

Wilmington Harbor 403 Draft Environmental Impact Study: Summary and Potential Impacts

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The Wilmington Harbor 403 DEIS purpose, as stated by the USACE, is to “contribute to national economic development by addressing transportation inefficiencies for the forecasted vessel fleet, consistent with protecting the Nation’s environment.” Both aspects are important, not just the economic development aspect. The “protecting the Nation’s environment” means that we must fully examine the current and future impacts in all the alternatives as to harm to the river and that mitigation measures must also be formulated that are truly mitigation benefits to the watershed. Deepening and widening the channel will lead to reduced hydraulic drag that makes it easier for water to move into and out of the river, thus impacting tides, salinity, and more. These efforts will negatively impact freshwater wetlands and aquatic habitat. But this same deepening will possibly lead to benefits with less vessel traffic and possibly beneficial placement of sediments for renourishment, intertidal buildup and shore protection, and to bird island restoration. The current plan, Action Alternative 1 (AA1) that would allow for deepening to 47 and 49-foot water depths, is stated as having a positive Benefits to Cost Ratio. These negative and positive factors are the point of the DEIS and for Public Comment. Our assessments should be to explore economic and environmental concerns, and all current and future impacts. If deepening is not critical to the future of the port, then we should look seriously at the No Action Alternative and just continue with maintenance dredging to support the port’s current successful operation. If it is critical then we should consider AA1.

Most of the materials mentioned below are directly from the DEIS Summary and Appendices. Other comments are based on references that are cited or observations over time in the watershed.

History of Port Deepening. A short comment about the history of port deepening is appropriate. Deepening began in 1871 to deepen the entire river to 12 feet. There were already deeper parts of the river, but shoals prevented access to Wilmington, particularly at low water stages. Deepening occurred in increments from that time as shown in Table to the right. The last deepening to 42 feet in the river and 44 feet in the ocean reach occurred in 2003. Maintenance dredging has occurred since that time for port activities.

Year	Dredge Depth (FT)
1871	12
1881	16
1890	20
1909	24
1912	26
1930	30
1946	32
1950	34
1970	38
2003	42/44

The current proposed deepening is to 47 feet from Port to Battery Island and 49 feet from Battery Island into the ocean for 9 miles. This is Action Alternative 1.

USACE Statement of Economics and Plan

“In the “future without” and “future with project” conditions, the same volume of cargo is assumed to move through Wilmington Harbor; however, channel modifications would allow for more efficient vessel use. National Economic Development (NED) Plan includes reasonably maximizing net benefits while remaining consistent with the Federal objective of protecting the nation’s environment.” This is a very important statement. Basically, larger ships will mean fewer trips but not necessarily any change in volume of cargo to the port with any of the alternatives. The value of the deepening is to have fewer, but larger vessels transporting cargo. The estimate is that there will be an average annual benefit of \$15,874,000 with a Benefits to Cost Ratio of 1.3 – not fantastic but meets criteria.

But is it needed? Can Wilmington maintain its important port status? Based on the Corps’ own documents, it can. It already receives the larger Generation III Post-Panamax container ships. The Turning Basin was already widened

to 1524 feet to accommodate the larger vessels, and we have seen several of the Post-Panamax ships come to the Wilmington Port. However, they do need to come in at high tide and perhaps have a lighter load to reduce the ship's draft requirements.

The preferred USACE Alternative AA1 is to deepen the river to 47 feet (Port to Battery Island = ~28 miles) and to deepen the ocean reaches to 49 feet (Battery Island through the Inner and Outer Ocean segments = ~9 miles). It is important to note that both deepening areas allow an additional 2 feet of overdepth dredging (can dredge 2 feet greater and still be in compliance) so the 47 feet could be dredged to 49 ft. etc.

Deepening requires some widening. A 3:1 slope (see below) is utilized. For every foot deepened, three feet would be widened. But there is additional widening in many parts of the planned deepening project.

The one big difference cited, which provides some positive economic benefits with deepening, is that the NAA requires more vessels to enter the river to meet port needs. The DEIS says this will lead to more erosion with wakes.

