Mid-Currituck Bridge Project
Essential Fish Habitat Technical Report Addendum

WBS ELEMENT: 34470.1.TA1
STIP NO. R-2576
CURRITUCK COUNTY
DARE COUNTY

North Carolina Department Of Transportation

North Carolina Turnpike Authority

April 2025

PURPOSE AND FORMAT OF THIS ADDENDUM

NCDOT has prepared this addendum to the Mid-Currituck Bridge Project Essential Fish Habitat Technical Report, November 2011 (Appendix A), in response to a request from the National Marine Fisheries Service for updated information on the project as it pertains to Essential Fish Habitat (EFH) in the project area.

In recognition of the fact that some conditions have changed since the original 2011 Essential Fish Habitat Technical Report (hereinafter referred to as the 2011 EFH Report) was developed, the purpose of this EFH Report Addendum is to provide updated information regarding anticipated impacts to EFH resulting from the construction of the project's Selected Alternative, which includes bridges over Maple Swamp and Currituck Sound, as well as associated US 158 and NC 12 road widening.

This addendum has been structured to only include aspects of the project and anticipated impacts that have changed since the 2011 EFH Report was submitted. Specifically, this addendum presents the most current information related to project status, project design, construction methodology, stormwater management, potential impacts to EFH, Submerged Aquatic Vegetation (SAV) monitoring and mitigation plan and any relevant changes to each of those items due to an increase in growth of SAV that has occurred in the project corridor since 2021.

Below are the sections of the 2011 EFH Report, taken from its Table of Contents, with annotations indicating those that needed updates. Sections that did not need an update are not addressed in this addendum, and the discussion from the 2011 EFH report still stands. For those sections that did need updates, the updates are provided in this Addendum as indicated below.

1.0 INTRODUCTION – *Updated to reflect project milestones achieved since 2011 EFH Report*
2.0 PROJECT AREA – *Updated to reflect only the Selected Alternative*
3.0 PROJECT DESCRIPTION – *Updated to describe the Selected Alternative only*
3.1 Preferred Alternative –*Replaced by "Selected Alternative" section, which addresses the FEIS, Reevaluation of the FEIS, ROD, and latest design revisions*
3.2 Mid-Currituck Bridge Construction – *Updated to reflect current approach*
3.3 Stormwater Management – *Replaced by Current Stormwater Management Plan section*
NEW SECTION: Current Status of SAV in the Project Area
4.0 ESSENTIAL FISH HABITAT – *No updates except to SAV (2011 EFH Report Section 4.1.1), which is addressed in the new section listed above.*
5.0 POTENTIAL IMPACTS TO EFH – *Updated to reflect current SAV status and Bridge Shading Tool results*
5.1 Short-term and Temporary Impacts – *Updated to reflect current SAV status*
5.2 Permanent and Long-Term Impacts – *Updated to reflect current SAV status*
5.2.1 Water Quality – *Updated to reflect current findings*
5.2.2 Water Flow – *No Update*
5.2.3 Bridge Shading – *Update provided in Section 5.0 above*
5.2.4 Discussion of Potential Long-Term Impacts – *No Update*
5.3 Potential Impacts to Individual Species – *No update, as stated below*
NEW SECTION: Agency Accepted SAV Monitoring and Mitigation plan Summary
6.0 FINDINGS AND CONCLUSION – *Updated*
7.0 REFERENCES/LITERATURE CITED – includes references only used in this addendum

INTRODUCTION (2011 EFH Report Section 1.0)

The purpose of the 2011 EFH Report was to assess impacts to essential fish habitat (EFH) resulting from the construction of the Mid-Currituck Bridge and associated US 158 and NC 12 road widening contained in the project's detailed study alternatives. The purpose of this Addendum is to update changes to the project based on the Selected Alternative and the current environmental conditions.

