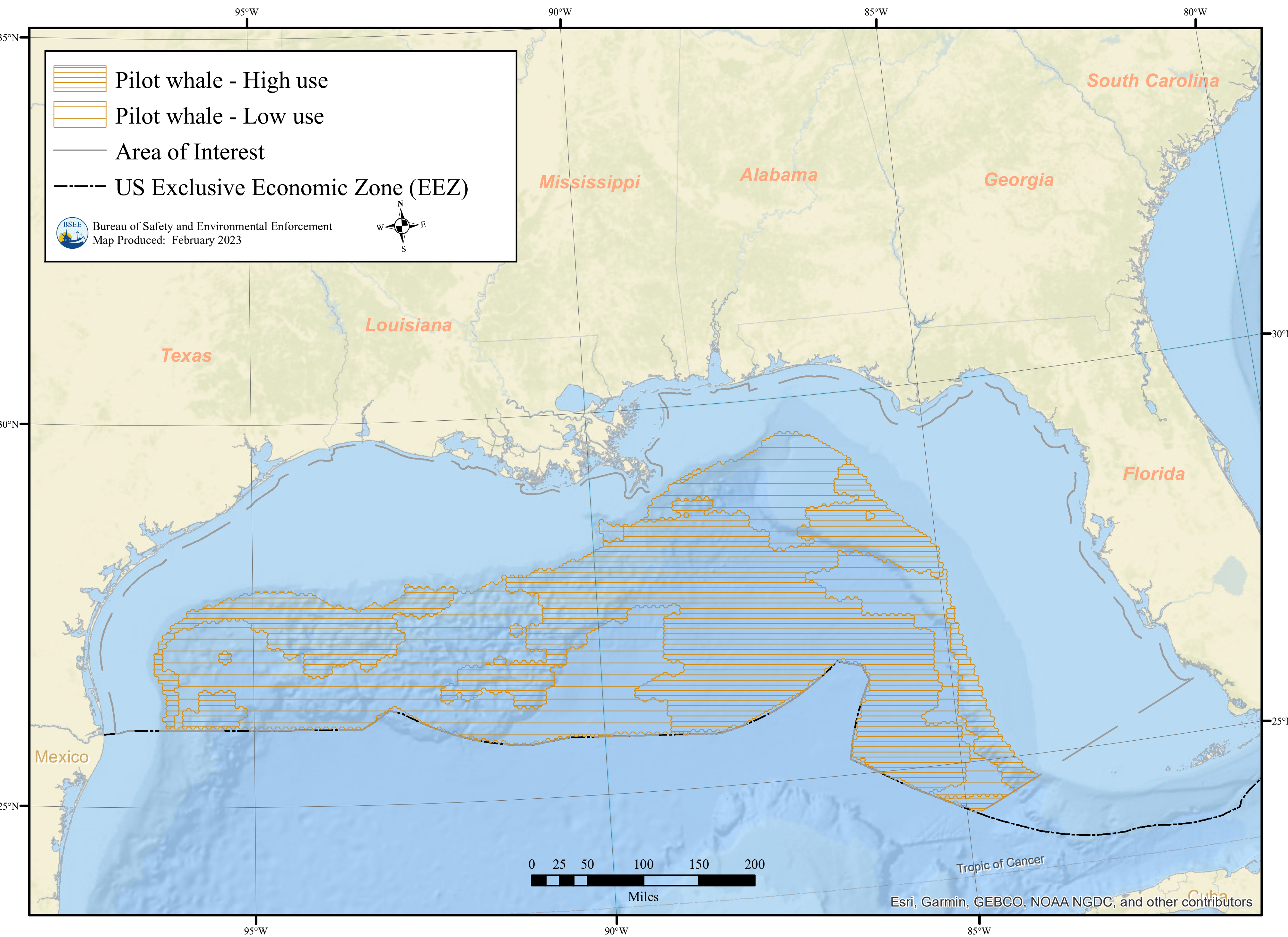


This map represents the approximate range of blackfish (false killer, pygmy killer, and melon-headed whales) in the Gulf of Mexico.



This map represents the approximate range of *Kogia* (dwarf and pygmy sperm whales) in the Gulf of Mexico.



This map represents the approximate range of pilot whale in the Gulf of Mexico.

SPATIAL TEMPORAL PROFILES AND BEST MANAGEMENT PRACTICES

Sea Turtles

- Green Sea Turtle
- Hawksbill Sea Turtle
- Kemp's Ridley Sea Turtle
- Leatherback Sea Turtle
- Loggerhead Sea Turtle

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Green Sea Turtle	ESA Status	Endangered (1978) North Atlantic DPS Threatened (2016)	81 FR 20057
Scientific Name	*Chelonia mydas*	**Critical Habitat**	Final Rule (1998)

Appearance: Variable in color, the adult carapace is smooth, keelless, and light to dark brown with dark mottling. The plastron is whitish to light yellow. Identifying characteristics include 4 pairs of costal scutes and only 1 pair of prefrontal scales. They are one of the largest hard-shelled sea turtles.

Diet: Green sea turtle hatchlings and early-stage juveniles eat a variety of plants and animals typically found in pelagic drift communities. Neritic stage juveniles and adult turtles shift to a mainly herbivorous diet consisting primarily of seagrasses and benthic macroalgae but may include sponges and other invertebrates.

Population: All major nesting populations within the North Atlantic Distinct Population Segments (DPS) represent a trend of increasing abundance. Nesting in Florida has increased substantially over the last 20 years.

Distribution/Habitat/Migration (see map for distribution in the GOM): Green sea turtles can be found in the U.S. Atlantic and Gulf of Mexico waters inshore and nearshore from Texas to Massachusetts, the U.S. Virgin Islands, and Puerto Rico. Hatchlings and early stage juveniles occupy oceanic habitats greater than 200 m, moving with the predominant oceanic gyres, until a shift to the post-pelagic development phase at around 5-7 years where the turtles occupy neritic habitats such as coral and nearshore reefs, seagrass beds to inshore bays, estuaries, and manmade embayments. Eleven DPS have been identified for the green sea turtle, which are distributed globally. The U.S. Gulf of Mexico region falls within the North Atlantic DPS. Areas that support major nesting concentrations within the North Atlantic DPS include: Costa Rica, Mexico, Cuba, and Florida (U.S.). In Florida, nesting occurs in all coastal areas except the Big Bend area of eastern central Florida. Within the U.S., green sea turtles are known to occasionally nest in Puerto Rico, North Carolina, South Carolina, Georgia, and Texas. Adults migrate between nesting and foraging habitats, hundreds to sometimes thousands of kilometers away. Females migrate from foraging areas to nesting beaches approximately every 2-5 years while adult males can breed every year.

Vulnerabilities and Sensitivities to Oiling: Sea turtle biology and behavior place them at risk of oil exposure during spills at sea, including dependence on nesting beaches, lack of avoidance behavior, reliance on oceanographic features that tend to accumulate oil, propensity for accidental ingestion, and specific sensitivities of some life stages (Wallace et al., 2020; Shigenaka et al., 2021). During the *Deepwater Horizon* spill, most reports of oiled surface pelagic juvenile turtles originated from convergence zones (DWH NRDA Trustees, 2016).

Sea turtles can be exposed to oil through direct contact with skin or eggs, ingestion, or inhalation. Sea turtles breathe at the water surface, and inhalation of oil may impair the olfactory gland, affecting sea turtles' sense of smell. The sense of smell plays a key role in sea turtle navigation and orientation. Damaging that sense could lead to overall harm to a population of sea turtles trying to orient during migration or to natal nesting beaches. Ingestion by unknowingly eating tar balls or contaminated food is a direct effect of an oil spill; however, reduced food availability is an indirect effect that can lead to a decline in local sea turtle populations.