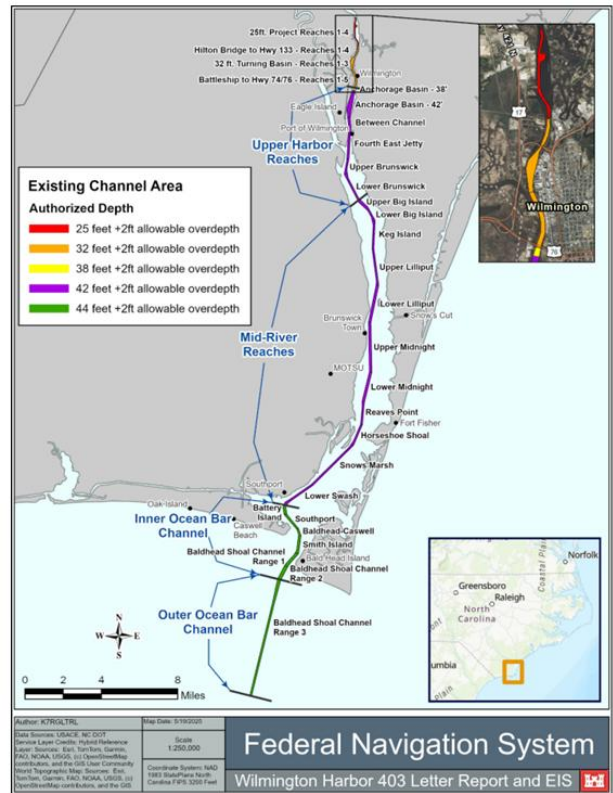


Figure 1-1: Existing Wilmington Harbor Federal Navigation Project and currently authorized depths

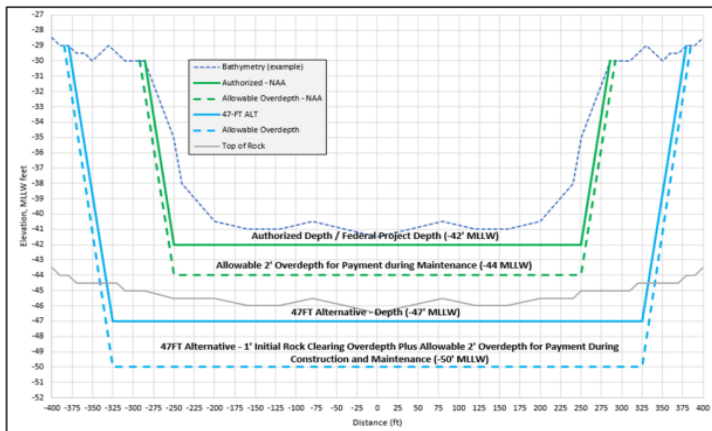


Figure 2-1: Typical cross section of Action Alternative 1 (-47 ft). Please note that the x-axis is more compressed than the y-axis and that the side slopes are not as steep as they appear in the figure.

Dredge Material – Amounts and Types

The total amount of dredge material listed in AA1 to deepen the river from 42 to 47 feet and in the ocean reaches from 44 to 49 feet 35.1 million cubic yards of sediment and rocks. Most of the material is unconsolidated sand, silt, and clay (equals ~ 30.5 million cubic yards of the total amount). The remainder is both hard and softer rock. The amount of hard rock is 3% (~1.1 million cubic yards) and soft rock is 10% (~3.5 million cubic yards) of the total. The hard rock will likely require blasting, which will demand that mitigation of the blast effects be implemented. There are methods, called

Note the deepening but also the widening that is required when deepening. This is what is said to reduce shear stress as vessels are more distant from the edges of the channel margins. There is a 2-foot overdepth, too; 1-foot in the rock area. The sidewalls are vertically exaggerated; the margins are not that steep.

Material type percentages anticipated during new work and O&M for both action alternatives.

Dredged Material Type	Percentage of Material in Navigation Channel AA1	Percentage of Material in Navigation Channel AA2
Sand ¹	17%	18%
Silty/Clayey Sand	21%	22%
Clays/Silts	25%	25%
Mix ²	19%	21%
Soft Rock ³	10%	8%
Hard Rock ⁴	3%	3%
Unknown ⁵	5%	3%
Total	100%	100%

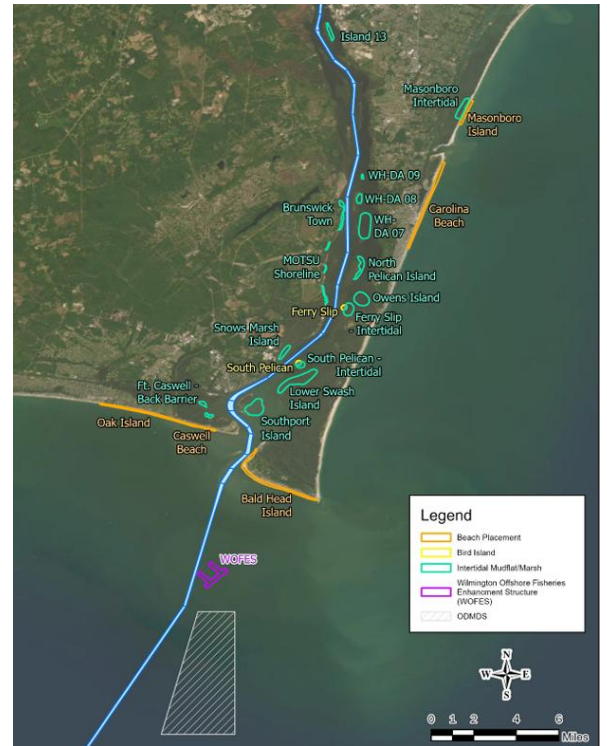
stemming, to reduce the blast impacts on species such as sturgeon. The removal of sediment will have impacts on the benthic fauna and their habitats. For information, yearly maintenance dredging removes ~2.5 million cubic yards of sediment.