Since the 2011 EFH Report, the North Carolina Turnpike Authority (NCTA), a division of the North Carolina Department of Transportation (NCDOT), in cooperation with the Federal Highway Administration (FHWA), published the Final Environmental Impact Statement (FEIS) for proposed improvements in the Currituck Sound area in 2012. A Re-evaluation of the Final Environmental Impact Statement (FEIS) (Appendix B) was published in 2019 to consider changes that may have occurred in the Project setting, travel demand, area plans, laws and regulations, and other information or circumstances since the 2012 FEIS was approved, in keeping with Title 23 CFR 771.129(b). The reevaluation found that the Project's purpose and need as outlined in the 2012 FEIS remained valid. The ROD for the Project was signed on March 6, 2019, signifying completion of the environmental study process." (NCDENR, 2024).

Executive Summary

Temporary and permanent impacts to EFH in the project area remain the same as those discussed in the 2011 EFH Report. The amount of SAV coverage that is now occupying seafloor in the current project area has increased. Another change since the 2011 EFH Report is the amount of SAV habitat acreage subject to potential impact from shading. The predictive model now in use by the NCDOT measures the level of shading predicted to occur during the day based on factors such as bridge height, width and orientation. These factors obviously change throughout the seasons so this addendum has described the greatest amount of habitat acreage that could be impacted by shading. This final impact number will be determined by a 5-year period of monitoring after construction. This monitoring is described in the "SAV Monitoring and Mitigation Plan" section of this addendum.

PROJECT AREA (2011 EFH Report Section 2.0)

Currituck and Dare counties are in northeastern North Carolina within the Tidewater Region of the Atlantic Coastal Plain physiographic province (Figure 1). Topography of the project area consists of nearly level and gently sloping land that drains primarily into Currituck Sound.

The project area is in northeastern North Carolina and includes the Currituck County peninsula on the mainland and its Outer Banks, as well as the Dare County Outer Banks north of Kitty Hawk. The project area is south of the Virginia Beach-Norfolk, Virginia (Hampton Roads) metropolitan area. The project area encompasses two thoroughfares: US 158 from its junction with NC 168 to NC 12 (including the Wright Memorial Bridge) and NC 12 north of its intersection with US 158 to its terminus in Currituck County. The primary north-south route on the mainland is US 158, and NC 12 is the primary north-south route on the Outer Banks. The Wright Memorial Bridge connects the mainland (southern end of Currituck County) with the Dare County Outer Banks.

Mainland portions of the project corridor traverse several distinctive landscapes. The eastern edge of Great Swamp occurs west of US 158 along the edge of the project area. Great Swamp is a low elevation wetland associated with the North River. Along the western side of the project area, US 158 is located along a well drained ridge. In proximity to Aydlett Road, the project area continues east of this ridge crossing a broad, level, poorly drained, linear depression occupied primarily by Maple Swamp. Another well drained ridge occurs between Maple Swamp and Currituck Sound. Mainland development is concentrated along these upland ridges. The project area crosses Currituck Sound to the Outer Banks and crosses narrow bands of poorly drained sandy soils supporting marshes and swamp forest before reaching better drained sandy soils along NC 12. Elevations on the mainland range from near sea level to 20 feet above sea level and elevations along the Outer Banks range from sea level to 10 feet above sea level.

PROJECT DESCRIPTION (2011 EFH Report Section 3.0)

The North Carolina Turnpike Authority (NCTA) proposes construction of a 4.7-mile-long, two lane toll bridge (the Mid-Currituck Bridge) across Currituck Sound between the communities of Aydlett on the mainland and Corolla on the Outer Banks, an interchange between US 158 and the mainland approach road to the bridge, a bridge across Maple Swamp as part of the mainland approach road, limited improvements to existing NC 12 and US 158, and primarily reversing the center turn lane on US 158 to improve hurricane clearance times in Currituck and Dare Counties (Figure 1).

Selected Alternative

Following the public and agency review of the 2010 Draft Environmental Impact Statement (DEIS), NCTA selected MCB4 [Mid Currituck Bridge 4], with approach road Option A and bridge corridor C1, as the Preferred Alternative. Based in part on public and agency comment, NCTA then refined the preliminary design of MCB4/A/C1 to further avoid and minimize impacts. These refinements, which were reflected in the 2012 Final Environmental Impact Statement (FEIS), included:

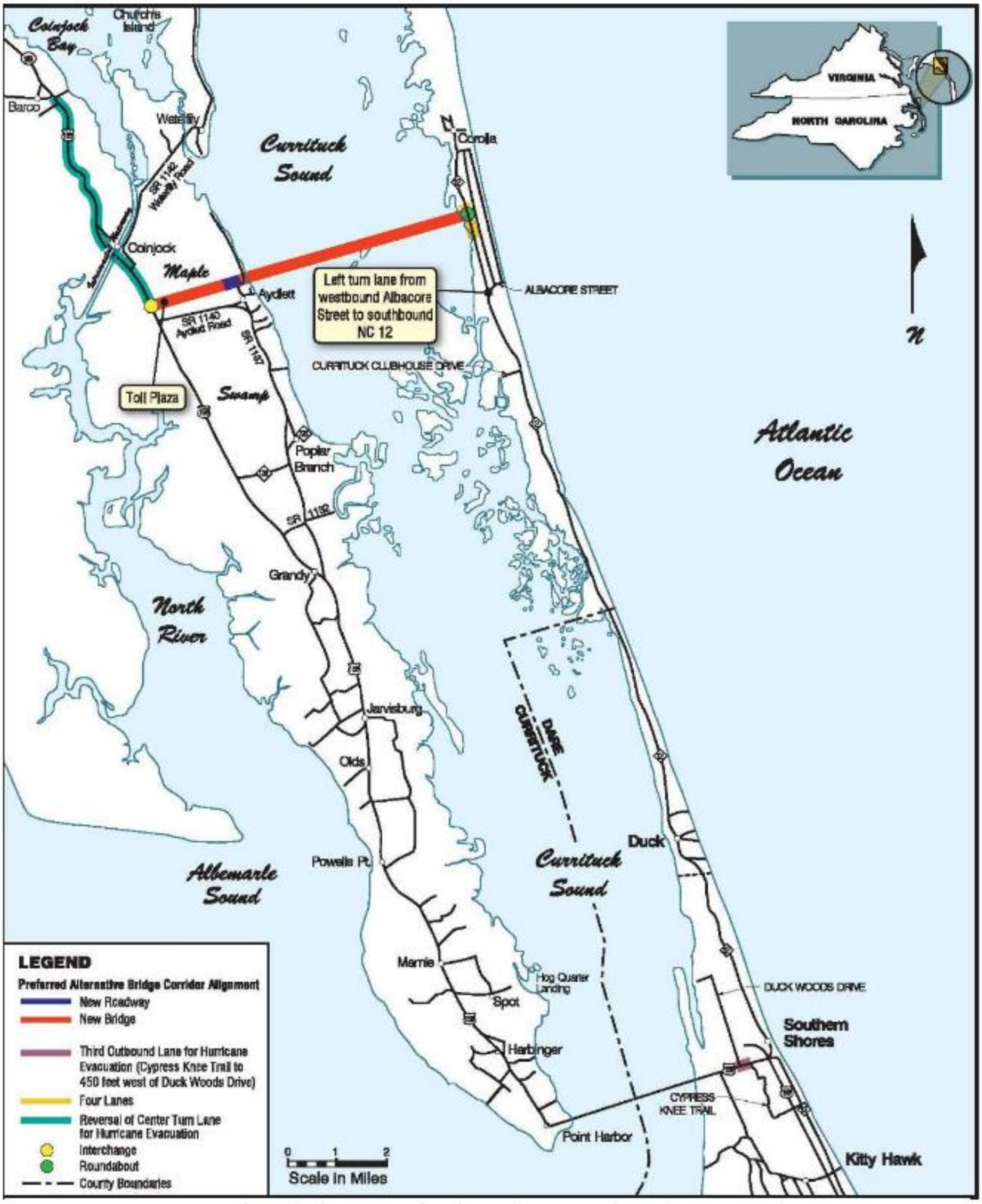
- Various design changes at local road intersections on US 158 to improve safety.
- Reducing the amount of four-lane widening along NC 12 from approximately 4 miles to three shorter sections of NC 12 for a total of approximately 2.1 miles
- Constructing roundabouts instead of signalized intersections at the NC 12 bridge terminus. (Terminating the bridge in a roundabout at NC 12 also allowed the C1 bridge alignment to be adjusted to remove curves and thereby reduced its length across Currituck Sound by approximately 250 feet).
- Improving hurricane clearance times on the mainland by reversing the center turn lane on US 158 between the US 158/Mid-Currituck Bridge interchange and NC 168.
- Improving hurricane clearance times on the Outer Banks by adding a third outbound lane for a length of about 1,600 feet, west of the NC 12/ US 158 intersection. (Lochner, 2020. 404 Permit app, Page 18, Attachment 2).