Physical fouling by oil is the most frequently reported effect of oil exposure on sea turtles (Shigenaka et al., 2021). Coating of oil on sea turtles at any life stage can have similar effects caused by smothering, clogging the mouth and nose, or creating an inability to maneuver. Oil contact can cause acute toxicity in hatchlings and impair their movements and normal bodily functions if coated. At sea, juvenile and adult sea turtles can be weighed down by oil, which can obstruct their ability to surface for air and reduce their ability to dive for feeding or to avoid predators or vessel strikes. Heavy oiling can interfere with regulation of temperature. Ingesting oil either directly (i.e., eating tar balls) or indirectly (i.e., consuming contaminated foods) can cause acute toxicity or, in terms of tar balls, can lead to blockage of their mouths or esophageal pathways. Loehefener et al. (1989) found tar balls in the mouths, esophagi, and stomachs of 65 out of 103 post-hatchling loggerhead turtles off the east coast of Florida in a convergence zone. Hatchlings, juveniles, and adults can experience difficulty eating if their beaks and esophagi are blocked, which could lead to starvation. Tar balls or oil that is ingested can also cause gut blockage, decreased absorption efficiency, absorption of toxins, effects of general intestinal blockage (i.e., local necrosis or ulceration), interference with fat metabolism, and buoyancy control

problems caused by buildup of fermentation gases (Shigenaka et al. 2021). Buoyancy control allows sea turtles to surface or dive to depth freely; without this ability, they are especially vulnerable to predators, vessel strikes, and disruption of normal feeding behavior. Harms et al. (2014) exposed 3-day old loggerhead hatchlings to crude oil with and without dispersant for 1 to 4 days, resulting in a failure to gain weight, indicating a lack of normal hydration in seawater.
BMPs for Offshore Operations: General: All vessels must be equipped with the necessary equipment (dip nets, holding containers, towels, etc.) to capture and hold sea turtles aboard the vessel. Resuscitate any live, unresponsive sea turtles according to the official sea turtle resuscitation guidelines (https://www.greateratlantic.fisheries.noaa.gov/protected/stranding/disentanglements/turtle/seaturtlehandlingresuscitationv1.pdf). Safely release uninjured and unoiled sea turtles over the stern of the boat, when gear is not in use, the engine is in neutral, and in areas where they are unlikely to be recaptured or injured by vessels. Retrieve injured/dead/oiled sea turtles using the Sea Turtle At-Sea Retrieval Protocol (http://sero.nmfs.noaa.gov/sustainable_fisheries/gulf_sa/turtle_sawfish_release/documents/pdfs/turtle_release_protocols.pdf). Skimming: Juvenile sea turtles associate with floating *Sargassum*, so avoid skimming *Sargassum* that is not oiled or is only very lightly oiled. To avoid entangling sea turtles, a trained observer or crew member is required for all skimming operations. Booming: All deployed boom must include: (1) gaps between boom or sufficient space under boom to allow sea turtles to go around or under them, (2) boom should be monitored daily for sea turtle presence. If a sea turtle is observed trapped or entangled in boom, open the boom carefully until the animal leaves on its own. Burning: Sea turtle observers on the ignition vessel will monitor 3 areas prior to the burn (the area in front of the trawlers, oil concentrated in the boom, and any oil trailing behind the boom) to spot and retrieve any sea turtles prior to the burn. A survey should be conducted in the burn area after the burn is complete and all dead sea turtles should be counted and if possible collected. Avoid burning unoiled/lightly oiled *Sargassum*. Aerial Dispersant: No dispersant application within 2 nautical miles of sighted sea turtles. Subsea Dispersants: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	X	X	X	X	X

References:

DWH NRDA Trustees (Deepwater Horizon Natural Resource Damage Assessment Trustees). 2016. *Deepwater Horizon* oil spill: final programmatic damage assessment and restoration plan and final programmatic environmental impact statement. https://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan.

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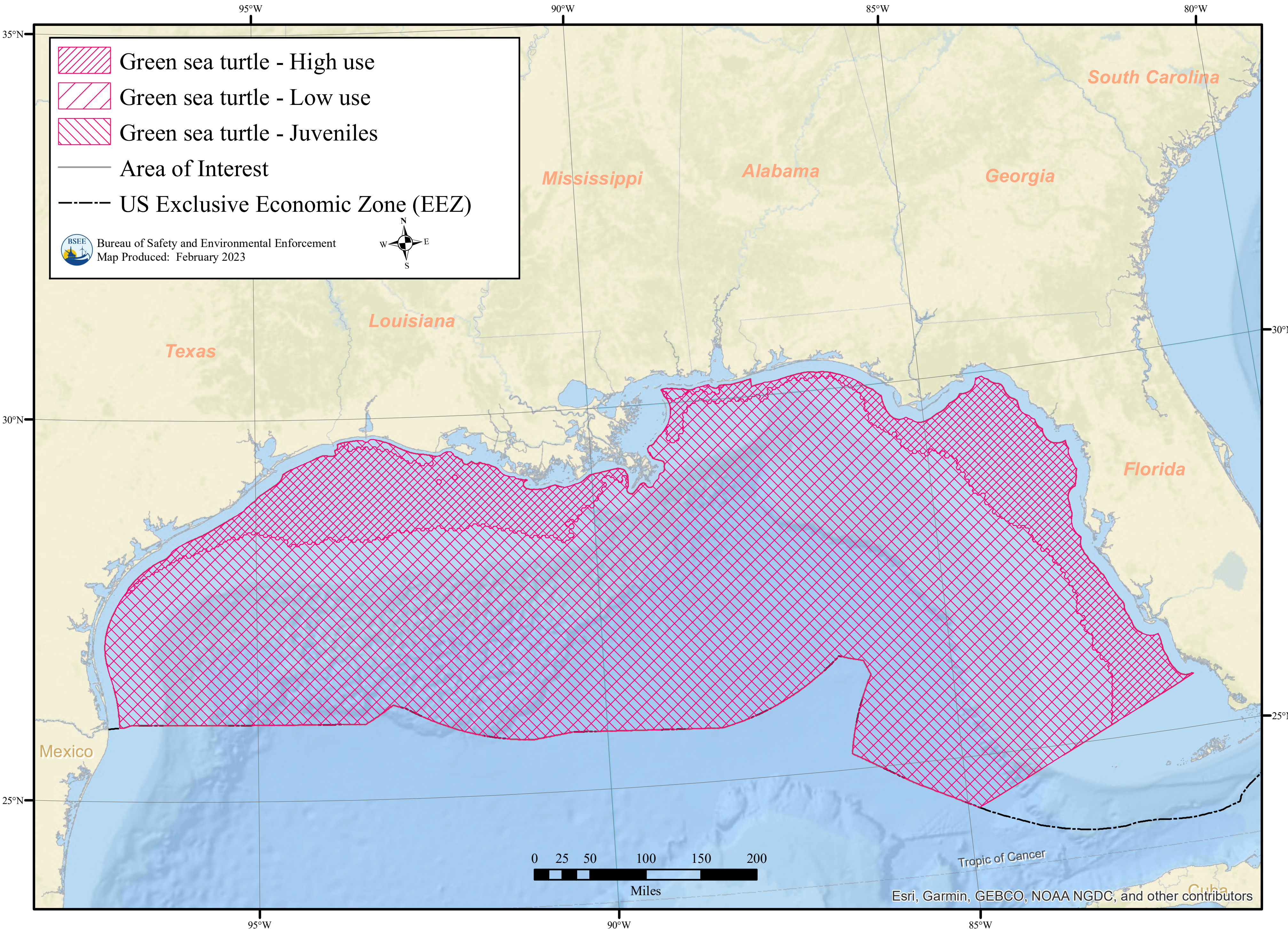
Wallace BP et al. 2020. Oil spills and sea turtles: documented effects and considerations for response and assessment efforts. Endangered Species Research 41:17-37.



