

U.S. Army Corps of Engineers South Atlantic Division
Pre-Construction Risk Assessment for Maintenance Dredging of Wilmington,
Morehead City, Charleston, Savannah, and Brunswick Harbors in Fiscal Year 2022

15 July 2021

1. PURPOSE AND BACKGROUND. This document provides the Pre-Construction Risk Assessment that the U.S. Army Corps of Engineers (USACE) South Atlantic Division (SAD) completed in accordance with the 2020 South Atlantic Regional Biological Opinion for Dredging and Material Placement Activities in the Southeast United States (2020 SARBO) to inform the decisions on when and how operations and maintenance (O&M) dredging is conducted under the South Atlantic Division Regional Harbor Dredging Contract 5.0 (Regional Dredging Contract). This Regional Dredging Contract will cover O&M dredging in North Carolina (Wilmington and Morehead City Harbors), South Carolina (Charleston Harbor), and Georgia (Savannah and Brunswick Harbors) during Fiscal Year (FY) 2022.

Since this risk-assessment is for maintenance dredging of five projects that historically result in a majority of take by hopper dredging of all projects covered under the 2020 SARBO, this assessment is more detailed and therefore longer than future assessments may be for the same projects or other projects covered under the 2020 SARBO. This assessment references key points in the 2020 SARBO instead of reiterating them and adds regional-specific details needed to make mitigation recommendations.

A. Background – O&M dredging in FY 2022. The FY22 Regional Dredging Contract will provide maintenance dredging for five (5) Federal navigation projects, with a focus primarily on maintenance of the entrance channels (Table 1). Dredging by hopper dredge will be allowed for this work with placement of material in Ocean Dredged Material Disposal Sites (ODMDS).

Table 1. FY 2022 Regional Dredging Contract Project Details

Project Name	Dredging Location	Disposal Location	Estimated Volume (cubic yards)
Morehead City Harbor, North Carolina	Range A (Outer/Inner Entrance) and Cutoff (Inner Entrance)	Morehead City ODMDS	1,600,000
Wilmington Harbor, North Carolina	Baldhead Shoal Channel Reach (Outer/Inner Entrance)	Wilmington Harbor ODMDS	850,000
Charleston Harbor, South Carolina	Charleston Harbor (Outer/Inner Entrance) and Wings	Charleston ODMDS	2,069,000
Savannah Harbor, Georgia	Tybee Knoll Cut Range (Inner Entrance) and Jones Island/Bloody Point Range (Inner/ Outer Entrance)	Savannah ODMDS	475,000 - 575,000
Brunswick Harbor, Georgia	St. Simons Range (Inner/Outer Entrance) and Cedar Hammock Range (Inner Harbor/ Estuary)	Brunswick ODMDS	1,215,000-1,510,000

B. Background – 2020 SARBO and Risk Assessment. Consultation with the National Marine Fisheries Service (NMFS) under Section 7 of the Endangered Species Act (ESA) for certain dredging (e.g., for maintenance dredging but not including new construction dredging) was concluded with the issuance of the 2020 SARBO, which replaced the 1997 SARBO. Any consultation or coordination with other agencies, such as the U.S. Fish and Wildlife Service, is independent of the 2020 SARBO.

The 2020 SARBO provides the USACE the flexibility to assess types of project equipment, timing of project completion, and available ways to minimize effects from dredging as long as project actions follow the project design criteria (PDCs). PDCs are the specific criteria indicating how an individual project must be carried out. The flexibility provided by the 2020 SARBO is through the use of a risk assessment and risk management process, which is described in Section 2.9.2 of the 2020 SARBO.

The risk-based decision-making process under the 2020 SARBO is not a significant change from the 1997 SARBO. Under the 1997 SARBO, the USACE retained flexibility to decide when and where projects would occur and the equipment type to be used for a particular project – although this flexibility was within defined seasonal dredging windows that limited hopper dredging to winter months. The dredging windows were set based on a conclusion formed in the 1980s that these windows were the most protective way to reduce the risk of lethal take of sea turtles. This conclusion hinged on the rationale that sea turtles are less prevalent in winter months and therefore are less likely to be encountered during dredging. However, advances in dredging and a better understanding of sea turtle use of areas by location and time of year led to an understanding that seasonal windows are not the only way to be protective of sea turtles. For context, sea turtles tend to migrate to and from areas based on water temperatures, as has been long understood. For loggerheads that temperature threshold is believed to be 17°C, triggering loggerheads to move inshore in spring and further offshore in Fall.¹ The 2020 SARBO formalizes and expands the risk assessment process into a robust risk-based adaptive project-management process which is further informed by coordination with and refinement by the SARBO Team.

A significant change from the 1997 SARBO is that the 2020 SARBO covers more species and designated critical habitat, and it requires risk to be addressed regionally for all covered species. During the development of the 2020 SARBO, the increased number of ESA-listed species in the areas, understanding of species' use of these areas, and identification of interactions that can occur during dredging and material placement activities led to a joint decision by the NMFS, USACE, and Bureau of Ocean Energy Management (BOEM) that an adaptive management strategy without static environmental windows for sea turtles would provide a more comprehensive approach

¹ Arendt, Michael & Segars, Albert & Byrd, Julia & Boynton, Jessica & Whitaker, J. & Parker, Lindsey & Owens, David & Blanvillain, Gaelle & Quattro, Joseph & Roberts, Mark. (2011). Seasonal distribution patterns of juvenile loggerhead sea turtles (*Caretta caretta*) following capture from a shipping channel in the Northwest Atlantic Ocean. Marine Biology. 159. 10.1007/s00227-011-1829-x.

to protect ESA-listed species and designated critical habitat. As noted in section 2.5.2 on p.643 of the 2020 SARBO,

Many of the ESA-listed species within the action area have overlapping ranges and habitats, and some protective measures frequently applied to projects for certain ESA-listed species conflict with protection of other listed species or critical habitats in these overlapping areas. The SARBO Team gave extensive consideration to which ESA-listed species could be affected by an activity covered under this Opinion, the probability of exposure based on project timing and anticipated species abundance in an area, and how to maximize protections for all ESA-listed species and designated critical habitat.

The risk-based adaptive project management process is an ongoing, deliberative, internal process that includes a pre-construction assessment step to consider how and when dredging is initiated and completed and to determine minimization measures to reduce risk to species (2020 SARBO). This process requires a continuous evaluation of the risk as dredging occurs and may result in changes before and during the project work. This process then includes a consideration of lessons learned after work is complete, and the SARBO Team (consisting of members of USACE, NMFS, and BOEM) meets monthly and for an annual review to discuss projects proposed to be covered for the upcoming year and associated minimization measures that may reduce the risk of take.

C. Background – Risk Assessment Steps. Appendix J of the 2020 SARBO sets forth NMFS's recommended factors to be considered with initial project planning, including items likely to be relevant to the risk assessment. The major considerations relevant to this risk assessment include the following:

- project details including dredge quantities expected (Section 1 above); duration of dredging; and the need for the dredging given shoaling rates;
- potential risk to ESA-listed species – which includes the species likely to be present (Section 2.A) based on their historic use of each project area, historic take (Section 2.B), and routes of effects from the proposed projects (Section 2.B);
- need for relocation trawling for each dredging project and other minimization measures available (Section 2.D) based on project timing [including risk to sea turtles, North Atlantic right whales, and sturgeon based on water temperature and winter months], equipment options available to reduce take (Section 2.C)

The following provides information for the five dredging projects that addresses these major considerations. It is generally organized as (1) identification of ESA-listed species likely to be present in the project areas; (2) routes of effects; (3) anticipated risk

focusing on sea turtles, sturgeon, and North Atlantic right whales; (4) minimization measures considered; and recommendations for each project.

2. RISK ASSESSMENT

A. Identification of ESA-listed species likely to be present. The effects to ESA-listed species under NMFS jurisdiction were considered in the 2020 SARBO, including setting a lethal and non-lethal take limit for each species from hopper dredging and relocation trawling for all projects covered under the 2020 SARBO. Therefore, USACE must manage the dredging program to ensure that, cumulatively, these projects do not exceed the take limits. Section 6 of the 2020 SARBO outlines NMFS rationale for estimated take and why take numbers may fluctuate by location, time of year, from one year to another, and other factors such as hurricanes. As stated in Section 2.9.2.1,

Utilizing adaptive management in this manner [that is, under the 1997 SARBO] allowed the USACE to consider the anticipated risk of harm to ESA-listed species in the context of shifting variables (e.g., environmental, financial, regulatory, etc.). Subsequent decisions made regarding project timing and equipment use maximized the ability to complete dredging and material placement projects, while minimizing the risk of incidental take. The USACE has a proven history of using this process to further reduce the likelihood of incidental take and will continue to do so under the 2020 SARBO.