After the 2012 FEIS, the Selected Alternative design was further revised in two primary ways: the interchange between US 158 and the mainland bridge approach road, including the associated

toll plaza, was revised to eliminate the need for a median acceleration lane at US 158's intersection with Waterlily Road, and most of the improvements to NC 12 south of those associated with the Outer Banks bridge terminus were eliminated. These revisions are reflected in the 2019 Reevaluation of the FEIS and subsequent Record of Decision (ROD) issued in 2019.

See Section 1.2.2 of the *Study Report* (NCDOT, 2019) for a full description of the features of the FEIS and revised design.

Figure 1, Selected Alternative for the Mid-Currituck Bridge Project



MID-CURRITUCK BRIDGE CONSTRUCTION (2011 EFH Report Section 3.2)

A construction approach for the Mid-Currituck Bridge project has been identified by NCDOT for the basis of determining project-related permit impacts stemming from the construction method. This construction approach has been derived through past project communication with potential bridge contractors, current project design plans, existing site conditions, and the experience of NCDOT staff with similar coastal bridge projects. Construction means and methods will ultimately be the responsibility of the selected project construction contractor. Changes in the construction approach may necessitate a modification of the permit applications and further discussion with the permitting agencies.

Land-based construction activities will be concentrated at three primary locations:

1) the US 158 interchange area,
2) the Aydlett area between the Maple Swamp Bridge and the Currituck Sound Bridge, and
3) the NC 12 area. These three areas include the bulk of the non-bridge construction including roadway, hydraulics, and access for bridge construction. In addition to these three primary construction areas, there will be smaller activity areas at Albacore Street east of NC 12 in Corolla and US 158 east of the Wright Memorial Bridge in Southern Shores in Dare County.

Maple Swamp Bridge

The roughly 1.5-mile-long Maple Swamp Bridge (Sta. 22+45 to Sta. 100+88) will be constructed from each end using a combination of construction mats and construction trestle. This bridge connects the US 158 interchange area with the Aydlett area. Bridge construction materials will be supplied from each end of the bridge.

Construction mats will be used in Maple Swamp on both the west and east ends of the bridge. This will extend on the west for 1,055 feet (Sta. 22+45 to Sta. 33+00) and on the east for 788 feet (Sta. 93+00 to Sta. 100+88). A 40-foot-wide matting area will be used along the north side of the proposed bridge location plus matting under the proposed bridge. During clearing the tree stumps will be cut at ground level followed by the installation of fabric so that all the mats/fill can be removed after construction. No compression of the soil is anticipated as this has not been an issue previously but should this occur NCDOT will work with the Resident Engineer and the appropriate environmental and regulatory agencies to remediate the site if needed.

A closed deck construction trestle (40 feet wide) will be used for the construction of most of the bridge length (6,000 feet) between the two areas of construction matting (Sta. 33+00 to Sta. 93+00). The trestle will be located on the north side of the proposed bridge. A trestle finger will be used at each bridge pile bent (40-foot width and 30-foot length for each trestle finger). Steel pipe piles (30-inch diameter) will be used as the substructure for the temporary trestle.

Currituck Sound Bridge

The Currituck Sound Bridge is about 4.7 miles in length (Sta. 118+05 to 364+70). The bridge will be constructed using a combination of construction trestles and in-water construction barges. Construction trestles will be used on both the west and east sides of Currituck Sound where the water depths are shallow (generally less than 6 feet deep) and may be habitat for submerged aquatic vegetation. Barges would be used in the middle areas of the sound where the water is deeper.

There will be two closed-deck trestles on the west side of Currituck Sound and north of the

proposed bridge – one (40 feet wide) for construction of the bridge and one (40 feet wide) for delivery of materials to barges. These trestles will extend 2,040 feet into Currituck Sound and each would be supported by four 30-inch diameter steel pipe piles at each bent on 40-foot spacing. The material supply trestle will widen to 80 feet for the last 120 feet at the east end to support vehicle turnaround and barge loading.