This map represents the approximate range of green sea turtle in the Gulf of Mexico.

Hawksbill Sea Turtle		ESA Status	Endangered (1970)	35 FR 8491
Scientific Name	*Eretmochelys imbricata*	**Critical Habitat**		Final Rule (1998)

Appearance: Brown with a mix of yellow, orange, or reddish brown on the carapace. The plastron is yellowish with black spots. The hawksbill is the only sea turtle with the combination of 2 pairs of prefrontal scales on the head and 4 pairs of costal scutes on the carapace. Also distinctive is its small head with hawk-like beak, and flippers with 2 claws.

Diet: This species prefers sea sponges and is usually associated with the coral reef community. Its beak aids in foraging in holes in coral reefs. Omnivorous, the hawksbill can feed on a variety of foods such as mollusks, marine algae, crustaceans, sea urchins, small fish, and jellyfish.

Population: Hawksbill populations have been greatly depleted from historic levels, with populations in the Atlantic Ocean generally doing better than those in the Indo-Pacific regions.

Distribution/Habitat/Migration (see map for distribution in the GOM): The hawksbill is known to be circumtropical, inhabiting waters between 30°N and 30°S latitudes in the Atlantic, Pacific, and Indian Oceans. It is most common in Puerto Rico and the U.S. Virgin Islands in the U.S. Atlantic territories, and in Florida, Texas, and occasionally in each of the Gulf states and on the east coast of Massachusetts, within the continental U.S. In Florida, the hawksbill can be found in reefs off Palm Beach, Broward, and Miami-Dade counties. Adult hawksbills are seldom seen in waters deeper than 20 m. Juveniles and early-stage hatchlings are usually found in the pelagic zone taking shelter in floating algal mats. After a few years, smaller juveniles migrate to neritic zones, including coral reef habitats, to feed. Habitat preferences include ledges and caves for shelter and rock formations and high energy shoals which provide good areas for sponge growth. In the absence of coral reef habitat, hawksbills can inhabit mangroves in bays and estuaries. The most significant nesting sites in the U.S. are on Mona Island in Puerto Rico and the U.S. Virgin Islands, specifically Buck Island Reef National Monument. In the continental U.S., nesting is rare and restricted to the southwest coast of Florida and the Florida Keys. This species has mixed migration patterns, with some migrating long distances between foraging and nesting areas while others stay close to their rookeries. Females tend to return to their natal beaches every 2-5 years to nest.

Vulnerabilities and Sensitivities to Oiling: Sea turtle biology and behavior place them at risk of oil exposure during spills at sea, including dependence on nesting beaches, lack of avoidance behavior, reliance on oceanographic features that tend to accumulate oil, propensity for accidental ingestion, and specific sensitivities of some life stages (Wallace et al., 2020; Shigenaka et al., 2021).

Sea turtles can be exposed to oil through direct contact with skin or eggs, ingestion, or inhalation. Sea turtles breathe at the water surface, and inhalation of oil may impair the olfactory gland, affecting sea turtles' sense of smell. The sense of smell plays a key role in sea turtle navigation and orientation. Damaging that sense could lead to overall harm to a population of sea turtles trying to orient during migration or to natal nest beaches. Ingestion by unknowingly eating tar balls or contaminated food is a direct effect of an oil spill; however, reduced food availability is an indirect effect that can lead to a decline in local sea turtle populations.

Physical fouling by oil is the most frequently reported effect of oil exposure on sea turtles (Shigenaka et al., 2021). Coating of oil on sea turtles at any life stage can have similar effects caused by smothering, clogging the mouth and nose, or creating an inability to maneuver. Oil contact can cause acute toxicity in hatchlings and impair their movements and normal bodily functions if coated. At sea, juvenile and adult sea turtles can be weighed down by oil, which can obstruct their ability to surface for air and reduce their ability to dive for feeding or to avoid predators or vessel strikes. Heavy oiling can interfere with regulation of temperature. Ingesting oil either directly (i.e., eating tar balls) or indirectly (i.e., consuming contaminated foods) can cause acute toxicity or, in the case of tar balls, can lead to blockage of their mouths or esophageal pathways. Loehefener et al. (1989) found tar balls in the mouths, esophagi, and stomachs of 65 out of 103 post-hatchling loggerhead turtles off the east coast of Florida in a convergence zone. Hatchlings, juveniles, and adults can experience difficulty eating if their beaks and esophagi are blocked, which could lead to starvation. Tar balls or oil that is ingested can also cause gut blockage, decreased absorption efficiency, absorption of toxins, effects of general intestinal blockage (i.e., local necrosis or ulceration), interference with fat metabolism, and buoyancy control problems caused by buildup of fermentation gases (Shigenaka et al., 2021). Buoyancy control allows sea turtles to surface or dive to depth freely; without this ability, they are especially vulnerable to predators, vessel strikes, and disruption of normal feeding behavior.

Harms et al. (2014) exposed 3-day old loggerhead hatchlings to crude oil with and without dispersant for 1 to 4 days, resulting in a failure to gain weight, indicating a lack of normal hydration in seawater.

BMPs for Offshore Operations:

General: All vessels must be equipped with the necessary equipment (dip nets, holding containers, towels, etc.) to capture and hold sea turtles aboard the vessel. Resuscitate any live, unresponsive sea turtles according to the official sea turtle resuscitation guidelines (https://www.greateratlantic.fisheries.noaa.gov/protected/stranding/disentanglements/turtle/seaturtlehandlingresuscitationv1.pdf). Safely release uninjured and unoiled sea turtles over the stern of the boat when gear is not in use, the engine is in neutral, and in areas where they are unlikely to be recaptured or injured by vessels. Retrieve injured/dead/oiled sea turtles using the Sea Turtle At-Sea Retrieval Protocol (http://sero.nmfs.noaa.gov/sustainable_fisheries/gulf_sa/turtle_sawfish_release/documents/pdfs/turtle_release_protocols.pdf).

Skimming: Juvenile sea turtles associate with floating *Sargassum*, so avoid skimming *Sargassum* that is not oiled or is only very lightly oiled. To avoid entangling sea turtles, a trained observer or crew member is required for all skimming operations.

Booming: All deployed boom must include: (1) gaps between boom or sufficient space under boom to allow sea turtles to go around or under them, (2) boom should be monitored daily for sea turtle presence. If a sea turtle is observed trapped or entangled in boom, open the boom carefully until the animal leaves on its own.

Burning: Sea turtle observers on the ignition vessel will monitor 3 areas prior to the burn (the area in front of the trawlers, oil concentrated in the boom, and any oil trailing behind the boom) to spot and retrieve any sea turtles prior to the burn. A survey should be conducted in the burn area after the burn is complete and all dead sea turtles should be counted and, if possible, collected. Avoid burning unoiled/lightly oiled *Sargassum*.

Aerial Dispersant: No dispersant application within 2 nautical miles of sighted sea turtles.