While the 2020 SARBO provides a list of all species that may occur from North Carolina to the Caribbean, Table 2 below lists the species likely to occur in each state where dredging of the five projects will be covered under the RHDC.

Table 2. Effects Determination(s) for Species the Action Agencies and/or NMFS Identify as Potentially Affected by the Proposed Action

			Probability of Occurrence in Action Area by District		
ESA-listed Species	ESA Listing Status ²	NMFS Determination ³	North Carolina	South Carolina	Georgia
Sea Turtles					
Green (North Atlantic [NA] Distinct Population Segment (DPS))	T	LAA	High	High	High
Green (South Atlantic [SA] DPS)	T	LAA	Low	Low	Low
Hawksbill	E	NLAA	Not expected	Not expected	Not expected
Kemp's ridley	E	LAA	Low	Low	Low
Leatherback	E	LAA	Low	Low	Low
Loggerhead (Northwest Atlantic [NWA] DPS)	T	LAA	High	High	High
Fish					
Atlantic sturgeon (Carolina DPS)	E	LAA	High	High	High
Atlantic sturgeon (SA DPS)	E	LAA	Low	Low	Low
Atlantic sturgeon (Gulf of Maine DPS)	T	LAA	Low	Low	Low
Atlantic sturgeon (New York Bight DPS)	E	LAA	Low	Low	Low
Atlantic sturgeon (Chesapeake Bay DPS)	E	LAA	Low	Low	Low
Shortnose sturgeon	E	LAA	Low	Low	Low
Elasmobranchs					
Giant manta ray	T	LAA	Moderate	Moderate	Moderate
Smalltooth sawfish (U.S. DPS)	E	LAA	Not expected	Not expected	Low
Whales					
Blue whale	E	NLAA	Low, ODMDS only	Low, ODMDS only	Low, ODMDS only
Fin whale	E	NLAA	Low, ODMDS only	Low, ODMDS only	Low, ODMDS only
North Atlantic right whale	E	NLAA	Low, Winter Only	Low, Winter Only	Low, Winter Only
Sei whale	E	NLAA	Low, ODMDS only	Low, ODMDS only	Low, ODMDS only
Sperm whale	E	NLAA	Low, ODMDS only	Low, ODMDS only	Low, ODMDS only

² E= endangered; T= threatened

³ NE = no effect, NLAA (may affect, not likely to adversely affect), LAA (may affect, likely to adversely affect).

B. Routes of Effects and the Anticipated Risk to ESA-listed Species by Route of Effect. Based on the routes of effects that are analyzed in the 2020 SARBO, USACE identified the routes of effects that are likely to occur during the dredging of the RHDC projects; these routes of effects are listed below in Section B.1. The routes of effects are then used to determine the potential risk to species that may be present (Section 3), based on adherence to the requirements (PDCs) in the 2020 SARBO.

B.1. Species interactions with dredging and material placement equipment, including entrainment or impingement⁴ and the potential for effects from degraded water quality (2020 SARBO Section 3.1.1).

- a. Maintenance dredging by hopper dredge. This route of effect was determined to be NLAA for changes in water quality for the species in these areas based on adherence to the PDCs. The 2020 SARBO concluded that sea turtles (green, Kemp's ridley, and loggerhead) and sturgeon (Atlantic and shortnose) may be taken by hopper dredging. Therefore, the risk to these species will be discussed further below. All hopper dredging take since 2010 for each of the projects is listed below in Table 3.
- b. Option for bed-leveling. Studies were done in Brunswick Harbor, Georgia to test if bed-leveling harmed sea turtles or sturgeon (see 2020 SARBO Section 3.1.1.6.1). Brunswick was chosen for this study based on the density of sea turtles in the area and the concern of sea turtle brumation (hibernating on the sea floor during cold weather events) leading to their being injured by bed-leveling. During the trials, trawling directly behind the bed-leveler captured and released 38 live sea turtles and two Atlantic sturgeon with no mortalities, thus demonstrating that sea turtles and sturgeon were present during the bed-leveling operations and unharmed by the process. We believe this process is effective at protecting all mobile species without harm. This route of effect was determined to be NLAA based on adherence to the PDCs and does not require additional consideration in the risk-assessment.
- c. Water quality changes. Changes in water quality from dredging, bed-leveling, and material placement are described in detail in the 2020 SARBO Section 3.1.4. In summary, turbidity plumes are expected to be localized and settle out quickly and not expected to result in sedimentation that would harm species or habitat in the area. USACE continues to evaluate the risk to habitat both within and adjacent to dredging and placement areas to ensure that significant effects do not occur. For example, USACE is collaborating with the North Carolina Division of Environmental Quality (NCDEQ), and NMFS Protected Resources and Habitat Conservation Division to complete a three-year study to better understand the effects of dredging, water quality changes, and habitat alteration associated with continued maintenance

⁴ For this Risk Assessment IAW the 2020 SARBO, entrainment occurs when a species either comes into contact with a suction type dredge (hopper or cutterhead) or is in close enough proximity that they cannot outswim the suction velocity created by the dredge. Impingement occurs when the species is captured by the equipment (e.g., captured in a mechanical dredge) or stuck to the equipment (e.g., entrained by a hopper dredge, but stopped by grating on the draghead that prevents movement into the hopper).

of Wilmington Harbor and Morehead City. At this time, additional consideration in the risk-assessment process is not required.

Table 3. Historic Observed Take from Hopper Dredging in Brunswick

Fiscal Year	Dredging Dates	Atlantic Sturgeon	Green	Kemp's Ridley	Leatherback	Loggerhead	Total Turtles
Wilmington							
2010	2/9/10-4/5/10	0	0	0	0	0	0
2011	12/16/10-4/21/11	0	0	0	0	0	0
2012	12/10/12-12/29/12	0	0	0	0	0	0
2013	Not Dredged	0	0	0	0	0	0
2014	2/6/14-3/17/14	-	-	-	-	-	-
2015	1/11/15-1/24/15	0	0	0	0	0	0
2016	3/16/16-3/31/16	0	0	0	0	0	0
2017	10/18/16-1/4/17	1	3	0	0	2	5
2018	3/25/18-4/10/18	0	0	0	0	0	0
2019	3/22-4/19/19	1	0	2	0	1	4
2020	4/2/20-4/8/20	0	1	0	1	0	2
Morehead							
2010	Not Dredged	-	-	-	-	-	-
2011	Not Dredged	-	-	-	-	-	-
2012	1/13/12-2/25/12	0	0	0	0	0	0
2013	1/18-1/29	0	0	0	0	0	0
2014	Not Dredged	-	-	-	-	-	-
2015	Not Dredged	-	-	-	-	-	-
2016	Not Dredged	-	-	-	-	-	-
2017	Not Dredged	-	-	-	-	-	-
2018	3/8/18-4/15/18	0	0	0	0	0	0
2019	2/28/19-4/11/19	0	3	0	0	1	4
2020	5/29/20-7/30/20	0	0	0	0	2	2
Charleston							
2010	2/26/10 – 3/17/10	0	0	0	0	0	0
2011	Not Dredged	-	-	-	-	-	-
2012	2/29/12 – 3/17/12	1	1	0	0	0	1
2013	Not Dredged	-	-	-	-	-	-
2014	1/8/14 – 2/19/14	0	0	0	0	0	0
2015	Not Dredged	-	-	-	-	-	-
2016	4/7/16 – 4/22/16	1	0	5	0	4	9
2017	2/4/17 – 2/17/17	1	0	0	0	0	0
2018	3/3/18 – 3/9/18	0	0	0	0	0	0
2019	Post 45 Deepening ⁵	3	3	0	0	0	3
2020	Post 45 Deepening	3	1	2	0	2	5
Savannah							
2010	3/5/10-3/29/10	0	0	0	0	0	0
2011	2/25/11-3/7/11	0	0	0	0	0	0
2012	3/18/12-3/30/12	0	1	0	0	1	2
2013	12/30/12-1/7/13	0	0	0	0	0	0
2014	12/31/13-1/22/14	0	0	0	0	0	0
2015	2/19/15-3/30/15	1	0	0	0	3	3
2016	12/26/15-1/13/16	0	0	0	0	1	1

⁵ Post 45 dredging is covered under a separate NMFS biological opinion, not the 2020 SARBO.