To minimize impacts to SAV, there will be two open-deck trestles on the east side of Currituck Sound – one construction trestle along each side of the bridge. Open-deck trestles allow sunlight to reach submerged aquatic vegetation habitat. Two trestles are needed to accommodate the width of the bridge as it approaches the barrier island. Each of these trestles will be used for both construction and material supply. Some materials may be supplied from the completed bridge spans when available. The trestle on the north side of the bridge will be 560 feet long and the trestle south of the bridge will be 8,800 feet long. Both trestles will be 40 feet wide supported by four 30-inch steel pipe piles per bent on 40-foot spacing.

In-water construction barges will be used for bridge construction and material supply between the trestles on the west and east sides of Currituck Sound (about 2.6 miles). This approach will keep barge operations in areas of deeper water and away from areas of submerged aquatic vegetation habitat. Barges with cranes will be used for various bridge-building activities including pile driving, pier cap construction, beam setting, and deck placement. Multiple barges with cranes will be at work simultaneously in Currituck Sound – some for pile-driving, others for setting pier caps and beams, and others for deck placement. Each of these barges with cranes will use spuds to stabilize the barges during construction activities. Additional barges will be used to carry materials from the west material supply trestle to the various construction operations in Currituck Sound. These barges will generally be mobile during periods of work that involve moving materials from the west trestle to the needed location. Workers will be delivered to the various barges in Currituck Sound by either boat or a material barge.

Previously in 2018 there would have been 4,470 linear feet of temporary trestle on the east side and 4,012 linear feet on the west side. Now that SAV has in recent years increased on the east shore and grown on the west shore of the sound there is now a total of 13,560 linear feet of temporary trestle and an additional 50 linear feet of permanent bridge over SAV habitat (east and west).

Table 1. Description of changes to temporary trestle and permanent bridge dimensions due to increase in SAV coverage.

	Previous dimensions 2018	Sq. Ft	Current dimensions 2025	Sq. Ft.	Sq. Ft Added	Linear Ft. added
Trestle 1 West	2004’ x 34’	68,136	2040’ x 40’	81,600	13,464	36’
Trestle 2 West	2008’ x 30’	60,240	2040 x 40’ + 120’ x 40’	86,400	26,160	32’
Trestle 3 East	3985’ x 40’	159,400	8800’ x 40’	352,000	192,600	4815’
Trestle 4 East	485’ x 40’	19,400	560’ x 40’	22,400	3,000	75’
Bridge over Currituck Sound	38’-7”x24,615’ on tangent	961,249	42’-7” x 24,665’ on tangent	1,062,804	101,555	50’
Total West					39,624	68’
Total East					195,600	4890’
Bridge					101,555	50’

CURRENT STORMWATER MANAGEMENT PLAN (2011 EFH Report Section 3.3)

Compliance with NC Session Law 2008-211's requirement for new development to capture and treat the first 1.5 inches of runoff from additional impervious surface areas would be met, to the maximum extent practicable, through a combination of pollutant source control and capture and treatment. Source control would be through the use of periodic pavement sweeping and vacuuming on bridge decks. Capture and treatment would be through the use of bridge drainage, stormwater wetlands, wet detention basins, and other roadway Best Management Practices (BMPs), to the maximum extent practicable.

The following paragraphs describe how stormwater would be managed with the Selected Alternative. A final stormwater management plan for minimizing the potential impact of project pollutants would be developed in association with the North Carolina Department of Environment Quality, Division of Water Quality (NCDEQ-DWQ), as well as other appropriate state and federal environmental resource and regulatory agencies, during final design and permitting of the bridge project.