Subsea Dispersants: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
	X				

References:

Harms CA et al. 2014. Clinical pathology effects of crude oil and dispersant on hatchling loggerhead sea turtles (*Caretta caretta*). In Proc. of the 45th Annual Meeting of the International Association for Aquatic Animal Medicine, http://www.vin.com/apputil/content/defaultadv1.aspx?pId=11397&meta=Generic&id=6251903.

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Michel J. (ed). 2021. Oil spill effects literature study of spills of greater than 20,000 barrels of crude oil, condensate, or diesel. Sterling (VA): US Department of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2020-058. 326 p.

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Shigenaka G, Stacy BA, and Wallace BP. 2021. Oil and sea turtles: biology, planning, and response. Seattle (WA): U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, Office of Response and Restoration. 117 p. + appendices.

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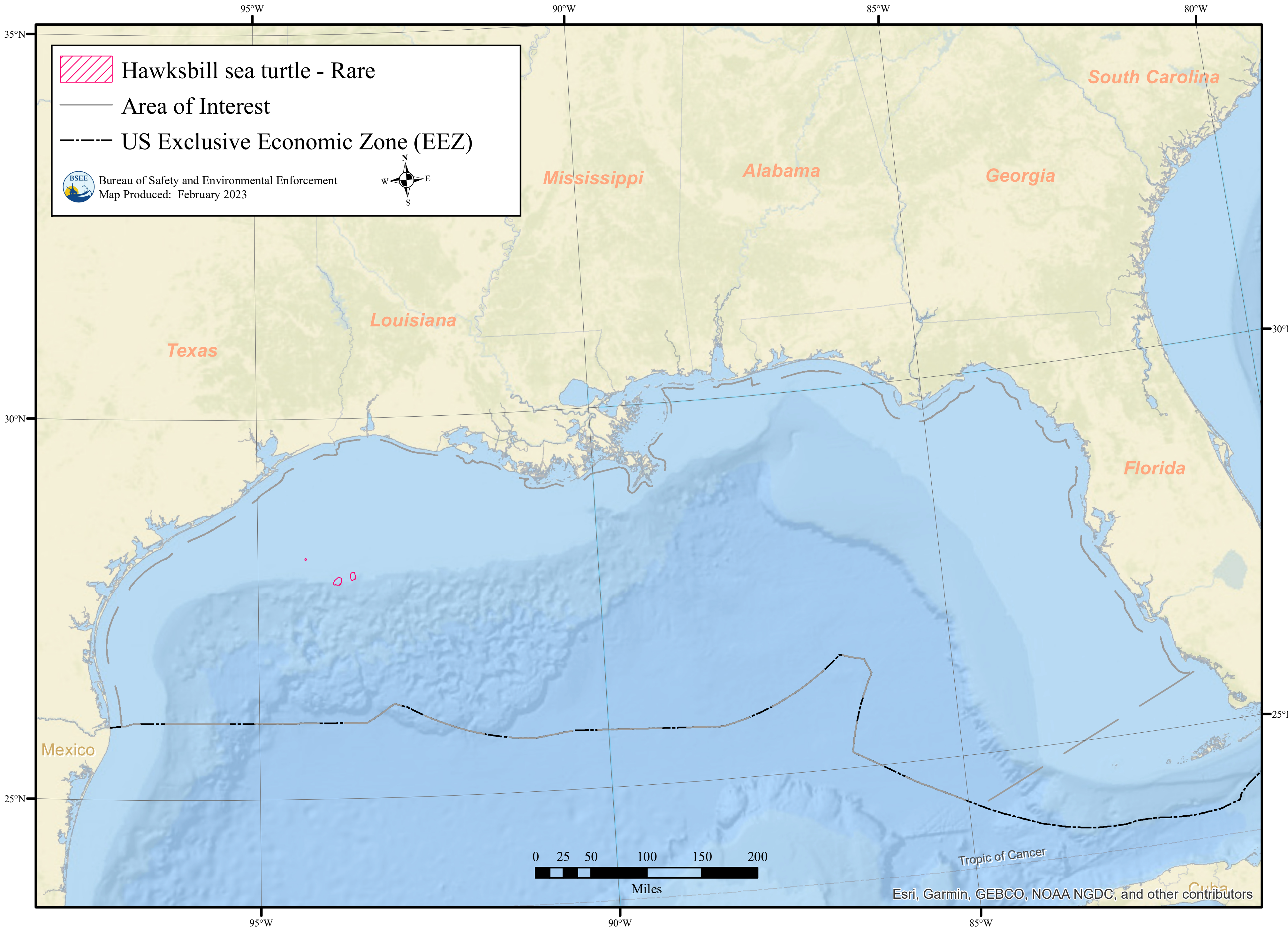

This map represent the approximate range of hawksbill sea turtle in the Gulf of Mexico.

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Kemp's Ridley Sea Turtle		ESA Status	Endangered (1970)	35 FR 18319
Scientific Name	*Lepidochelys kempii*	**Critical Habitat**		Petitioned (2010)

Appearance: Grayish-green, nearly circular top shell with a pale yellowish bottom shell. They are the smallest marine turtle.

Diet: The distribution of foraging Kemp's ridley sea turtles is related to the distribution and availability of all the major crab species that constitute the bulk of their diet. Neritic zone juvenile Kemp's ridley sea turtles feed primarily on decapod crustaceans. Neritic zone adult Kemp's ridleys have a preference for portunid crabs. Adults appear to be shallow-water, benthic feeders, consuming primarily crabs and occasionally clams, shrimp, vegetation, fish, and marine debris.

Population: The Kemp's ridley has experienced a dramatic decrease in arribada size at the nesting beaches of Rancho Nuevo. Today, the Kemp's ridley population appears to be in the early stages of recovery.

Distribution/Habitat/Migration (see map for distribution in the GOM): Kemp's ridleys are distributed throughout the Gulf of Mexico and U.S. Atlantic seaboard. Adult Kemp's ridleys primarily occupy neritic habitats (muddy or sandy bottoms where prey can be found). They rarely venture into waters deeper than 50 m. In the U.S., nesting occurs primarily in Texas and occasionally from Florida to North Carolina. Juveniles associate with floating *Sargassum*, utilizing it as an area of refuge, rest, and/or food. Overnight data from observing three juvenile Kemp's ridleys showed that they spend 97% of the day and 87% of the night within 1 m of the surface (Witherington et al. 2012). Pelagic juveniles spend ~2 years in the ocean prior to recruiting to nearshore waters. Some males migrate annually between feeding and breeding grounds; others may not migrate at all. Hatchlings may be found in currents within the Gulf of Mexico.

Vulnerabilities and Sensitivities to Oiling: Sea turtle biology and behavior place them at risk of oil exposure during spills at sea, including dependence on nesting beaches, lack of avoidance behavior, reliance on oceanographic features that tend to accumulate oil, propensity for accidental ingestion, and specific sensitivities of some life stages (Wallace et al., 2020; Shigenaka et al., 2021). During the *Deepwater Horizon* spill, most reports of oiled surface pelagic juvenile turtles originated from convergence zones (DWH NRDA Trustees, 2016).

Sea turtles can be exposed to oil through direct contact with skin or eggs, ingestion, or inhalation. Sea turtles breathe at the water surface, and inhalation of oil may impair the olfactory gland, affecting sea turtles' sense of smell. The sense of smell plays a key role in sea turtle navigation and orientation. Damaging that sense could lead to overall harm to a population of sea turtles trying to orient during migration or to natal nesting beaches. Ingestion by unknowingly eating tar balls or contaminated food is a direct effect of an oil spill; however, reduced food availability is an indirect effect that can lead to a decline in local sea turtle populations.