Beneficial Uses of Dredge Material

Approximately ½ of the total dredge material (17.5 million cubic yards) is scheduled for “Beneficial Uses”. The other ½ will be placed in the Ocean Dredged Materials Disposal Site (ODMDS) – see image to right. There are many possible benefits as well as issues with dredge spoil placement.

The types of projects being considered include:

(1) Intertidal placement of fine-grained and sandy material along riverbanks, back barrier areas, surrounding bird island areas, and along marshes in the Cape Fear River. This is the dominant type of beneficial placement as it can utilize all types of materials. In addition, with rising sea levels and erosion that has impacted many areas within the river, these might provide important habitats and future forage sites as this would help them keep up with sea level rise. The amount of acreage anticipated for placement is 1,782.5 acres with 14,019,232 million cubic yards of various sand/silt/clay sediment compositions. These will serve as shoreline protection (MOTSU, Brunswick Town, Fort Fisher, etc.) and habitat/island maintenance.



There will of course be short-term turbidity issues as well as questions about sediment content (chemicals, etc.) that are mentioned below. Thin layer placement has been described (<https://coastalscience.noaa.gov/news/thin-layer-sediment-placement-boosts-marsh-growth-in-new-experimental-study/>) in several studies.

(2) Beach nourishment in New Hanover and Brunswick counties. Material must be sand for these beach renourishment projects, and they must be done during turtle non-nesting season (Nov – Apr). The beaches considered are Bald Head, Oak Island, and Caswell Beaches though Carolina and Masonboro may be considered. The total acreage and cubic yards, including Carolina and Masonboro Island, are 788.5 acres and 4.9 million cubic yards, respectively. Renourishment sands are becoming more problematic and expensive.

(3) Bird island placement includes those existing and historic footprints. Two islands, Ferry Slip and South Pelican, are considered. The goal is to enlarge the islands back to the desired sizes of 25 acres (size is important as larger islands may attract more predators) and there will also be placement of intertidal materials that will serve as aprons around the islands for food. The total will be 563,000 cubic yards. Audubon has stated they are opposed to the Port Deepening as they state that “larger vessels will increase wake and therefore inundation and erosion of these and other islands that support significant coastal waterbird areas” (<https://nc.audubon.org/news/proposed-wilmington-port-expansion-bad-news-birds-and-people>). And there is concern upstream, too, with loss of habitat for birds in the bottomlands. If this project proceeds, there must be mitigation for the possible harm to the bird islands as up to 30% of North Carolina’s coastal waterbirds are found here. Questions of PFAS in the sediment are an issue, too.

(4) Fish habitat rock placement will be at the existing Wilmington Offshore Fisheries Enhancement Structure or WOFES. The rocks will provide important reef habitats in the offshore environment. One consideration of the rock is the possible impact of blasting rock from the river bottom. This is of course a concern but, done right, the impacts are minimal if the blasting is confined. This may be done with controlled blasting that minimizes the impacts by drilling the hole and setting the explosive and capping that with gravel etc. to confine the blast to the subsurface as much as possible. The USACE will evaluate potential effects, though, including any impacts to ecological or cultural resources. This is particularly important for some species such as the endangered Atlantic sturgeon.

Are there any issues with the Dredged Material?

There are of course many issues with the location, type, and thickness of the sediment placement. Too much or too little intertidal material could have many detrimental effects on habitat and forage but there are many potential benefits such as increasing habitat and forage areas in the low-lying marsh areas and on the bird islands. And of course, the placement at the shore in several areas may reduce erosion/protect significant areas. And renourishment of our beaches is an important economic driver for our beach communities with a positive cost/benefit ratio. As mentioned previously these projects require compatible sand and the timing of placement is also important.