The Mid-Currituck Bridge project connects US 158 (Caratoke Highway) south of Coinjock to NC 12 (Ocean Trail) south of Corolla with a toll road. The project mainline will consist of 6.2 miles of bridge with 5.8 miles of the bridge having an overall width of 42.6'. Wetland Swales will be used to the maximum extent practical to treat the newly built upon area. The proposed bridges will have deck drains installed in the form of 6" scuppers placed on 12' centers, deck drains were eliminated from the east end of the bridge over the Currituck Sound to the maximum extent practical over SAV beds. Permeable Pavement is being used in the parking lot for the Proposed Toll Maintenance Facility off of alignment -Y2A- Sta. 18+50 Lt, and for the three blocks of parking for the Toll Collection Building at -Y2A- Sta. 28+00. Turbidity curtains will be used at bridge bent locations that involve pile driving. Infiltration Basins were designed to treat runoff equivalent to and smaller than the design storm. The infiltration Basin located at -L- Sta. 19+00 Rt was designed to treat the runoff occurring from the toll plaza. The second infiltration basin located at -L- Sta. 364+49 Rt was designed to treat the roadway runoff occurring on the pavement located off the end of the bridge. Preformed scour holes will be used to treat water being discharged at the beginning and ending of the bridge in order to diffuse the flow of the storm drain systems at these locations.

Water Quality Monitoring and Stormwater Research

The NCDOT in coordination with the NCDEQ and USGS conducted the Bridge Stormwater Project (BSP) to comply with Session Law 2008-107, Section 25.18, "Stormwater Runoff from Bridges" (NCGA, 2008). The weight-of-evidence considered in this study indicated that bridge deck runoff does not have a widespread effect on receiving waters and that NCDOT's current use of stormwater control measures for the mitigation of bridge deck runoff is protective of surface waters (NCDOT, 2012).

CURRENT STATUS OF SAV IN THE PROJECT AREA (New Section)

The distribution of SAV habitat falling specifically within the Mid-Currituck Bridge alignment has recently been examined by comparing previous data with recently collected side-scan imaging sonar data collected from May and September 2024 (RK&K, 2024) (Figures 4a, 4b, 4c). The proposed bridge landing area on the east end (Corolla, on the Outer Banks) has SAV habitat forming nearly continuous cover from the shoreline westward into the Sound (see Figures 4a and 4b). Proceeding west towards the mainland, the bridge alignment crosses an area of deeper water where SAV is absent. At the western landing site on the mainland in Currituck County (see Figure 4c), no SAV was observed in surveys prior to 2022, although small SAV patches along the shoreline have been observed in previous years, indicating a spatially and temporally variable SAV resource in this area.

Beginning in May of 2022 SAV cover increased in the project area, including larger areas of SAV occurring near the western landing site where little to no SAV had been seen in recent years. SAV in the project area occupied 24.01 acres in May 2022 and 54.59 acres in September 2022, 58.31 acres in May 2023 and 53.46 acres in September 2023, 60.63 acres in May 2024 and 57.66 acres in September 2024 (see Table 2). Until the September 2022 survey, water depths ranging from -6 to -11 MLLW feet were not occupied with SAV. During the September 2022, 2023, and 2024 surveys, SAV was observed in water depths of -7.3 feet, not accounting for daily wind or tide variations. Deeper open waters (> -7.4 feet) were assessed, and no SAV was located. Water clarity was measured with a Secchi disk and ranged from 1.0 meter to 1.2 meters across the study area in May and 0.4 meter to 1 meter in September 2023 (RK&K 2023).

There are likely multiple factors contributing to the increase in SAV. Favorable climate conditions have been observed in recent years, including the absence of large storm events and warmer water temperatures during the winter. These climate influences can create stable conditions and reduce turbidity. When turbidity is reduced, photosynthetically active radiation (PAR) can enhance SAV growth.

Table 2. Submerged Aquatic Vegetation (SAV) coverage by year for Mid-Currituck Sound Bridge as Surveyed by RK&K for NCDOT. The surveyed project area contains impact plus reference areas.