Physical fouling by oil is the most frequently reported effect of oil exposure on sea turtles (Shigenaka et al., 2021). Coating of oil on sea turtles at any life stage can have similar effects caused by smothering, clogging the mouth and nose, or creating an inability to maneuver. Oil contact can cause acute toxicity in hatchlings and impair their movements and normal bodily functions if coated. At sea, juvenile and adult sea turtles can be weighed down by oil, which can obstruct their ability to surface for air and reduce their ability to dive for feeding or to avoid predators or vessel strikes. Heavy oiling can interfere with regulation of temperature. Ingesting oil either directly (i.e., eating tar balls) or indirectly (i.e., consuming contaminated foods) can cause acute toxicity or, in terms of tar balls, can lead to blockage of their mouths or esophageal pathways. Loehefener et al. (1989) found tar balls in the mouths, esophagi, and stomachs of 65 out of 103 post-hatchling loggerhead turtles off the east coast of Florida in a convergence zone. Hatchlings, juveniles, and adults can experience difficulty eating if their beaks and esophagi are blocked, which could lead to starvation. Tar balls or oil that is ingested can also cause gut blockage, decreased absorption efficiency, absorption of toxins, effects of general intestinal blockage (i.e., local necrosis or ulceration), interference with fat metabolism, and buoyancy control problems caused by buildup of fermentation gases (Shigenaka et al., 2021). Buoyancy control allows sea turtles to surface or dive to depth freely; without this ability, they are especially vulnerable to predators, vessel strikes, and disruption of normal feeding behavior.

Harms et al. (2014) exposed 3-day old loggerhead hatchlings to crude oil with and without dispersant for 1 to 4 days, resulting in a failure to gain weight, indicating a lack of normal hydration in seawater for both treatments.
BMPs for Offshore Operations: General: All vessels must be equipped with the necessary equipment (dip nets, holding containers, towels, etc.) to capture and hold sea turtles aboard the vessel. Resuscitate any live, unresponsive sea turtles according to the official sea turtle resuscitation guidelines (https://www.greateratlantic.fisheries.noaa.gov/protected/stranding/disentanglements/turtle/seaturtlehandlingresuscitationv1.pdf). Safely release uninjured and unoiled sea turtles over the stern of the boat, when gear is not in use, the engine is in neutral, and in areas where they are unlikely to be recaptured or injured by vessels. Retrieve injured/dead/oiled sea turtles using the Sea Turtle At-Sea Retrieval Protocol (http://sero.nmfs.noaa.gov/sustainable_fisheries/gulf_sa/turtle_sawfish_release/documents/pdfs/turtle_release_protocols.pdf). Skimming: Juvenile Kemp's ridley sea turtles associate with floating *Sargassum*, so avoid skimming *Sargassum* that is not oiled or is only very lightly oiled. To avoid entangling sea turtles, a trained observer or crew member is required for all skimming operations. Booming: All deployed boom must include: (1) gaps between boom or sufficient space under boom to allow sea turtles to go around or under them, (2) boom should be monitored daily for sea turtle presence. If a sea turtle is observed trapped or entangled in boom, open the boom carefully until the animal leaves on its own. Burning: Sea turtle observer on the ignition vessel will monitor 3 areas prior to the burn (the area in front of the trawlers, oil concentrated in the boom, and any oil trailing behind the boom) to spot and retrieve any sea turtles prior to the burn. A survey should be conducted in the burn area after the burn is complete and all dead sea turtles should be counted and, if possible, collected. Avoid burning unoiled/lightly oiled *Sargassum*. Aerial Dispersant: No dispersant application within 2 nautical miles of sighted sea turtles. Subsea Dispersants: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area					
Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

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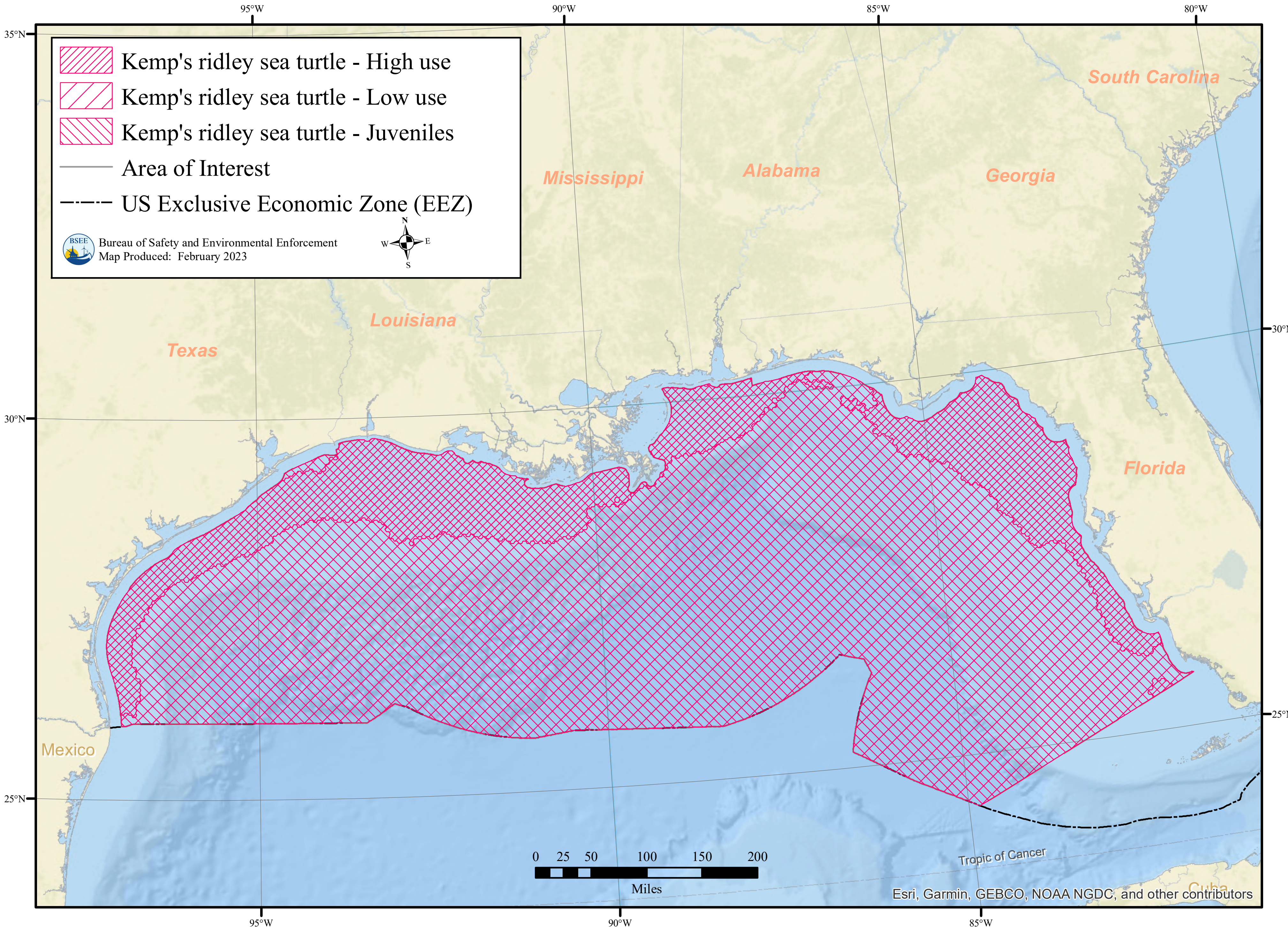

This map represents the approximate range of Kemp's ridley sea turtle in the Gulf of Mexico.