However, one other thing must be considered – what is in the sediments other than sediments/rocks? If we are placing sediment in all these critical habitat and nursery areas, we should consider concentration levels of PFAS and other toxic chemicals. There have been several studies that show PFAS is present in the sediments (<https://www.deq.nc.gov/genx/deq-2021-sediment-study-report/open>; <https://pubs.rsc.org/en/content/getauthorversionpdf/d2em00246a> , etc.). And with both deepening and widening, we need to know what the levels of toxins are in those sediments. EPA (<https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks-pfas>) and CDC (<https://www.atsdr.cdc.gov/pfas/about/health-effects.html>) have both provided health issue warnings and we know that EPA set limits for several of these forever chemicals (<https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas>). But the DEIS doesn't address this issue as USACE says that PFAS is not a regulated substance by EPA. This is a large omission in the DEIS. It is true that EPA does not currently have regulatory limits on PFAS. But PFOA and PFOS will be in 2031. It is unfortunate this delay occurred as well as EPS's removal of several other PFAS chemicals, including GenX, from the regulated list. However, **since dredging initiation, if done, won't be until 2030 and dredging will continue for 6 years, the dredging will occur after regulations are established.** Therefore, this should require USACE to look at possible impacts in this study as an EIS requires potential impacts.

There is another argument that the EIS should address PFAS, etc. These “forever” chemicals are listed as hazardous with CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act/Superfund Act). EPA concluded that a hazard “*designation is warranted based solely on its finding that PFOA and PFOS may present a substantial danger to the public health or welfare or the environment when released into the environment.*” And, as of 2022 “*EPA is designating PFOA and PFOS, including their salts and structural isomers, as hazardous substances under section 102(a) of CERCLA*” (<https://www.epa.gov/superfund/questions-and-answers-about-designation-pfoa-and-pfos-hazardous-substances-under-cercla#:~:text=The%20EPA%20has%20designated%20PFOA%20and%20PFOS,for%20contamination%20pay%20to%20clean%20it%20up>). Hazard to public health and the environment warrants a response and action.

Estuary Changes/Impacts (Mostly Environmental)

Wave, Wake, and Erosion. Vessel traffic causes elevated sediment disturbance and increases shoreline vulnerability with the waves and wake generated. Under the NAA plan, there will be more vessels needed to handle projected cargo increases at the port. Increased vessel traffic over time would continue to elevate sediment disturbance and increase river shoreline vulnerability throughout Wilmington Harbor. The AA1 plan will also have sediment/erosion issues but the increased depth and widening decreases the bed shear stresses. Placement of materials from dredging and maintenance dredging are said to protect shorelines and islands. But wakes and waves will still occur. Based on the DEIS the AA1 plan is positive.

Tides. We know that tides have approximately doubled in Wilmington since 1870 with the deepening of the river. We know this as Wilmington tides have increased while those in Southport have only increased slightly (Familkhalili and Talke, 2016). There is some discrepancy/change comparing the 203 Harbor Deepening Report with the current DEIS. Deepening in the 203 report was suggested to lead to a 4-inch tidal range change with a 2-inch higher high tide and 2-inch lower low tide. The current DEIS still suggests a larger tidal range but the increase is estimated to be 3.1 inches (5.9% increase) with a 1.3-inch higher tide and a 1.8-inch lower tide. This will of course move saline waters further up the river as described below. And importantly, though 1.8 inches doesn't sound like much, if you add that to already flooded areas during rain events, storm surge, sea level rise and high tide flooding that does make a difference.

Storm Surge. There is likely to be an approximate 1-inch storm surge increase. Storm surge occurs when onshore winds "push" waters into and up the river. These may occur in storms or with onshore winds from frontal passages. The onshore winds also hold the water in the river leading to rising water levels. Again, 1 inch sounds small, but coupling that with the tides and other events mentioned above it does have impact. Consider adding 2 or 3 inches of water onto already low areas that are impacted by compound flooding such as Eagles Island, Point Peter, and downtown Wilmington. And as sea level rise is accelerating, with Wilmington having one of the larger rises in sea level on the East Coast since 2000, this will have even more impact in the future.

For the 500-year storm surge event under no SLC (Sea Level Change), AA1 increases peak water levels by 3.1% at Wilmington and expands the total inundation area by 0.5% compared to the NAA.

Salinity. Saltwater intrusion into the estuary is more pronounced with deepening. Saltwater is denser than freshwater and deepening allows for a saltwater wedge to move further upriver changing ecosystem dynamics. This is at the heart of mitigation requirements. In particular, the change of tidal freshwater swamps to oligohaline (0.5 – 5.0 ppt) marshes/wetlands. This is described below in the mitigation discussion and shown in the table to the right. The loss of 1,071 acres of freshwater wetlands is the object of mitigation. Impacts are shown to the right.