2017	12/9/16-1/6/17	1	1	0	0	1	2
2018	3/15/18-3/24/18	0	0	0	0	0	0
2019	2/2/19-2/28/19	2	0	0	0	0	0
2020	1/24-20-2/16/20	2	1	0	0	0	1
	Brunswick						
2010	1/26/10-3/5/10	0	0	0	0	0	0
2011	1/15/11-2/24/11	0	0	0	0	0	0
2012	1/26/12-2/7/12 & 3/22/12-3/22/12 ⁶	0	1	5	0	3	9
2013	1/8/13-1/16/13	0	0	0	0	0	0
2014	1/24/14 - 3/13/14	0	0	0	0	2	2
2015	1/20/15 - 2/14/15	1	0	0	0	0	0
2016	1/14/16-2/12/16	0	0	0	0	0	0
2017	1/7/17 - 3/29/17	1	1	4	0	4	9
2018	12/30/17 - 3/15/18	6	0	2	0	0	2
2019	1/8/19 - 2/2/19	0	1	0	0	0	1
2020	1/10/20 - 2/20/20	4	2	1	0	2	5

B.2. Potential entanglement with equipment (2020 SARBO Section 3.1.2). This route of effect was determined to be NLAA based on adherence to the PDCs and does not require additional consideration in this risk assessment.

B.3. Impacts caused by capture via relocation (2020 SARBO Section 3.1.3).

- a. Relocation trawling. The 2020 SARBO concluded that sea turtles (green, Kemp's ridley, leatherback, and loggerhead), sturgeon (Atlantic and shortnose), giant manta ray, and smalltooth sawfish may be captured by relocation trawling. Therefore, the risk to these species will be discussed further below.
- b. Monitoring for and handling of ESA-listed species during hopper dredging and trawling. Protected Species Observers (PSOs) are required on all hopper dredges to monitor for take. Any captured non-ESA-listed species are recorded as bycatch. USACE is working on improvements to the digital program that tracks take (i.e., the Operations and Dredging Endangered Species System - ODESS), including improved tracking of bycatch to better understand effects to all species, which includes those of concern to other agencies. This route of effect was evaluated in the 2020 SARBO and does not require additional analysis in this risk assessment, based on adherence to the PDCs. Relocation trawling captures that occurred within the SARBO action area from 1997 to 2019 are provided in Table 13 of the 2020 SARBO. Table 4 below provides information from surveys completed in FY20 and FY21. Closed net/capture relocation trawling in these areas was limited between 2010 and 2018 due to a change in NMFS' approach to authorizing this activity. The 1997 SARBO did not include relocation trawling as an activity since the handling of species was covered under a separate authorization process (that is, a Section 10 permit). Later, NMFS decided handling of ESA-listed species as part of a project

⁶ Had three takes in one day and the project was stopped

should be authorized as part of a biological opinion, as it is in the 2020 SARBO.

Table 4. Capture Relocation Trawling Data within the Action Area

Location	Start Date	End Date	Atlantic Sturgeon	Green Sea Turtle	Kemp's Ridley Sea Turtles	Leatherback Sea Turtles	Loggerhead Sea Turtle	Total Turtles	Total
Brunswick, Georgia	2/9/20	2/19/20	0	1	0	0	0	0	1
Bogue Bank/ Post-Florence Renourishment, North Carolina	2/21/21	4/26/21	12	0	4	0	10	14	16
King's Bay	3/15/21	3/24/21	31	1	4	0	8	12	43
Oak Island, North Carolina	5/1/21	5/22/21	0	0	19	0	15	34	34
Morehead, North Carolina	5/27/21	6/15/21	0	0	3	0	6	9	9
All Reports (FY 1997-2019)			297	53	91	25	358	527	824

B.4. Potential for a species to be struck by a vessel (2020 SARBO Section 3.1.4). Vessel strikes may occur during dredging or during the transportation of materials between dredging and material placement locations. This route of effect was determined to be NLAA based on adherence to the PDCs for all species; however, emphasis was placed on the risk of vessel strike to the North Atlantic right whale (NARW). The 2020 SARBO includes a North Atlantic right whale conservation plan to address this issue (Appendix F). NARWs typically inhabit coastal waters along coastal Georgia and North Florida each winter during calving season, often remaining close to shore. They also inhabit coastal waters in North and South Carolina while transiting to and from calving areas. According to the NOAA species directory website, each fall, some right whales travel more than 1,000 miles from North Atlantic feeding grounds to the shallow, coastal waters of South Carolina, Georgia, and northeastern Florida. These waters in the southern U.S. are the only known calving area for the species. These whales migrate to the winter calving areas each winter and remain near the surface with their new calves, making them susceptible to vessel strikes. The migration to and from calving areas follows a typical pattern but can vary. This offshore location, which is considered critical habitat for calving, is between the Brunswick federal navigation channel and the offshore placement area (ODMDS). NARW are found along the coast and within the action area for the entrance channel, ODMDS and transiting areas.

This endangered species is of particular concern to NMFS due to its critically low population numbers, low calving rates including no calves born in 2018, and an unusual mortality event where 49 individuals of an estimated population of 368 died within a few years. This approximately 10% loss of population is a significant setback to the recovery of the population, especially since there was also a decrease in calves during a similar timeframe (<https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2021->

north-atlantic-right-whale-unusual-mortality-event). Therefore, the risk to NARW will be discussed further below.

B.5. How species interact with the placement of material (2020 SARBO Section 3.1.5). Placement of dredged material in uplands or ODMDS. This route of effect was determined to be NLAA for the species in these areas based on adherence to the PDCs and does not require additional consideration in the risk assessment.

B.6. The potential for blocked access by construction activities (2020 SARBO Section 3.1.6). This route of effect was determined to be NLAA based on adherence to the PDCs and does not require additional consideration in the risk-assessment.

B.7. Habitat alteration for activities covered under this Opinion (2020 SARBO Section 3.1.7). Activities covered are maintenance and are not expected to directly alter sensitive habitat. Placement is limited to ODMDS so alteration of habitat around the dredging sites is limited. The 2020 SARBO also considers the recurring loss of benthic resources within project areas such as foraging resources for sturgeon in maintained channels that are assumed to apply to other species as well. This route of effect was determined to be NLAA based on adherence to the PDCs for species and habitat in the areas covered under the RHDC. As discussed for water quality in 3.1 above, USACE continues to evaluate this risk.

B.8. Sound generated by activities covered under this Opinion (2020 SARBO Section 3.1.8). Geophysical (G&G) surveys. This route of effect was determined to be NLAA based on adherence to the PDCs and does not require additional consideration in the risk assessment.

C. Summary of Effects Anticipated. Table 5 below provides a summary of the level of risk anticipated at the projects covered under the RHDC with a short summary of the rationale. The rationale for sea turtles, sturgeon, and NARW are further discussed in the following sections.

Table 5. Summary of Risk to ESA-Listed Species under the 2020 SARBO.

(Risk is color coded: red is high, yellow is moderate, and green is low.)

Species	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Whales (Blue, Fin, Sei, Sperm)	These whale species are deep water pelagic species not expected to be found within areas where activity would occur. The likelihood of encounter is very low. No reported encounters with dredging or related activities.												
NARW	Calf off this area in winter months. One reported encounter with hopper dredge and highly susceptible to vessel strikes.				Not expected to be present; migrate north during these months.								
Sea turtles	Sea turtles present year-round. Entrainment: Hopper dredging and trawling frequently result in encounters with higher numbers in Brunswick than Savannah. Loggerheads nest in the area May to mid-August. Infrequent nests from leatherback, green, and Kemp's ridley. Medium risk because probability of encounters is high, but loss of individuals limited by 2020 SARBO has low risk to species survival or recovery at all population levels evaluated in 2020 SARBO.												
Oceanic Whitetip shark	This shark is a deep-water pelagic species. The likelihood of encounter is very low and the risk to this species from the routes of effects identified is low, as described in the 2020 SARBO.												
Giant manta ray	Based on observations, giant manta ray may be present year-round with higher likelihood in warmer months as they migrate up the Atlantic coast in summer months. No reported encounters with hopper dredges and rare encounters with relocation trawling. Therefore, the likelihood of encounter is low and the risk to this species from the routes of effects identified is low, as described in the 2020 SARBO. Non-lethal capture by relocation trawling (take) is provided in the 2020 SARBO.												
Smalltooth sawfish	Observations north of Florida are rare and typically limited to Georgia. No reported encounters with hopper dredges and rare encounters with relocation trawling. Therefore, the likelihood of encounter is very low and the risk to this species from the routes of effects identified is low, as described in the 2020 SARBO. Non-lethal capture by relocation trawling (take) is provided in the 2020 SARBO.												
Atlantic Sturgeon	Frequent encounters by hopper and trawler in winter months, but risk of take changing survivability or recover of species based on take limits in 2020 SARBO is low.												
Shortnose Sturgeon	Shortnose sturgeon typically stay in spawning rivers year-round and there are no records of hopper dredging take of this species in these project areas. Therefore, the likelihood of encounter is very low and the risk to this species from the routes of effects identified is low, as described in the 2020 SARBO.												