Leatherback Sea Turtle		ESA Status	Endangered (1970)	35 FR 5961
Scientific Name	*Dermochelys coriacea*	**Critical Habitat**		Final Rule (1979)

Appearance: The largest of all sea turtles, the leatherback's shell is composed of small bones covered by mostly black rubbery skin with variable pale spots. Distinguishing characteristics include the pink spot on the dorsal surface of the adult head, no prefrontal scales, 7 ridges on the shell, and the absence of scutes. It has paddle-like clawless limbs.

Diet: The leatherback is the most pelagic of all sea turtles, preferring to feed on jellyfish, but may also utilize sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed. Its sharp-edged jaws and pointed tooth-like cusps allow it to eat more soft-bodied open ocean prey.

Population: Although populations are declining in many parts of the world, with especially dramatic declines in the Pacific, leatherback populations appear to be stable in many nest areas in the Atlantic and Indian Oceans. In Florida, the number of nests has generally increased since 1979.

Distribution/Habitat/Migration (see map for distribution in the GOM): Leatherbacks are found worldwide in tropical and subtropical waters of the Atlantic, Pacific, and Indian Oceans. The leatherback spends its life in the pelagic zone except when females come ashore to lay eggs. Multiple migration patterns are found to exist between breeding populations. Extraordinary swimmers and excellent navigators, they have the longest migration routes between feeding and nesting sites of any sea turtle, traveling sometimes up to 11,000 km. Leatherbacks can dive to depths of approximately 1,200 m and can stay down for up to 85 minutes. Within the U.S. Atlantic territories, major nesting occurs in Puerto Rico and the U.S. Virgin Islands. In the continental U.S., nesting occurs in southeastern Florida, specifically Brevard and Broward counties. Leatherbacks grow rapidly from hatchlings to juveniles, faster than hard-shelled sea turtles. Little is known about the post-hatchling to adult phases.

Vulnerabilities and Sensitivities to Oiling: Sea turtle biology and behavior place them at risk of oil exposure during spills at sea, including dependence on nesting beaches, lack of avoidance behavior, reliance on oceanographic features that tend to accumulate oil, propensity for accidental ingestion, and specific sensitivities of some life stages (Shigenaka et al., 2021).

Sea turtles can be exposed to oil through direct contact with skin or eggs, ingestion, or inhalation. Sea turtles breathe at the water surface, and inhalation of oil may impair the olfactory gland, affecting sea turtles' sense of smell. The sense of smell plays a key role in sea turtle navigation and orientation. Damaging that sense could lead to overall harm to a population of sea turtles trying to orient during migration or to natal nesting beaches. Ingestion by unknowingly eating tar balls or contaminated food is a direct effect of an oil spill; however, reduced food availability is an indirect effect that can lead to a decline in local sea turtle populations.

Physical fouling by oil is the most frequently reported effect of oil exposure on sea turtles (Shigenaka et al., 2021). Coating of oil on sea turtles at any life stage can have similar effects caused by smothering, clogging the mouth and nose, or creating an inability to maneuver. Oil contact can cause acute toxicity in hatchlings and impair their movements and normal bodily functions if coated. At sea, juvenile and adult sea turtles can be weighed down by oil, which can obstruct their ability to surface for air and reduce their ability to dive for feeding or to avoid predators or vessel strikes. Heavy oiling can interfere with regulation of temperature. Ingesting oil either directly (i.e., eating tar balls) or indirectly (i.e., consuming contaminated foods) can cause acute toxicity or, in terms of tar balls, can lead to blockage of their mouths or esophageal pathways. Loehefener et al. (1989) found tar balls in the mouths, esophagi, and stomachs of 65 out of 103 post-hatchling loggerhead turtles off the east coast of Florida in a convergence zone. Hatchlings, juveniles, and adults can experience difficulty eating if their beaks and esophagi are blocked, which could lead to starvation. Tar balls or oil that is ingested can also cause gut blockage, decreased absorption efficiency, absorption of toxins, effects of general intestinal blockage (i.e., local necrosis or ulceration), interference with fat metabolism, and buoyancy control problems caused by buildup of fermentation gases (Shigenaka et al., 2021). Buoyancy control allows sea turtles to surface or dive to depth freely; without this ability, they are especially vulnerable to predators, vessel strikes, and disruption of normal feeding behavior.

Harms et al. (2014) exposed 3-day old loggerhead hatchlings to crude oil with and without dispersant for 1 to 4 days, resulting in a failure to gain weight, indicating a lack of normal hydration in seawater.
BMPs for Offshore Operations: General: All vessels must be equipped with the necessary equipment (dip nets, holding containers, towels, etc.) to capture and hold sea turtles aboard the vessel. Resuscitate any live, unresponsive sea turtles according to the official sea turtle resuscitation guidelines (https://www.greateratlantic.fisheries.noaa.gov/protected/stranding/disentanglements/turtle/seaturtlehandlingresuscitationv1.pdf). Safely release uninjured and unoiled sea turtles over the stern of the boat, when gear is not in use, the engine is in neutral, and in areas where they are unlikely to be recaptured or injured by vessels. Retrieve injured/dead/oiled sea turtles using the Sea Turtle At-Sea Retrieval Protocol (http://sero.nmfs.noaa.gov/sustainable_fisheries/gulf_sa/turtle_sawfish_release/documents/pdfs/turtle_release_protocols.pdf). Skimming: Juvenile sea turtles associate with floating *Sargassum*, so avoid skimming *Sargassum* that is not oiled or is only very lightly oiled. To avoid entangling sea turtles, a trained observer or crew member is required for all skimming operations. Booming: All deployed boom must include: (1) gaps between boom or sufficient space under boom to allow sea turtles to go around or under them, (2) boom should be monitored daily for sea turtle presence. If a sea turtle is observed trapped or entangled in boom, open the boom carefully until the animal leaves on its own. Burning: Sea turtle observers on the ignition vessel will monitor 3 areas prior to the burn (the area in front of the trawlers, oil concentrated in the boom, and any oil trailing behind the boom) to spot and retrieve any sea turtles prior to the burn. A survey should be conducted in the burn area after the burn is complete and all dead sea turtles should be counted and, if possible, collected. Avoid burning unoiled/lightly oiled *Sargassum*. Aerial Dispersant: No dispersant application within 2 nautical miles of sighted sea turtles. Subsea Dispersants: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area					
Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

References:

Harms CA et al. 2014. Clinical pathology effects of crude oil and dispersant on hatchling loggerhead sea turtles (*Caretta caretta*). In Proc. of the 45th Annual Meeting of the International Association for Aquatic Animal Medicine, http://www.vin.com/apputil/content/defaultadv1.aspx?pId=11397&meta=Generic&id=6251903.