Salinity Zone	AA1 Impacts (Acres)
Tidal Fresh	-1,071
Oligohaline	-204
Mesohaline	1,114
Polyhaline	87
Euhaline	75

In the 203 model studies, the surface waters near Wilmington were projected to increase in salinity by 1 ppt while waters along the bottom of the river would increase by up to 5 ppt. The new USACE DEIS hydrologic models show that salinities will increase, but not as much with either the base case SLR (SLC0) or with the high SLR (SLC3). The most notable salinity impact in the current assessment occurred at monitoring location M61 (mid-estuary, near the Port of Wilmington), where the average surface salinity change during a typical year without SLC was 1.28 ppt at the surface and 2.51 at the bottom layer, as shown in Table 3-20 and Table 3-21. The mean difference in surface salinity was 0.84 ppt for SLC0 and 0.93 ppt for SLC3 across all monitoring stations. For the bottom layer, mean difference in salinity was 1.21 ppt for SLC0 and 1.10 ppt for SLC3 across all monitoring stations. It is best to look at

the high case like at M61 to assess changes, in my opinion. The state criteria for changes in salinity for Class SC waters is no removal of the functions of Primary Nursery Areas; therefore, any project impacts on wetlands adjacent to the river and tributaries must involve mitigation.

Salinity changes have already led to changing ecosystems along the river and up tributaries including the NECFR, Smith Creek, Town Creek and more. Ghost forests are an obvious indicator of salinity increase. However, the insidious migration of more salt tolerant plant species to replace freshwater tidal swamp forest and freshwater marshes has been recognized with the current deepening and will be even more significant with further deepening. As one example, bottomland swamp forests were lost and converted to marsh grasses for a 2-mile stretch along Town Creek from 2006 to 2021. Much of this is likely a result of increased salinity following the deepening to 42 feet in the early 2000s. Migration of these communities may only progress so far upstream as increasing elevations may preclude further migration. These same effects have been seen in Smith Creek and other locations. Magolan and Halls, 2020 (A Multi-Decadal Investigation Of Tidal Creek Wetland Changes, Water Level Rise And Ghost Forests) and Devereaux et al., 2025 (Tree- Ring and Sediment Analyses Reveal Processes of Bald Cypress Ghost Forest Formation From Dredging in the Cape Fear River, North Carolina, USA) show these impacts.

Salinity increases are also changing the fauna within the river to more brackish forms. For instance, Blue Crabs are moving further up the estuary and are now found north of Wilmington.

One other factor that should also be considered with salinity change is that “saltier” waters lead to the breakdown of freshwater organics/mud in the soils. This breakdown will lead to even more erosion and subsidence in the adjacent land areas dominated by the freshwater tidal wetlands. This has not been considered.

These salinity increases are important and modeling must provide details on the impacts to the flora and fauna at the river bottom, within the water column, and in areas adjacent to the river, including tributaries and wetlands.

Sea Level Rise. The USACE is including a wider range of sea level rise estimates in their DEIS than that used in the 203-Study – this is a good thing. Low to high levels from NOAA and USACE will be used. The three, sea level change (SLC) scenarios considered are No SLC, SLC1 (0.5 ft by 2086), SLC2 (1.28 ft by 2086), and SLC3 (3.77 ft by 2086). For information the Coastal Resources Commission Science Panel has stated there is ≥ 1 foot of rise to occur in NC by 2050 (<https://www.deq.nc.gov/2024-north-carolina-sea-level-rise-science-update/open>). And NOAA has similar data as well as a 2-foot rise estimate by ~2070 as an intermediate case. Addressing higher values is a must as our tide gauge data illustrates an acceleration of sea level rise along the East Coast and even a higher rise here in Wilmington. And there are factors with our changing climate that may lead to very high increases. Sea level rise is one of the compound flood issues for our area, but higher water will also impact the ports and infrastructure needed for the port.

Climate Change. It goes without saying that climate change is impacting many things we do as well as hazards that we are facing. This is true of the Cape Fear Estuary. But for this project we need to look at the future state of and vulnerability of the estuary to changes that may occur. We have seen the impact of 500 and even 1000-year flood events in our area that have been caused by heavier rainfall events; warm air holds more moisture. And when coupled with the higher tides, storm surge, and sea level rise, our area businesses, property, and lives are even more at risk. Our area is a compound flood area (local rainfall, upstream rainfall, storm surge, sea level rise, and high-tide/perigeal flooding) and all of these events should be considered as additive impacts with the river deepening. Multiple studies discuss the increased impacts of these events:

(<https://www.weather.gov/ilm/hurricaneflorence#:~:text=Hurricane%20Florence%2C%20a%20large%20and,Cape%20Fear%20and%20Cape%20Lookout>),

<https://ncimpact.sog.unc.edu/2021/12/coastal-resilience-in-the-wilmington-region/#:~:text=In%20recent%20years%2C%20coastal%20North,this%20topic%20in%20September%202021> .

Florence is used, as it should be, by the USACE as the storm of record for our area with its associated flooding and rainfall. It is certainly our “disaster storm” of record. However, it is important to note that Isaias in 2020 actually had a higher flood stage at downtown Wilmington. As the Zurich Insurance Group said, “think how bad it can be and plan for worse”.