C.1. Sea Turtles. As stated in Section B.1, sea turtles are at risk of take by hopper dredging by entrainment (green, Kemp's ridley, hawksbill, and loggerhead) and capture by relocation trawling (green, Kemp's ridley, hawksbill, leatherback, and loggerhead). Also, take limits are provided in the 2020 SARBO for each turtle species.

C.1.1. Sea Turtle Data. Loggerhead sea turtles are the most frequently encountered species in North Carolina, South Carolina, and Georgia, followed by green and Kemp's ridley sea turtles. Sea turtle nesting throughout the area is summarized in Table 6 below showing that loggerhead sea turtles also nest in much higher numbers than the other sea turtle species in this area.

Table 6. Sea Turtle Nesting

Sea Turtle Nesting	North Carolina	South Carolina	Georgia	Florida
Estimated annual nesting timeframe	1 MAY- 31 OCT (2020 First nest= 3 May, Last nest= 31 OCT)	1 MAY- 31 AUG (2020 First nest= 1 May, Last nest= 23 AUG)	1 MAY- 31 AUG (2020 First nest=26 APR, Last nest= 25 AUG)	1 MAY- 31 AUG (2020 First nest= 23 FEB, Last nest= 25 SEP)
Green	1 MAY- 31 OCT (44 nests in 2020)	Very limited (Only 3 nests in 2020)	Very limited (Only 6 nests in 2020)	1 MAY- 1 OCT (181 nests in 2020)
Kemp's Ridley	Very limited (Only 8 nests in 2020)	Very limited (Only 1 nest in 2020)	Very limited (Only 1 nest in 2020)	Very limited (Only 1 nest in 2020)
Leatherback	Very limited (2 nests in 2018)	Very limited (Only 1 nest in 2020)	Very limited (1 nests in 2017)	15 FEB- 1 OCT (43 nests in 2020)
Loggerhead	1 MAY- 31 OCT (1,335 nests in 2020)	1 MAY- 31 AUG (5,550 nests in 2020)	15 MAY- 31 AUG (2,786 nests in 2020)	1 MAY - 1 OCT (2,601 nests in 2020)
Hawksbill	Very limited (2 nests in 2016)	No nesting	No nesting	No nesting

Loggerhead sea turtles also are the sea turtle most frequently taken by hopper dredging in the southeast (from North Carolina to the Florida Keys) resulting in the highest allowed take under the 2020 SARBO (107 loggerheads per three-year period, which is approximately 35 per year). Table 36 of the 2020 SARBO lists total hopper dredging takes from 1997-2018 by species covered under the 1997 SARBO, with loggerhead sea turtles accounting for 53% of all lethal take (183 loggerhead), followed by an almost even number of green and Kemp's ridley sea turtles each making up approximately 18% of observed lethal take (53 green and 54 Kemp's ridley). According to Table 12 in the 2020 SARBO, the maximum number of sea turtles taken in a single fiscal year (green, Kemp's ridley, loggerheads, and those unable to be identified by species) was 66 total turtles. This was an anomaly with the average take per year since 1997 being 16 and the lowest year was only a total of five sea turtles. Only three of the twenty-one years reviewed in Table 12 reported over 25 total sea turtles taken by hopper dredging.

USACE has and will continue to closely monitor all take (lethal and non-lethal) and adjust dredging operations or cease dredging as deemed appropriate based on multiple considerations. USACE would not allow a single project to use all take allowed under the SARBO for a single species or combination of species since it must manage all USACE navigation covered under the 2020 SARBO. Table 36 in the 2020 SARBO lists the minimum, maximum, and average take by species from hopper dredging. For example, the maximum number of observed lethal loggerhead sea turtle take was 18 in one year with an average of nine observed lethal loggerhead lethal take per year for all projects covered under SARBO. The largest annual take of loggerhead sea turtles occurring on a single project under SARBO was six turtles, demonstrating USACE's commitment to managing the level of take and ceasing work when the risk is deemed too high, as described below.

- a. The total take for a project does not tell the whole story of adaptive management used by the USACE to minimize take of ESA-listed species. For example, Brunswick Harbor is adaptively managed and often work is stopped early as a result of sea turtle takes occurring during historic winter dredging windows. Information for FY07-09 are provided below for historic context, but this adaptive management continued through all subsequent years. In FY07, hopper dredging in Brunswick Harbor was adjusted multiple times to reduce take. Dredging began on December 20, 2006 and the first turtle take did not occur until December 26, 2006, when a loggerhead was taken (and water temperatures were 16°C, below the 17°C threshold when loggerhead sea turtles tend to shift locations based on water temperature, discussed in Section 1.B), along with one Atlantic sturgeon prior to that species being listed under the ESA. After two Kemp's Ridley sea turtles were taken on December 29th, (with a 14.5°C water temperature), work was stopped until relocation trawling could begin. Relocation trawling began on December 30th and continued until dredging ceased on January 11, 2007, when another Kemp's Ridley was taken (15°C). After dredging had been completed on another project (Savannah), relocation trawling began again in Brunswick on March 15th, with dredging recommencing on March 20th. After two loggerhead sea turtles were taken in one load on March 24th (18.3°C water temperature), the dredging work was ended.

In FY08, a pre-construction risk-assessment for Brunswick led to the decision to start relocation on January 14, 2008, trawling prior to starting to dredge on January 19th based on lessons learned during FY07, discussed above. Only two sea turtles were relocated before dredging began [and 10 Atlantic sturgeon prior to this species being listed under the ESA] and no other turtles were captured so the trawling stopped on January 27, 2008 (10.7°C water temperature). A loggerhead was taken on February 13, 2008 (13.3°C) and then two other turtles (loggerhead and Kemp's ridley) in a single load on February 26th (16°C water temperature) resulting in stopping work to reassess risk. It was decided that work could not continue unless relocation trawling was reinstituted. Eight turtles were relocated between February 28 and March 6, 2008 and, on March 6th, a Kemp's and a loggerhead were taken in the same load (16.1°C water temperature) and work was terminated for the year.

In FY12, Brunswick Harbor was no longer able to use capture/relocation trawling due to changes in NMFS' opinion on how to authorize this activity (discussed in Section 2.B.3). Instead, non-capture/sweep trawling was initiated on January 25, 2012 prior to commencing work and continued until February 7, 2012. During that time, six turtles were taken - one loggerhead, one green, and four Kemp's ridley sea turtles (15-15.2°C water temperatures). Two of the four Kemp's ridley were caught in consecutive loads on February 7, 2012 and work was suspended. After dredging was completed on another project (Savannah), sweep trawling began again in Brunswick on March 21, 2012. In the first day of dredging with non-capture trawling restarted, three turtle takes occurred in the same load on March 22, 2012 (two loggerheads and one Kemp's ridley) and the dredging work was terminated.

- b. Tampa Bay. Maintenance hopper dredging that started on November 30, 2018, and resulted in six sea turtle takes in four days. Though this was the beginning of the project, the risk of take was deemed too high and the project was delayed until May. The costs associated with delaying this project and remobilizing months later cost approximately \$2 million.
- c. Charleston (Post 45, not covered under SARBO) deepening resulted in five sea turtles in 24 hours and work was stopped. These takes occurred near the end of the project (cleanup phase) and the remaining material was moved by bed-leveling to reduce further take. For context, over \$1.4 million has been spent on this project for relocation trawling resulting in the relocation of 71 animals (i.e., 33 Atlantic sturgeon and 38 sea turtles).

Given that sea turtle populations are large and the 2020 SARBO allows only limited take of any covered turtle species, the impact to any species of sea turtle from dredging under the 2020 SARBO would not affect sea turtle population status or recovery, as analyzed and concluded in the 2020 SARBO.

Throughout the risk-assessment process, USACE will continue to evaluate the risk of hopper dredging take based on an evolving understanding of how green, Kemp's ridley, and loggerhead turtles use project areas by time of year and in response to factors such as cold-snaps, hurricanes, and prevalence of foraging resources. Understanding species abundance and how the species is using and moving within the area aids in understanding the risk from actions such as hopper dredging.