Year	SAV Coverage (acres)
2015	14.90
2016	14.78
2017	13.17
May 2018	15.59
September 2018	17.26
May2019	13.59
September 2019	14.32
May 2020	12.57
September 2020	14.06
May 2021	14.22
September 2021	18.50
May 2022	24.01
September 2022	54.59
May 2023	58.31
September 2023	53.46
May 2024	60.63
September 2024	57.66

Table 3. Sechhi Depths per Year of Surveys

Year	Secchi Depth Across Study Area (meters)
2018	0.4m-0.6m
2019	0.3m-0.5m
2020	0.3m-0.75m
2022	0.6m-1.1m
2023	0.4m-1.2m
2024	0.7m-1.0m

Figures 4a-c. SAV Delineations 2015-2024

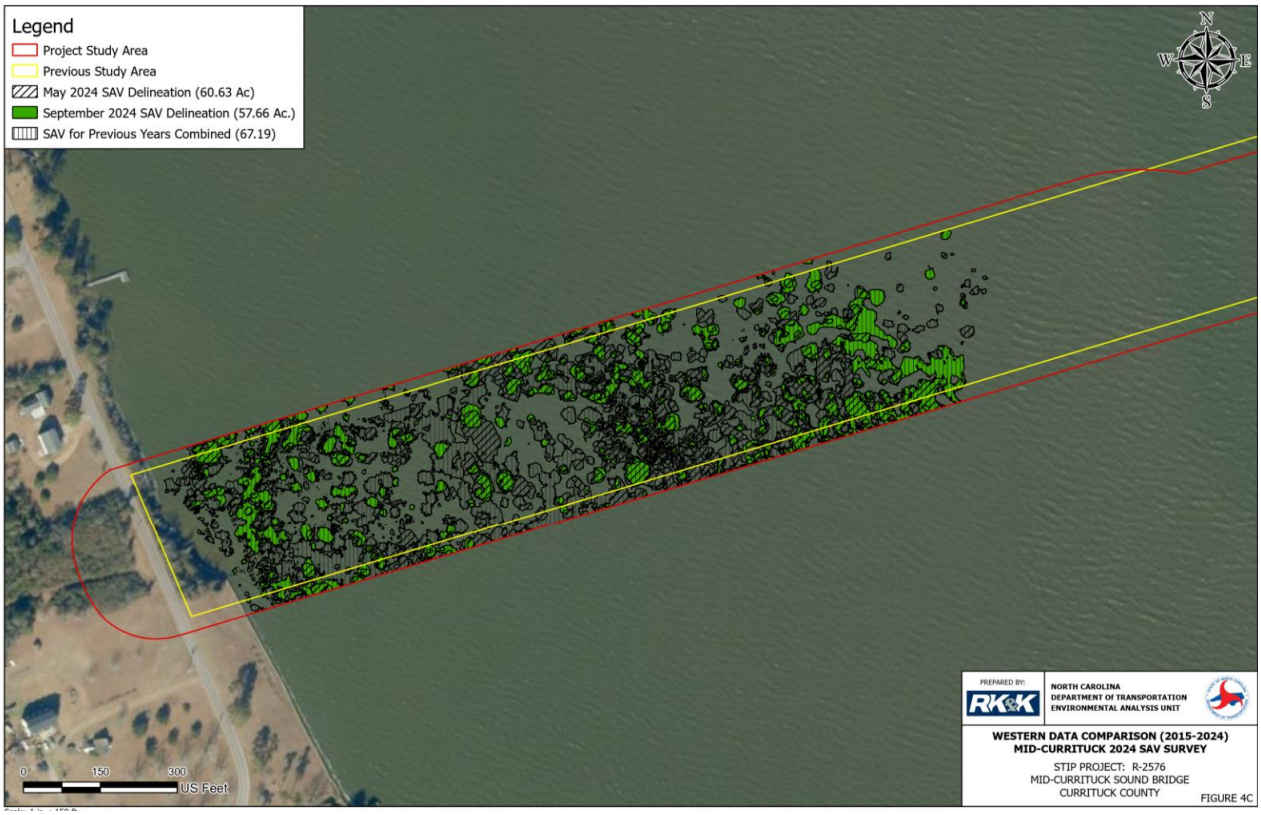


Table 4. Distance of SAV from shore in project corridor

Cumulative	West	East
2015-2021	0ft	3938 ft.
2022-2023	1660 ft	8891 ft

POTENTIAL IMPACTS TO EFH (2011 EFH Report Section 5.0)

The Selected Alternative, likely would result in short-term and long-term adverse effects to EFH and managed species. In general, the Selected Alternative would not have a substantial long-term adverse impact on EFH or managed species given the small permanent bridge pile (0.064 acres) and the overall small shading impact of the Mid-Currituck Bridge (up to 22.45 acres), compared to the total area of Currituck Sound (97,920 acres). Bridge pilings could provide additional habitat for some managed species. The aquatic substrate generally would be expected to recover after construction.