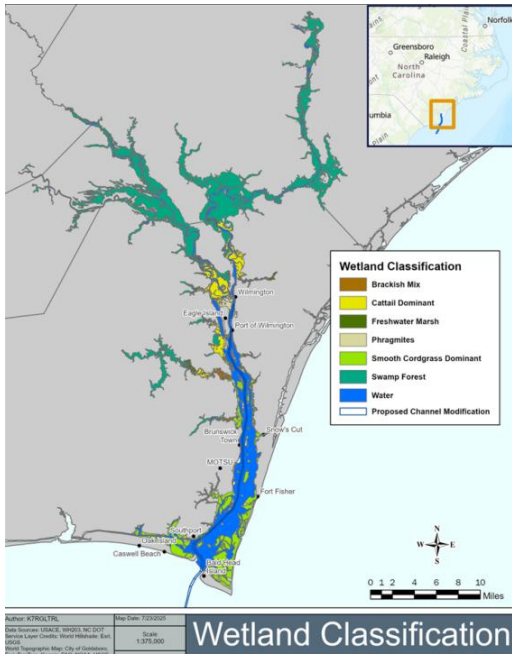
Water Quality. Comparison of before and after water quality is an essential component of the assessment. We know there will be salinity changes but other properties such as turbidity (cloudiness of the water that will lower sunlight penetration and, in some cases, make filter feeding more problematic), temperature, and dissolved oxygen may be impacted. Dredging will lead to turbidity issues, at least in the short term. The data in the DEIS shows that there will be minimal water quality changes in TSS, DO, and temperature.

But one aspect that we know little about is what is in the sediment/rock that will be removed. We know that toxic substances such as PFAS have been found in soils and sediments along the Cape Fear. We need to know what is in the materials that will be dredged. This is of course important for two reasons. First, will toxic substances be released into the river that may impact species in the river. And second, if we do use some of these sediments for beneficial placement or thin-bed application in marshes, do they contain toxic substances that will be spread on marshes or other habitat restoration areas. We would not want to place contaminated sediments on sensitive areas. This is discussed above in the Beneficial Use of Dredge Material. One other issue not mentioned above with PFAS is the soon to be completed Brunswick County Northwest Water Treatment Plant Reverse Osmosis Unit. Reverse osmosis effectively removes many toxins from drinking water but the effluent will have more concentrated PFAS and it will be released into the Cape Fear River above Wilmington.

Groundwater. Part of the Cape Fear River Estuary is already “grounded” in the Castle Hayne Limestone as some rock was removed in the 2000 – 2003 dredging operation. With the proposed 5 feet of further deepening, there is some concern that the groundwater will be impacted. There will be over 1 million cubic yards of rock to be removed, mainly in the Lower Brunswick to the Keg Island area. The studies in the DEIS indicate, from modeling, that there will be no contribution of river water into the aquifers surrounding the river. The river is a net gaining stream meaning that pressure is higher in the aquifers and net movement of water that does occur will move into the river. There is concern with saltwater intrusion in the northern part of NHC, Wrightsville, Carolina, and Kure Beaches but this is due to overuse of groundwater and to sea level rise – not riverine saltwater intrusion.

Cultural, Historical, and Environmental Justice Considerations. There has been minimal coverage of these topics other than to list these as socioeconomic resources. But it is very important that we safeguard these resources and our heritage. There are many aspects to this that may be impacted including our maritime artifacts and Gullah Geechee corridor and rice culture that includes the many historic rice canals that line the river and tributaries. The Gullah Geechee heritage and impacts is not mentioned in the DEIS; this is an important oversight. Possible impacts to other significant areas include Brunswick Town, Fort Fisher, and more.

Habitat, Vegetation, and Primary Nursery Ground Changes. Estimates in the 203-Study were that vegetation changes may include the loss or modification of 242 acres of tidal swamp forest, 98 acres of tidal freshwater marsh, and 62 acres of cattail dominated marsh. In addition, 33 acres of significant Primary Nursery Grounds will be impacted. Primary Nursery Grounds occur all along the Cape Fear Estuary including at and upstream of the Ports. These are critical to our finfish and shellfish.



The current DEIS states that there will be a loss of 1,071 acres for tidal freshwater wetlands and marshes caused by increasing salinity. The map below shows these types of ecosystems in green. One of the studies that will need to be done will be to assess the impact of deepening on threatened and endangered species such as the Atlantic and Short-nosed Sturgeons, and for that matter, all of the species such as anadromous fish species in the river. And at the lower end of the estuary turtles and birds could be impacted with the dredging activities and the placement of sand on the beaches.