C.1.2. Sea turtle ability to avoid interactions with dredging by time of year. USACE agrees with NMFS determinations in the 2020 SARBO that limiting work to winter months, as was required under the 1997 SARBO, is not the only or even most effective way to reduce risk to sea turtles. Much knowledge has been gained since the decision was made to try to protect sea turtles by restricting hopper dredging to winter months. Because most take occurs when the dragheads are not firmly embedded in the sediment, USACE has worked to find ways to reduce this risk by adding draghead deflector shields that create a sand wave to move turtles away from the draghead, requiring that draghead pumps are disengaged when not actively dredging, or switching

to bed-leveling during clean-up phase when hills and valleys left by hopper dredging make it harder to keep dragheads embedded. In addition, USACE closely monitors dredging using the National Dredging Quality Management Program (DQM), which is a USACE-Dredging Industry partnership for automated monitoring of dredge activities to provide quality near-real-time data such as monitoring the draghead depths, the velocity of material entering the dragheads, when pumps are engaged and disengaged, and related dredging information to ensure that the 2020 SARBO PDCs are being followed. In addition, closed net relocation trawling, now covered under the 2020 SARBO, has been proven to reduce risk of take during hopper dredging by providing a way to safely move sea turtles out of the project area to avoid hopper dredging interactions.

Since most hopper dredging take of sea turtles is loggerhead sea turtles, USACE considered if species areas are known to have higher density or life cycle importance and if that information could be used to further reduce the risk of take by hopper dredging during dredging at these five RHDC projects. NMFS identified key life-cycle areas for loggerhead sea turtles with the designation of critical habitat for this species in 2014 (79 FR 39855). Of note are nesting beaches (nearshore reproductive habitat), breeding areas, and migratory pathways. Waters off the outer banks of North Carolina have been identified as a constricted migratory pathway for loggerhead sea turtles migrating to northern foraging grounds in summer months and back in the fall and an overwintering sites south of Cape Hatteras. Both of these key areas demonstrate abundance of sea turtles in waters off the North Carolina coast but are located east of the outer banks and therefore do not overlap with Wilmington or Morehead City Harbors. Between FY13-20 (a readily available data set), only approximately 10% of all sea turtle takes in waters from North Carolina to the Florida Keys occurred in Wilmington and Morehead City hopper dredging project.

Another area of importance identified in the loggerhead critical habitat designation were the waters off the central east coast of Florida that are identified as breeding areas. Even though the east coast of Florida has the largest loggerhead nesting population, only 14% of all sea turtle takes from North Carolina to the Florida Keys occurred on the east coast of Florida south of Kings Bay.

Unfortunately, from FY13-20, almost 60% of all sea turtle takes for all turtle species and also almost 60% of all loggerhead sea turtle takes from North Carolina to the Florida Keys occurred at just three project locations adjacent to each other (Savannah Harbor, Brunswick Harbor, and Kings Bay). While the percent of take by project or region provides some information, it does not consider the number of projects, frequency of projects, or length of time to complete a project. It is concerning to USACE that the most significant number and percent of lethal hopper dredging takes are limited to such a small area of projects covered under 2020 SARBO (i.e., Savannah Harbor, Brunswick Harbor, and Kings Bay). Hopper dredging in these areas has been generally limited to historic winter dredging windows as a way to minimize take. However, USACE concludes that moving hopper dredging to warm summer months may be more protective of sea turtles. A study released in 2020 used genetics to determine that the majority (84.4%) of female loggerhead sea turtles nesting in North Carolina, South

Carolina and Georgia migrate north to foraging areas north of North Carolina after nesting each summer⁷. However, not all turtles migrate, leaving a smaller resident population that moves shorter distances to forage and overwinter. The 2020 study also concluded that these turtles then migrate back south to wintering areas from Cape Hatteras, North Carolina to West Palm Beach in Florida, “where they can enter warmer waters adjacent to the Gulf Stream while minimizing the migratory distance, time and energy required to return to their northern foraging sites when water temperatures rise in the spring.” Due to the greatest number of hopper dredging lethal take of sea turtles being concentrated in this south Georgia/ Northern Florida area, it seems that this area may have a higher number of wintering sea turtles that are too cold to easily avoid interactions with hopper dredging. Some sea turtle experts believe that summer hopper dredging may have the lowest risk to sea turtles, even if abundance is high in the area. In the summer, turtles are warmer and can more easily avoid interactions and may be using areas outside of channels as they disperse throughout the region. Since the majority of loggerhead sea turtles migrate to northern foraging grounds, the density of turtles in the summer (post-nesting) may actually be lower.

To date, the only hopper dredging completed outside of the historic dredging windows was Brunswick and Savannah in September 2009 (Fall) as part of a pilot study. The 2009 dredging resulted in six loggerhead sea turtle takes for the combined project during a time that water temperatures were ~27°C, which some biologists conclude demonstrated excess lethal take and that dredging during this time of year was unsuccessful. For comparison, Brunswick and/or Savannah Harbors have been frequently dredged with less take; however, six sea turtle takes occurred in FY12 in Brunswick (discussed above) and six sea turtle takes in FY20 in Brunswick and Savannah combined when water temperatures were ≤15°C. Therefore, limiting to winter timeframes with colder water is not a completely effective way to reduce risk.

Warm waters and/ or high sea turtle density in an area does not necessarily equate to higher or unacceptable hopper dredging take. For example, multiple hopper dredging projects have occurred in recent years during time periods when waters were warm and sea turtle abundance in the area was known to be high. Yet, these projects were able to be successfully completed with a low level of lethal take per project.

- Bogue Banks. Hopper dredging from February 21, 2021 – April 6, 2021 resulted in three sea turtle takes (two Kemp’s ridley and one loggerhead) while 24 sea turtles (10 Kemp’s ridley and 14 loggerheads) were relocated. In addition, 17 Atlantic sturgeon were relocated. Dredging in FY21 was the third phase of this project. Dredging from March 8, 2019 – April 24, 2019 did not have any lethal hopper dredging take. Dredging from February 6, 2020 – April 29, 2020 dredged 2,270,000 cubic yards of material with only 3 lethal sea turtle takes (one Kemp’s ridley and two

⁷ Pfaller JB, Pajuelo M, Vander Zanden HB, Andrews KM, Dodd MG, Godfrey MH, et al. (2020) Identifying patterns in foraging-area origins in breeding aggregations of migratory species: Loggerhead turtles in the Northwest Atlantic. PLoS ONE 15(4): e0231325. <https://doi.org/10.1371/journal.pone.0231325>.

loggerheads). Relocation trawling was conducted in both FY19 and FY20 and relocated sea turtles and Atlantic sturgeon (a combined total of eight Kemp's ridley, 14 loggerheads, six green sea turtles, and 17 Atlantic sturgeon). No Atlantic sturgeon were taken in any of the three years of hopper dredging.

- Wilmington. Hopper dredging from May 24, 2021 to June 27, 2021 did not result in any sea turtle take, even without relocation trawling.
- Morehead City. Hopper dredging from May 29, 2020 – July 30, 2020 resulted in two loggerhead sea turtle takes. Hopper dredging again during the summer of 2021 (May 30, 2021 – June 14, 2021) resulted in two loggerhead and one green sea turtle takes with nine sea turtles relocated (six loggerhead and three Kemp's ridley).
- Oak Island. Hopper dredging from May 6, 2021 – May 22, 2021 resulted in only one loggerhead lethal take while 34 turtles were relocated (19 Kemp's ridley and 15 loggerhead sea turtles) and 12 Atlantic sturgeon.

Since hopper dredging outside of winter months has been less common in this area, take information for a large project in the Northern Gulf is provided for comparison. The Mississippi Coastal Improvements Program work was completed over multiple years and included all seasons, including warm water months with a clear abundance of sea turtles present based on the high numbers relocated, as described below.

- Phase I (SER-2012-09304). Hopper dredging from November 2017 to January 2019 resulted in no sea turtle take and one Gulf sturgeon take while 395 sea turtles were relocated (280 Kemp's ridley, 108 loggerhead, six green, and one leatherback) and two Gulf sturgeon.
- Phases 3 and 4 (SERO-2018-00260, SER-2018-19667). Hopper dredging for Phases 3 and 4 from July to December 2020 resulted in no sea turtle take and one Gulf sturgeon take while 33 sea turtles were relocated (26 Kemp's ridley, six loggerheads, and one leatherback) and two Gulf sturgeon.