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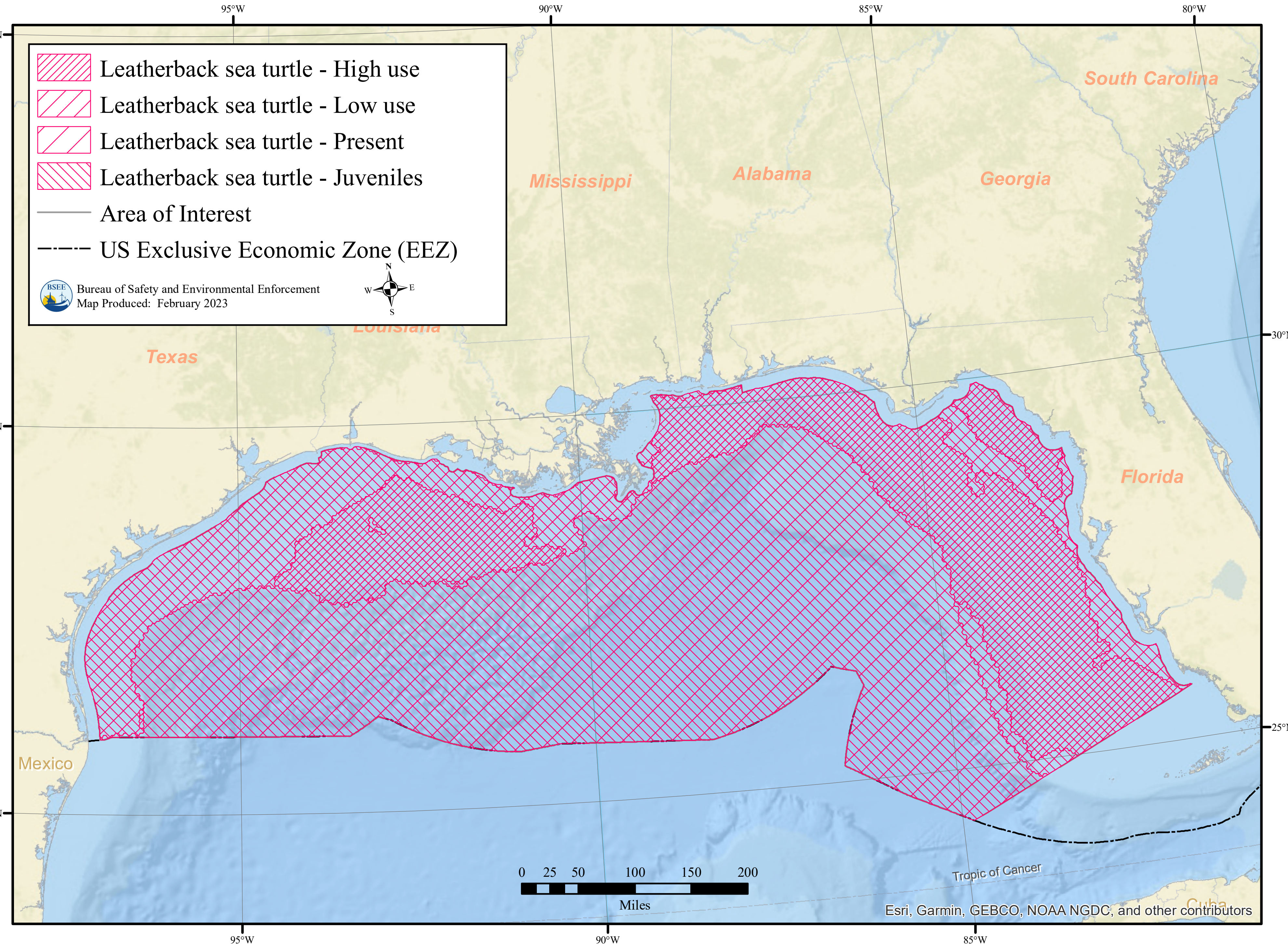

This map represents the approximate range of leatherback sea turtle in the Gulf of Mexico.

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Loggerhead Sea Turtle	**ESA Status**	**Threatened (1978) North Atlantic DPS Threatened (2011)**	43 FR 32800
Scientific Name	*Caretta caretta*	**Critical Habitat**	Final Rule (2014)

Appearance: Large head with blunt jaws. For adults and juveniles, the carapace and flippers are reddish-brown while the plastron is medium to light yellow. Distinguishing characteristics include a unique combination of 5 pairs of costal scutes, more than 1 pair of prefrontal scales, and 3 inframarginal poreless scutes that connect the carapace to the plastron.

Diet: Loggerheads feed on a variety of foods including mollusks, crustaceans, fish, and other marine animals. During the post-pelagic stage, juveniles and early-stage adults shift to neritic habitats where they become benthic feeders in habitats such as lagoons, estuaries, and other shallow coastal waters. They prefer to feed in coral reef habitats, rocky areas, and around shipwrecks.

Population: The Northwest Atlantic Ocean Distinct Population Segment (DPS) of the loggerhead sea turtle has been forecasted to likely decline in the foreseeable future and could be at risk of extinction.

Distribution/Habitat/Migration (see map for distribution in the GOM): Loggerhead sea turtles are distributed worldwide throughout temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Loggerheads can be found in U.S. Atlantic and Gulf of Mexico coastal waters inshore and nearshore from southern Virginia to Alabama. Hatchlings and early-stage juveniles occupy oceanic habitats greater than 200 m depth and are associated with floating *Sargassum* rafts moving with the North Atlantic oceanic gyre. There is a shift to the post-pelagic development phase at around 7-12 years when the turtles move to occupy neritic habitats, such as lagoons, estuaries, bays, marshes, rivers, and shallow coastal waters. Nine DPS have been identified for the loggerhead sea turtle, which are distributed globally. The U.S. Gulf of Mexico region is in the Northwest Atlantic Ocean DPS. Loggerhead females return to natal grounds to nest on open beaches or along narrow bays, often in association with other sea turtles. In the U.S. North Atlantic Ocean DPS, loggerheads nest along the Atlantic coasts of Florida, Georgia, South Carolina, and North Carolina, and along the Florida and Alabama coasts in the Gulf of Mexico. Adult loggerheads are known to make considerable migrations between foraging and nesting areas.

Vulnerabilities and Sensitivities to Oiling: Sea turtle biology and behavior place them at risk of oil exposure during spills at sea, including dependence on nesting beaches, lack of avoidance behavior, reliance on oceanographic features that tend to accumulate oil, propensity for accidental ingestion, and specific sensitivities of some life stages (Wallace et al., 2020; Shigenaka et al., 2021). During the *Deepwater Horizon* spill, most reports of oiled surface pelagic juvenile turtles originated from convergence zones (DWH NRDA Trustees, 2016).

Sea turtles can be exposed to oil through direct contact with skin or eggs, ingestion, or inhalation. Sea turtles breathe at the water surface, and inhalation of oil may impair the olfactory gland, affecting sea turtles' sense of smell. The sense of smell plays a key role in sea turtle navigation and orientation. Damaging that sense could lead to overall harm to a population of sea turtles trying to orient during migration or to natal nesting beaches. Ingestion by unknowingly eating tar balls or contaminated food is a direct effect of an oil spill; however, reduced food availability is an indirect effect that can lead to a decline in local sea turtle populations.

Physical fouling by oil is the most frequently reported effect of oil exposure on sea turtles (Shigenaka et al., 2021). Coating of oil on sea turtles at any life stage can have similar effects caused by smothering, clogging the mouth and nose, or creating an inability to maneuver. Oil contact can cause acute toxicity in hatchlings and impair their movements and normal bodily functions if coated. At sea, juvenile and adult sea turtles can be weighed down by oil, which can obstruct their ability to surface for air and reduce their ability to dive for feeding or to avoid predators or vessel strikes. Heavy oiling can interfere with regulation of temperature. Ingesting oil either directly (i.e., eating tar balls) or indirectly (i.e., consuming contaminated foods) can cause acute toxicity or, in terms of tar balls, can lead to blockage of their mouths or esophageal pathways. Loehefener et al. (1989) found tar balls in the mouths, esophagi, and stomachs of 65 out of 103 post-hatchling loggerhead turtles off the east coast of Florida in a convergence zone. Hatchlings, juveniles, and adults can experience difficulty eating if their beaks and esophagi are blocked, which could lead to starvation. Tar balls or oil that is ingested can also cause gut blockage, decreased absorption efficiency, absorption of toxins, effects of general intestinal blockage (i.e., local necrosis or ulceration), interference with fat metabolism, and buoyancy control problems caused by buildup of fermentation gases (Shigenaka et al., 2021). Buoyancy control allows sea turtles to surface or dive to depth freely; without this ability, they are especially vulnerable to predators, vessel strikes, and disruption of normal feeding behavior.