Of note, there have been minimal studies within the Cape Fear River estuary to look at hard bottoms, soft bottoms, shellfish, and if there is any submerged aquatic vegetation present. This is stated for review in the EIS but was not fully addressed in discussions in the USACE forums on the topic. Remember, there will be a very large volume of sediment and rock removed from the river if dredged to 47 feet, and this will change habitat and foraging for multiple species.

Biological Assessment of Endangered and Threatened Species

The biologic assessment of threatened and endangered species was extensive. Most of these are near coast with beach nourishment for turtles or deposition of material in the Offshore Placement Zone. However, sturgeon may be affected. The table to the right shows the assessment for these species and habitats and possible effects:

- NE = No Effect
- MANLAA = May Affect, Not Likely to Adversely Affect
- MALAA = May Affect, Likely to Adversely Affect

If you look at the Essential Fish Habitat appendix, most of them are said to have Adverse but Not Substantial impacts with both dredging and beneficial placement. Obviously, these are of concern.

Species	ESA Listing Status	Effects Determination
Sea Turtles		
Green (North Atlantic [NA] DPS)	T	MALAA
Hawksbill	E	MANLAA
Kemp's ridley	E	MALAA
Leatherback	E	MALAA
Loggerhead (Northwest Atlantic [NWA] DPS)	T	MALAA
Fish		
Atlantic sturgeon (SA DPS)	E	MALAA
Shortnose sturgeon	E	MALAA
Elasmobranchs		
Giant manta ray	T	MALAA
Oceanic whitetip shark	T	NE
Whales		
Blue whale	E	NE
Fin whale	E	NE
North Atlantic right whale	E	MANLAA
Sei whale	E	NE
Sperm whale	E	NE

E= endangered; T= threatened

And one area that I think deserves more coverage is the bottom fauna – epifauna and infauna at the river bed.

Mitigation for Wetland Function Loss and Aquatic Habitat Impacts

Implementation of AA1 will lead to changes within the Cape Fear Estuary that include wetland ecological function loss and adverse aquatic habitat impacts. The project will lead to a shift in salinity upriver, which can lead to salt-stressed vegetation and cause a loss of tree canopy. The change in wetland ecological function includes the conversion of 1,071 acres of freshwater forested and marsh wetlands (<0.5 ppt salinity) to oligohaline wetlands (0.5 – 5.0 ppt salinity). The adverse aquatic habitat impacts include loss of Atlantic sturgeon spawning and impacts to them in the first year, striped bass larval and spawning habitat impacts, and impacts to blueback herring and American shad. Two Wetland Mitigation Sites and Two Aquatic Habitat Improvement Sites have been identified as mitigation measures.

If the AA1 is done, the best mitigation projects should be adopted. There are issues with two of the plans. But first what are the plans and what are the issues?

The proposed plans for Wetland Mitigation, costing a total of \$ \$21,304,624, are:

1. Eagles Island Restoration Project is removal of invasive Phragmites and restoration of tidal pools and flows and planting of native marsh vegetation to enhance biodiversity.

Problem: Phragmites is “notoriously” hard to remove. Herbicides and burning have had some success but there are many citations of poor response to eradication efforts. I believe this mitigation plan will have limited positive impacts. In fact, with rising sea levels, Phragmites “keeps up” with sea level rise better than native grasses.

Monies would be better spent on other restoration projects. Papers include:

<https://news.ncsu.edu/2017/02/invasive-marsh-grass/> and <https://www.wypr.org/wypr-news/2019-10-17/as-climate-changes-scientists-re-think-phragmites> .

Better use of funds might be along the NECFR with purchase of Sledge Forest or other parts of the NECFR Bottomland Corridor.

2. Black River Purchase Project: The Black River Corridor consists of an old growth swamp forest in the floodplains of the Black River. Although there is high timber value, logging is problematic. However, it would still be of value to remove any risk of bottomland hardwood loss in this area. These bottomlands have high value with flood control, sediment and nutrient retention, water storage, and carbon storage. Maintaining unfragmented habitats will maintain high biodiversity.

Benefit: The total acreage preserved will be 603 acres and will provide needed assurance of preservation of high value, high biodiversity bottomland habitats. Ownership guarantees preservation.

The currently considered Plans for the Aquatic Habitat improvements costing \$41,072,332 are:

1. Lock and Dam #1: The dam has been an impediment, as have Dams 2 and 3, to anadromous fish spawning migration since their construction from 1915 – 1935. A rock arch rapid was constructed at #1 in 2012 and modified in 2021 to encourage fish passage. However, striped bass and sturgeon have seen limited success in migration rates. To increase passage, a bypass channel is proposed through the northern floodplain to allow passage around the dam.