C.1.3. Spring and Fall. SARBO discusses that sea turtle take in summer (JUL-SEP) may be lower, but spring and fall may be higher when sea turtles are migrating, based on a study released by the USACE (Dickerson, D. D., and coauthors. 2007. *Effectiveness of relocation trawling during hopper dredging for reducing incidental take of sea turtles*. U.S. Army Corps of Engineers, Engineer Research and Development Center Research Initiatives and Central Dredging Association, Lake Buena Vista, FL.). Some turtle experts conclude that spring may be the worst time for dredging because northern migrations begin and turtles may be moving into coastal waters in these areas. Of the data from FY13 to FY20 that was reviewed for hopper dredging projects from North Carolina to the Florida Keys, almost 60% of sea turtle takes occurred in March, which lends support to the conclusion that spring is not the optimal time for hopper dredging. However, with projects historically limited to winter hopper dredging windows, March also represented the month in which dredging had to

be complete, and there may have been a disproportionate number of project areas that had hills and valleys created by hopper dredging (cleanup phase) that caused the greatest risk of take if the draghead could not remain embedded in the sediment. With bed-leveling allowed under the 2020 SARBO, this risk is reduced.

USACE will continue to monitor take by area and time of year and work with turtle experts to better understand these movement patterns to determine if adjusting the timing for maintenance dredging can reduce the risk of take.

C.1.4. Additional loggerhead sea turtle information. Given that loggerhead sea turtles are taken in higher numbers than other sea turtle species, additional analysis is provided below for this species. This threatened species was divided into nine Distinct Population Segments (DPS) in 2011, with all loggerhead sea turtles in the United States along the Atlantic Coast and Gulf of Mexico in the Northwest Atlantic DPS (76 FR 58868, published on September 22, 2011). While the loggerhead sea turtle Recovery Plan identified smaller nesting populations based on genetics, it classified loggerhead sea turtles in the study area as part of the Northern Recovery Unit spanning from the Florida /Georgia border north through southern Virginia. Therefore, loggerhead sea turtle take occurring at a single project or across all five RHDC projects would have the same effect to the Northwest Atlantic DPS and/or the Northern Recovery Unit (NRU). Even if 35 loggerhead sea turtles were taken under the 2020 SARBO at a specific project or within a specific state, it would not change the status of the loggerhead sea turtle population or recovery.

The loggerhead take limit for the 2020 SARBO is relatively low for the amount of work and covered when compared to individual project consultations completed by NMFS. NMFS recently completed a biological opinion on the shrimp fishery and concluded that 2,150 lethal loggerhead sea turtle takes per 5-year period, (approximately 430 per year) would not change the recovery or result in jeopardy of the species even in the context of that loss combined with all other actions resulting in take of loggerhead sea turtles, including those covered under the 2020 SARBO⁸.

According to the status of the species section in a recent NMFS biological opinion⁸, loggerhead sea turtles in the NRU

are showing improved nesting numbers and a departure from the declining trend. Georgia nesting has rebounded to show the first statistically significant increasing trend since comprehensive nesting surveys began in 1989 (Mark Dodd, GADNR press release, <http://www.georgiawildlife.com/node/3139>). South Carolina and North Carolina nesting have also begun to shift away from the past declining

⁸ NMFS Reinitiation of Endangered Species Act (ESA) Section 7 Consultation on the Implementation of the Sea Turtle Conservation Regulations under the ESA and the Authorization of the Southeast U.S. Shrimp Fisheries in Federal Waters under the Magnuson-Stevens Fishery Management and Conservation Act (MSFMC), NMFS Tracking Number SERO-2021-00087

trend. Loggerhead nesting in Georgia, South Carolina, and North Carolina all broke records in 2015 and then topped those records again in 2016. Nesting in 2017 and 2018 declined relative to 2016, back to levels seen in 2013 to 2015, but then bounced back in 2019, breaking records for each of the three states and the overall recovery unit.

In addition, the total NWA DPS loggerhead population estimates vary, but range from 30,000 to 1,000,000 of just female loggerhead sea turtles, according to Section 4.1.1.5 of the 2020 SARBO.

According to the NMFS website at <https://www.fisheries.noaa.gov/species/loggerhead-turtle>, “In the United States, the Northwest Atlantic Ocean DPS of loggerhead turtle nests primarily along the Atlantic coast of Florida, South Carolina, Georgia, and North Carolina and along the Florida and Alabama coasts in the Gulf of Mexico. Total estimated nesting in the United States is more than 100,000 nests per year.” Sea turtle nesting data for the study area is available at www.seaturtle.org and summarized in Table 6 above.

The annual allowed take for all activities in the South Atlantic under the 2020 SARBO remains the same for loggerhead sea turtles as it was under the 1997 SARBO. Specifically, the 1997 SARBO evaluated the loss of 35 loggerhead sea turtles annually (observed lethal take). The 1997 SARBO did not account for take that was unobserved take as that was not common practice at that time. The 2020 SARBO evaluated loggerhead sea turtle take including 107 observed lethal takes plus 107 unobserved lethal takes per three consecutive year period to account for annual variation as is common in NMFS-issued biological opinions. For context, 107 observed lethal takes per three years is an average of 35.6 observed lethal takes per year, which is the same as the 1997 SARBO.

C.2. Sturgeon. Atlantic sturgeon inhabit coastal, estuarine, and riverine environments on the Atlantic coast. Five separate DPSs of Atlantic sturgeon were listed in 2012, and the project areas are located within the South Atlantic DPS (77 FR 5880 and 77 FR 5914, Publication Date February 6, 2012). Atlantic sturgeon commonly occur in the project areas. Adults migrate into spawning rivers, designated as critical habitat, in the spring and likely fall. Shortnose sturgeon, unlike Atlantic sturgeon, tend to spend relatively little time in the ocean, according to the NOAA species directory website. When they do enter marine waters, they generally stay close to shore. In the spring, adults move far upstream and away from saltwater to spawn. USACE will continue to monitor take by area and time of year and work with sturgeon experts to better understand these movement patterns to determine if adjusting timing can reduce the risk of take.

Of the data from FY13-20 reviewed for hopper dredging projects from North Carolina to the Florida Keys, almost 75% of Atlantic sturgeon lethal take occurred at the same three projects with high turtle takes (i.e., Savannah Harbor, Brunswick Harbor, and Kings Bay). Many projects have resulted in an almost equal number of Atlantic sturgeon take

relative to take of all species of sea turtles, as shown in Table 7 below.

Table 7. Historic Observed Take from Hopper Dredging of Sea Turtles Compared to Atlantic Sturgeon

Fiscal Year	Dredging Location	Dredging Dates	Atlantic Sturgeon	Total- All Turtle Species
2012	Charleston	2/29/12 – 3/17/12	1	1
2017	Charleston	2/4/17 – 2/17/17	1	0
2019	Charleston- Post 45 Deepening ⁹	12/10/18-4/14/19	3	3
2020	Charleston- Post 45 Deepening ¹⁰	12/25/19-3/27/20	3	5
2021	Charleston- Post 45 Deepening ¹¹	11/27/20-5/5/21	7	10
2019	Savannah	2/2/19-2/28/19	2	0
2020	Savannah	1/24-20-2/16/20	2	1
2015	Brunswick	1/20/15 - 2/14/15	1	0
2018	Brunswick	12/30/17 - 3/15/18	6	2
2020	Brunswick	1/10/20 - 2/20/20	4	5

In addition, relocation trawling during winter months has resulted in the relocation of high numbers of Atlantic sturgeon in some areas, including 79 Atlantic sturgeon relocations in Brunswick Harbor between January 18 to March 18, 2018. In Savannah Harbor, 41 Atlantic sturgeon were relocated between November 30, 2017 to April 1, 2018. Similarly, the three years combined for Charleston Deepening listed in Table 7 above included relocation of a total of 20 sea turtles for all species combined, but included relocation of 33 Atlantic sturgeon. While minimal mortality was associated with these relocation efforts, it is stressful to the sturgeon and may result in decreased ability to weather other stresses. In general, the number of sturgeon in many entrance channels is much larger in the winter than it is during the summer. The current theory is that the sturgeon are staging in these areas to go up nearby spawning rivers in the spring. While our understanding of the seasonal timing of sturgeon staging and annual migrations into spawning rivers is still developing, USACE will continue to monitor captures and work with sturgeon experts to understand how to reduce risk to this species.