Harms et al. (2014) exposed 3-day old loggerhead hatchlings to crude oil with and without dispersant for 1 to 4 days, resulting in a failure to gain weight, indicating a lack of normal hydration in seawater.

Using keratin samples from loggerhead carapaces to record the foraging history (over up to 18 years), Vander Zanden et al. (2016) determined that, in 2011 and 2012, of the 10 individuals that foraged in areas with surface oil, none had significant changes in foraging patterns post spill. This high site fidelity could increase the risk of chronic exposures in the *Deepwater Horizon* impact area and during future spills (Frasier et al., 2020).

BMPs for Offshore Operations:

General: All vessels must be equipped with the necessary equipment (dip nets, holding containers, towels, etc.) to capture and hold sea turtles aboard the vessel. Resuscitate any live, unresponsive sea turtles according to the official sea turtle resuscitation guidelines (https://www.greateratlantic.fisheries.noaa.gov/protected/stranding/disentanglements/turtle/seaturtlehandlingresuscitationv1.pdf).

Safely release uninjured and unoiled sea turtles over the stern of the boat, when gear is not in use, the engine is in neutral, and in areas where they are unlikely to be recaptured or injured by vessels. Retrieve injured/dead/oiled sea turtles using the Sea Turtle At-Sea Retrieval Protocol (http://sero.nmfs.noaa.gov/sustainable_fisheries/gulf_sa/turtle_sawfish_release/documents/pdfs/turtle_release_protocols.pdf).

Skimming: Juvenile sea turtles associate with floating *Sargassum*, so avoid skimming *Sargassum* that is not oiled or is only very lightly oiled. To avoid entangling sea turtles, a trained observer or crew member is required for all skimming operations.

Booming: All deployed boom must include: (1) gaps between boom or sufficient space under boom to allow sea turtles to go around or under them, (2) boom should be monitored daily for sea turtle presence. If a sea turtle is observed trapped or entangled in boom, open the boom carefully until the animal leaves on its own.

Burning: Sea turtle observers on the ignition vessel will monitor 3 areas prior to the burn (the area in front of the trawlers, oil concentrated in the boom, and any oil trailing behind the boom) to spot and retrieve any sea turtles prior to the burn. A survey should be conducted in the burn area after the burn is complete and all dead sea turtles should be counted and, if possible, collected. Avoid burning unoiled/lightly oiled *Sargassum*.

Aerial Dispersant: No dispersant application within 2 nautical miles of sighted sea turtles.

Subsea Dispersants: Spill-specific BMPs to be followed.

Potential Range by Area Contingency Planning Area

Corpus Christi	Houston/ Galveston	Port Arthur	New Orleans/ Houma	Mobile	St. Petersburg
X	**X**	**X**	**X**	**X**	**X**

References:

DWH NRDA Trustees (Deepwater Horizon Natural Resource Damage Assessment Trustees). 2016. *Deepwater Horizon* oil spill: final programmatic damage assessment and restoration plan and final programmatic environmental impact statement. https://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan.

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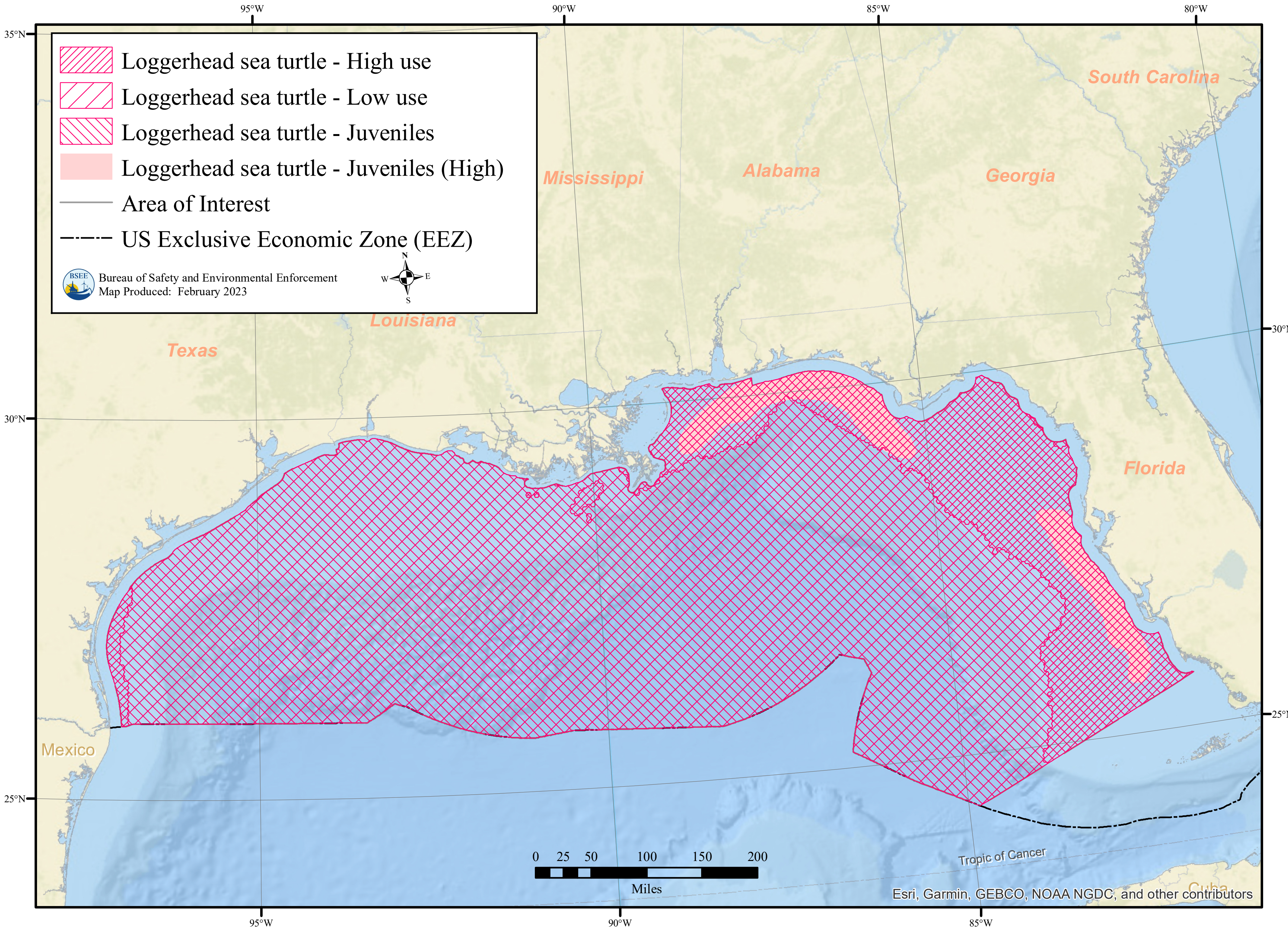

This map represents the approximate range of loggerhead sea turtle in the Gulf of Mexico.