Benefit: If this is possible, it would be of great value to an important part of the anadromous fish in the Cape Fear River Basin. The plan sounds good but requires some further discussion. It would be good to know what the % passage has been for striped bass w/ the modified rapids following 2021. The cost is \$ 8,835,832.

2. Lock and Dam #2: Even if fish passage is successful at L&D#1, the other dams are impediments to upstream migration. The proposal here is to construct a rock arch rapid at L&D#2. The scour hole would have to be filled before construction of rock arch. There is no option here for a channel cut around the dam. The cost would be \$32,236,500.

Issue: Although passage is needed, this is **not the best alternative. I believe if you look at the cost/benefit of actions the best plan would be to remove the dam.** Dams 1 and 3 can't be removed as they provide storage water volumes for water intake and use. However, Dam #2 could be, though of course there should be a full study, removed as it provides no storage volume needs. Removal could be done for just part of the dam leaving the lock and part of the dam as historic features on the river while still providing for fish passage and boat passage. There might even be more money for starting a fish passage at Dam #3.

Bottomline Comments:

The Wilmington Harbor 403 Port Deepening Study (Draft Environmental Impact Statement - DEIS) provides important information to consider. The information considers a No Action Alternative as well as the preferred Action Alternative 1, which is the deepening of the river from 42 to 47 feet in the river and 44 to 49 feet in the ocean reaches. There is information on the Alternative Action 2 plan, which is deepening to 46 feet, but since it is not the preferred plan, it is of little concern in my summary. The DEIS concludes that there are some negative impacts (aquatic habitat loss and wetland change) with deepening but there are benefits (reduced ship traffic and wake, etc.), too. Here is the statement from the USACE at the beginning of the Summary Report:

“A wide range of impacts are described and analyzed in the DEIS. Most are minor, temporary, construction-related impacts associated with dredging and dredged material placement. Two general types of meaningful adverse impacts identified would require compensatory mitigation. They include the direct loss of fish habitat from channel widening and deepening activities and indirect wetland functional impacts associated with shifts in vegetation from increased salinity concentrations within the lower Cape Fear River. Once constructed, the deeper and wider channels would allow more ocean water to mix with the freshwater in the river. Wetlands salt-tolerant vegetation would shift upstream within and somewhat upstream of the deepened reaches of the river system and adjacent wetlands. Although there would be no net loss of wetlands, there would be a loss of freshwater forested wetlands. Along with the adverse impacts, some beneficial effects would be expected. The deepened and widened channels would allow the cargo to be transported on a smaller number of larger and more modern and efficient vessels. In addition to the economic benefits, these transportation efficiencies would result in fewer vessel transits through the harbor yielding beneficial effects such as reduced fuel consumption, air emissions, vessel strikes to animals in the channels and shoreline erosion compared to the No Action Alternative. To compensate for the loss of aquatic habitat, fish passage improvement projects would be constructed at Lock and Dams 1 and 2 on the Cape Fear River to enable anadromous fish to access quality habitat upstream of those facilities. Proposed compensatory mitigation for changes in wetlands vegetation includes preservation of high-quality forested freshwater wetlands and enhancement of degraded wetlands in the lower Cape Fear River.”

My assessment is that, though there are some economic benefits (less vessels carrying more cargo) and some possible environmental benefits (beneficial sediment placement for habitat enhancement in intertidal areas, placement of sand on bird islands and beaches) the negatives and potential negatives outweigh those benefits. Increases in tidal range and storm surge will exacerbate rising sea levels and flooding in an already hazardous compound flood area. And the increase in salinity changes the ecosystems further upstream, reducing the valuable tidal freshwater wetlands while deepening activities also jeopardize habitat that must also be mitigated. There are also the unknown impacts of PFAS and other toxins in the river sediments that should be addressed in the report. Not knowing impacts means the DEIS is flawed, even if these chemicals aren't currently regulated. Further, the economic benefits, though present, are marginal. Impacts and possible impacts are most important.

HOWEVER, the report should include and also if the deepening does occur, I recommend that the stated mitigation scenarios be reviewed and changed. The Eagles Island restoration involving Phragmites removal is not well spent money as Phragmites notoriously comes back from eradication attempts. The money could be used to purchase more property to protect more ecosystems; purchase is the only way to guarantee preservation. I would also revise the proposed project at Lock and Dam #2. Better results would occur with the removal of the dam instead of building another very expensive rock arch rapid for fish passage. I would use the money saved to help construct a rock arch rapid at Lock and Dam #3; this would cover all three dams that have prevented anadromous fish species from moving to historic spawning grounds. Optimizing monies for maximum benefit is a must. I would also require PFAS testing of sediments, river-bed faunal studies, address Gullah Geechee heritage, and more primary and secondary economic evaluations with truck and rail traffic, etc.