C.3. North Atlantic Right Whales. NARW typically inhabit coastal waters along coastal Georgia and northern Florida each winter, often close to shore. According to the NOAA species directory website, each fall, some right whales travel more than 1,000 miles from North Atlantic feeding grounds to their only known calving grounds in the southeast; the majority of calving occurs in the shallow, coastal waters off Georgia and northeastern Florida. These whales remain near the surface with their new calves and are hard to spot in the water making them susceptible to vessel strikes, which is one of the leading causes of death for this species. In fact, both NARW deaths that occurred in 2021 occurred in the area covered by the 2020 SARBO - with one death caused by a vessel strike in St. Augustine, Florida and the other death off Myrtle Beach, South Carolina from a long-term entanglement. Entanglement is the other leading

⁹ Post 45 dredging is covered under a separate NMFS biological opinion, not the 2020 SARBO.

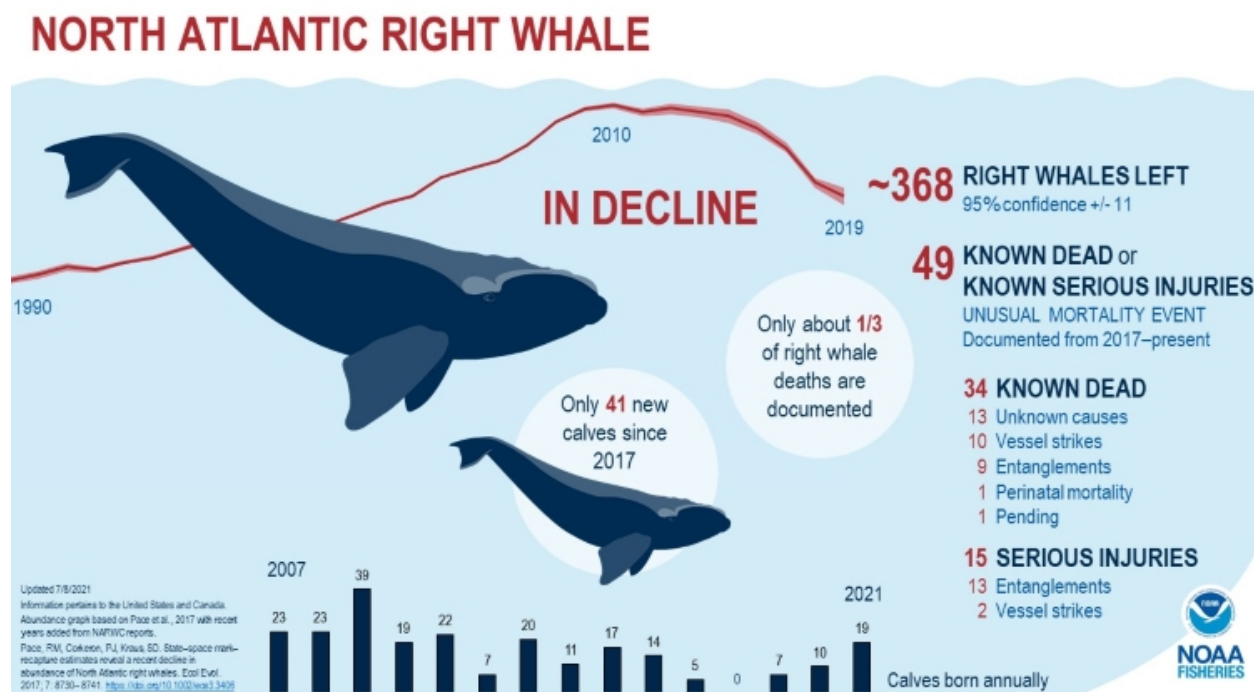
¹⁰ Post 45 dredging is covered under a separate NMFS biological opinion, not the 2020 SARBO.

¹¹ Post 45 dredging is covered under a separate NMFS biological opinion, not the 2020 SARBO.

cause of death for this species and the reason the 2020 SARBO requires all lines associated with work on a project to be non-entangling.

The coastal waters from Cape Fear, North Carolina southward to Cape Canaveral Florida are designated as critical habitat for calving and encompasses the federal navigation channels that are six meters or deeper, offshore placement area (ODMDS), and all areas in between that are transited by dredging and support vessels. None of the actions covered under the 2020 SARBO affect the NARW critical habitat essential features.

This endangered species is of particular concern to NMFS due to its critically low population numbers (estimated at only 368 remaining), low annual calving rates including no calves born in 2018, and an unusual mortality event where 49 individuals have died since 2017 equating to an estimated 10% population loss. This population loss and low birth rates is considered a significant setback to the recovery of the population as summarized in the image below (<https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2021-north-atlantic-right-whale-unusual-mortality-event>).



As noted in Section 3.1.4.1.4 of the 2020 SARBO,

We [NMFS] believe that the risk of a vessel strike occurring during a project analyzed under this Opinion is very low,[fn omitted] since we are only aware of 2 reported interactions with vessels related to dredging, worldwide with North Atlantic or the closely related South Atlantic right whales despite decades of dredging both within the action area and

globally. ***However, the consequences of potential take of a North Atlantic right whale to the small population of the species is high.***

While we do not normally discuss the status of a species when evaluating effects to a species if the effects from the action are not likely to adversely affect the species, the risk of vessel strikes and potential outcome of a strike to a North Atlantic right whale is unique due to the critical status of the population of this species. (emphasis added)

Also in Section 4.1.4.1.4, NMFS stated it was aware of two reports of a hopper dredge collision with a right whale. “One report occurred in South Africa in 1984 involving a Southern right whale and the other report occurred in Brunswick Harbor (within the action area) in 2005, though the report is contested by the USACE.”

The conclusions made by NMFS in the 2020 SARBO are predicated on USACE shifting the majority of dredging for which vessels must transit through NARW calving areas to times when they are not present. As stated in the vessel strike analysis conclusion for NARW in Section 3.1.4.1.4,

Because there are so few North Atlantic right whales, and much of the vessel traffic associated with the proposed action will take place outside of areas and times when North Atlantic right whales may be present, the likelihood of collisions is already very rare. We believe that the implementation of these additional protective measures in the PDCs further reduces the possibility of a vessel strike. When the rarity of occurrence is combined with the requirements of the *North Atlantic Right Whale Conservation Plan*, we believe a vessel strike is extremely unlikely to occur.

SARBO Section 6.1.1, lists the navigation channels that USACE had proposed to be dredged in warmer months and were analyzed by NMFS (that is, Brunswick Harbor, Savannah Harbor, Charleston Harbor, Wilmington Harbor Entrance/Inner Ocean Bar, Morehead City, and Manteo Entrance Channel). NMFS noted in Section 6.1.1 that any additional locations will be evaluated using the risk-based assessment process.

Under the North Atlantic Right Whale Conservation Plan (2020 SARBO Appendix F), USACE committed to reducing vessel traffic when and where NARW may be found. Specifically, Avoidance Measure NARW.1 states, “Hopper dredging and projects requiring survey vessels over 33-ft in length will be scheduled, to the maximum extent practicable, outside of North Atlantic right whale migration and calving season to avoid impacts to North Atlantic right whales, including reproducing females and newborn calves.” USACE also committed to expanding the aerial surveys used to locate NARW in the southeast. Historically, NARW aerial surveys were limited to Georgia and Northern Florida, which were co-funded by USACE, NMFS, U.S. Navy, and the U.S. Coast Guard. These surveys are used as part of the Early Warning System to alert vessels of their presence to reduce the risk of vessel strikes. The survey area expanded after completion of the 2020 SARBO to include North and South Carolina at

the cost of approximately \$1.5 million covered solely by USACE demonstrating USACE commitment to NARW conservation. This expanded aerial survey area expands the area where whale alerts are provided to mariners to reduce vessel strikes and provides valuable information on NARW use of this area to researchers. In FY20, the Early Warning System supported by USACE was able to locate NARWs, alert vessel pilots, and alert researchers so that temporary tags could be applied to short-term movement as part of ongoing research. USACE also helped to locate a deceased entangled NARW (named Cottontail) multiple times for researchers to study.

D. Minimization Measures/ Options Considered. Dredging of all five projects under the RHDC will adhere to all applicable PDCs in the 2020 SARBO; project timing, equipment use, and minimization measures are considered using the risk-assessment process. As outlined in this document, the primary species at risk of hopper dredging take from dredging of the five projects under the RHDC are sea turtles, Atlantic sturgeon, and NARW. Even after decisions are made based on this risk-assessment, USACE SAD will continue to work with Districts up to the commencement of work on these projects and throughout the dredging process to adaptively manage risk based on best-available information. USACE SAD also retains the ability to cease dredging if risk is determined to be too high during dredging operations.

D.1. Project Timing. The risk-assessment considerations for NARW and Atlantic sturgeon discussed in Sections C.2 and C.3 lead USACE to conclude that dredging outside of the historic dredging windows that were in the 1997 SARBO significantly reduces the risk to both NARW and sturgeon.

For NARW, adherence to the North Atlantic Right Whale Conservation Plan (2020 SARBO, Appendix F) ensures USACE vessels over 33 feet in length have reduced speeds to 10 knots when NARW are identified to be within 38 nautical miles. However, even with this Conservation Plan, the consequence of a potential vessel strike is greater than if dredging was done outside of the calving season because a NARW may be present that has not been spotted by an observer on a vessel or in a plane under the Early Warning System. This is the reason that USACE committed to expanding aerial surveys and moving as much work as is practicable outside of calving season as part of the Conservation Plan after numerous discussions with NMFS about NARW protection in light of its critically endangered status and population decline. Since the population status of NARW is so low, the consequence of a potential vessel strike makes the risk of working during calving season extremely high. The low population numbers (approximately 368 individuals total) of this species cannot sustain the species at its current rate of recent high death rates (49 dead since 2017 equaling almost 10% population loss) and low birth rates (only 41 calves born since 2017), meaning that more individuals have died than have been born since 2017. This population trend is in stark contrast to the other species covered by the 2020 SARBO and is the reason that no take (lethal or nonlethal) is authorized for NARW under the 2020 SARBO. For example, Table 6 lists 12,272 loggerhead sea turtle nests in 2020 within the SARBO action area.

For sea turtles, some individuals predict that working outside of historic dredging windows may slightly increase risk because more sea turtles may be more prevalent in the project areas in the spring, summer or fall when water temperatures are warmer. However, warmer water and higher densities of sea turtles will not necessarily result in higher take by hopper dredging, as discussed in Section 2.C.1 above. Hopper dredging has been successfully conducted in areas when sea turtle abundance was high and did not result in sea turtle take by hopper dredging. The 2020 SARBO offers the flexibility to continue to adjust project timing, equipment options, and minimization measures covered under SARBO to adjust work on projects to continue to try to reduce risk to all species based on an increased understanding of species and risk. Continued research increases the understanding of species' use of areas, risk from projects, and how these continue to change based on factors such as extreme weather events, like hurricanes, and climate change. Research during the past several decades has lead some turtle experts to conclude it may be in the best interest of turtles to move dredging outside historic dredging windows.

For Atlantic sturgeon, the high numbers encountered in many of these channels during historic dredging windows has led biologists to question whether hopper dredging in areas where sturgeon are likely staging prior to a spawning run is a the best time for activities like dredging. Though large numbers have been successfully relocated during winter months, especially in Brunswick Harbor, the long-term effects of these relocations is still not well understood. Moving work outside of historic winter months will also benefit this species by reducing the number of those captured by relocation trawling. Also, changing the timing of dredging will reduce lethal take because sturgeon move into rivers for spawning in spring and likely fall, thus reducing the likelihood of encounter.

Availability of dredging equipment is also a consideration. In past years, dredging in these project areas has been cut short or the channels were not maintained when hopper dredges had to be diverted to nationally higher priority projects, such as the annual maintenance dredging in the high-shoaling Mississippi River that typically occurs from February to April. Working outside of the winter months is also beneficial to the species considered in this assessment.

D.2. Equipment Choice. USACE also considered the use of cutterhead dredge, mechanical dredging, or limiting material placement to uplands to reduce risk to NARW. These options were determined to be cost prohibitive and would not be practicable for carrying out the necessary routine O&M of these critical Federal navigation projects.

Another equipment choice that can reduce risk of species entrainment from hopper dredging (e.g., sea turtles and sturgeon) is to utilize bed-levelers, as discussed in Section B.1.b above. USACE plans to continue to use this option to the maximum extent practicable for all projects.

USACE will also continue to work with species experts and industry to find ways to further reduce risk. If innovative equipment or equipment modifications are deemed

appropriate to try to reduce species risk, these changes will be coordinated with NMFS through the “Alternative Project Implementation and Programmatic Modification through the Superseding Process of Review,” which is outlined in Section 2.9.5 of the 2020 SARBO.

D.3. Relocation trawling. Relocation trawling remains a viable option to reduce the risk of hopper dredging take of sea turtles and sturgeon. However, relocating during summer months may encounter gravid (i.e., pregnant, carrying eggs) female sea turtles, and stress and exertion from relocation increases risk (e.g., nonlethal reproductive loss), as analyzed in SARBO Section 6.1.4.1.2 and therefore may result in unobserved take. Therefore, the duration of relocation trawling will be based on a balance of stressors inflicted upon sea turtles during relocation versus risk of lethal entrainment from hopper dredging (i.e., will depend upon number of adult female sea turtles captured versus the number of those entrained).

3. RECOMMENDATIONS FOR THE RHDC PROJECTS. USACE plans to issue a solicitation for a regional dredging contract to perform maintenance dredging at the five project locations listed in Section 1. So long as work is performed in compliance with any restrictions set by USACE (e.g., earliest start date for work, latest completion date, and use of certain mitigation measures), the exact timing for performing work will be left to the discretion of the company awarded the Regional Dredging Contract. It is assumed that a hopper dredge will be used by the company awarded the contract; however, hopper dredge is not required, and the company may use other options, including cutterhead or mechanical dredging. Use of other options is not expected based on past experience and limitations of these equipment types to complete work in these environments. USACE will continue to use the risk-based adaptive management process to evaluate and adjust recommended minimization measures, such as relocation trawling and bed-leveling, before and during dredging. USACE will retain the right to stop work on any project whenever the risk to ESA-listed species is deemed too high, as USACE has done for decades and is discussed earlier in this document.

An accurate and timely reporting is essential to risk-assessment and the adaptive process applied by USACE. Reporting requirements are important and consequently should be included as contract requirements. For example, hopper dredging and relocation trawling reports completed by the Protected Species Observer need to be provided to NMFS after every encounter with an ESA-listed species according to the 2020 SARBO PDCs. Reporting of hopper dredging take is currently entered in ODESS and relocation trawling reports are handwritten. Once ODESS is upgraded to Version 2, all data will be entered in the new hopper and trawling phone or tablet application. In addition, weekly reports should be provided in a digital, manipulatable Excel spreadsheet (e.g., not a scanned PDF) that provide all information required in the 2020 SARBO including species type, measurements taken, and confirmation if a tag was applied and genetic sample taken when required. This spreadsheet will provide a total count by species of all ESA-listed species captured. An end of project summary report is also required that includes the complete spreadsheet of ESA-listed species captured and a digital scanned copy of all handwritten reports (e.g., load, tow, daily report), if

applicable. All bycatch will be recorded indicating if bycatch occurred, species observed, and estimated numbers of species captured. Emphasis will be placed on tracking bycatch for species provided by USACE.

Based on the risk assessment in Section 2 above, the following is recommended for the dredging of these projects.

A. Wilmington and Morehead City Harbors. It is recommended that dredging be initiated on or after March 1st, which is a month later than the initiation of work under last year's contract. The risk assessment supports USACE moving outside of historic winter dredging windows. Since dredging is required annually for these two projects, the timing of the work needed to maintain the navigability of the Federal channels cannot be changed dramatically from year to year. Relocation trawling should be included in the contract as an optional line item so that it is a measure that USACE, at its discretion, can determine if or when use of relocation trawling begins and ends. The determination regarding relocation trawling will be based on best available information at the time, including hopper dredging take and relocation trawling captures that may be occurring at other projects in the area. Application of these considerations is consistent with past projects that were successfully performed within the past years (as discussed in Section 2). Also, the use of bed-levelers should continue to the maximum extent practicable.

B. Charleston, Savannah, and Brunswick Harbors. The risk assessment supports USACE moving outside of historic winter dredging windows to dredge these projects. Dredging within the prior windows does not reduce risk to the fullest extent for Atlantic sturgeon, NARWs, and likely sea turtles. However, dredging should be performed between 15 December and 31 March during FY22 because this timeframe is currently dictated by environmental compliance requirements that are being addressed and the ongoing litigation involving maintenance dredging of Brunswick Harbor. Relocation trawling should be included in the contract as an optional line item to provide discretion to USACE to require its use as needed, and the use of bed-levelers should continue to the maximum extent practicable. Once current sources of restrictions are resolved, USACE should update and apply the risk-based assessment and process, as required by the SARBO, to determine the timing, equipment, and mitigation measures for conducting maintenance dredging at these three projects and minimizing the risk of takes.

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