As indicated in Table 5 and figures 5a through 5e below, the greatest potential permanent impacts to SAV would be from the highest gradation of shading (high to very high) zone as predicted by the shading prediction model (CSA Ocean Sciences, 2019).

The nature of shading impacts to EFH or managed species has not changed from those described in the 2011 EFH document. What has changed and is described in this addendum is the amount of habitat that may be affected.

Table 5. SAV Impacts Summary

Type of Impact	***Acres Affected***
Permanent bridge piles	0.064
Potential shading from permanent bridge deck dripline (includes permanent bridge piles acreage)	8.94
Highest estimate of potential shading zones (0%-100%) from permanent bridge shadow (includes dripline)	22.45*
Temporary bridge piles	0.112
Potential shading from temporary bridge deck (includes temporary bridge piles acreage)	0.889

*From October 2023 shading tool model run.

Figures 5a-e. SAV Monitoring Area Indicating Reference and Impact Zones

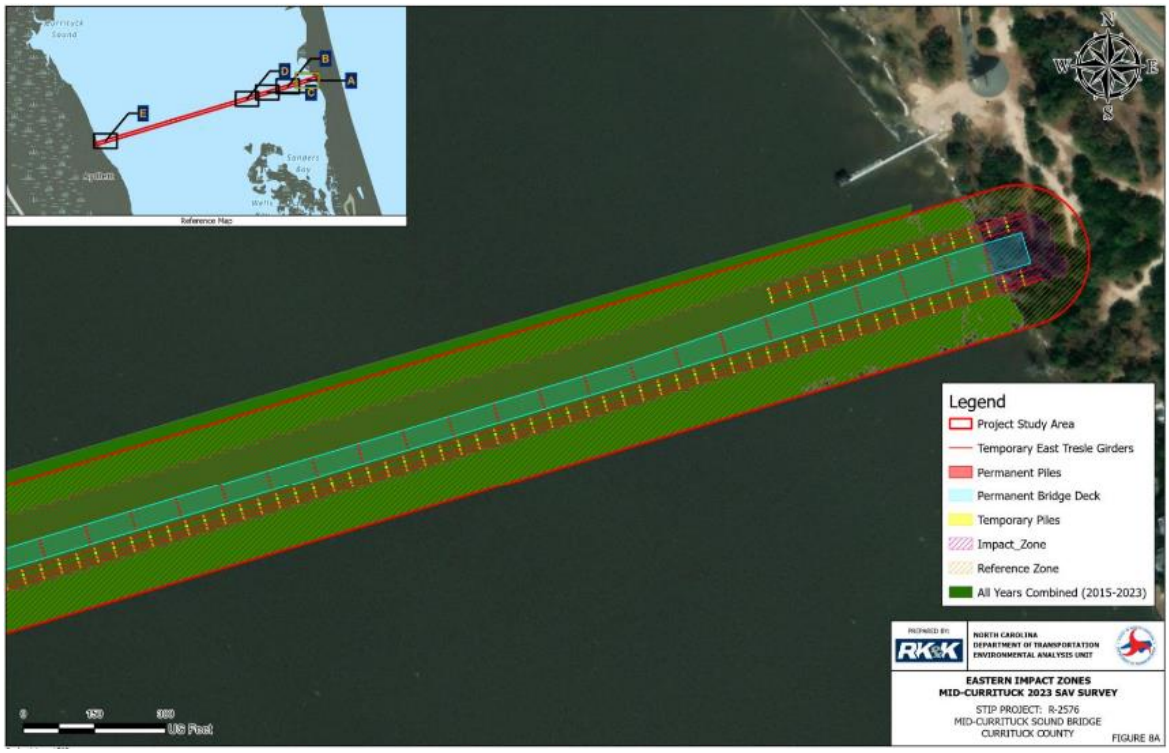


Figure 5a. East side SAV monitoring area indicating reference and impact zones.

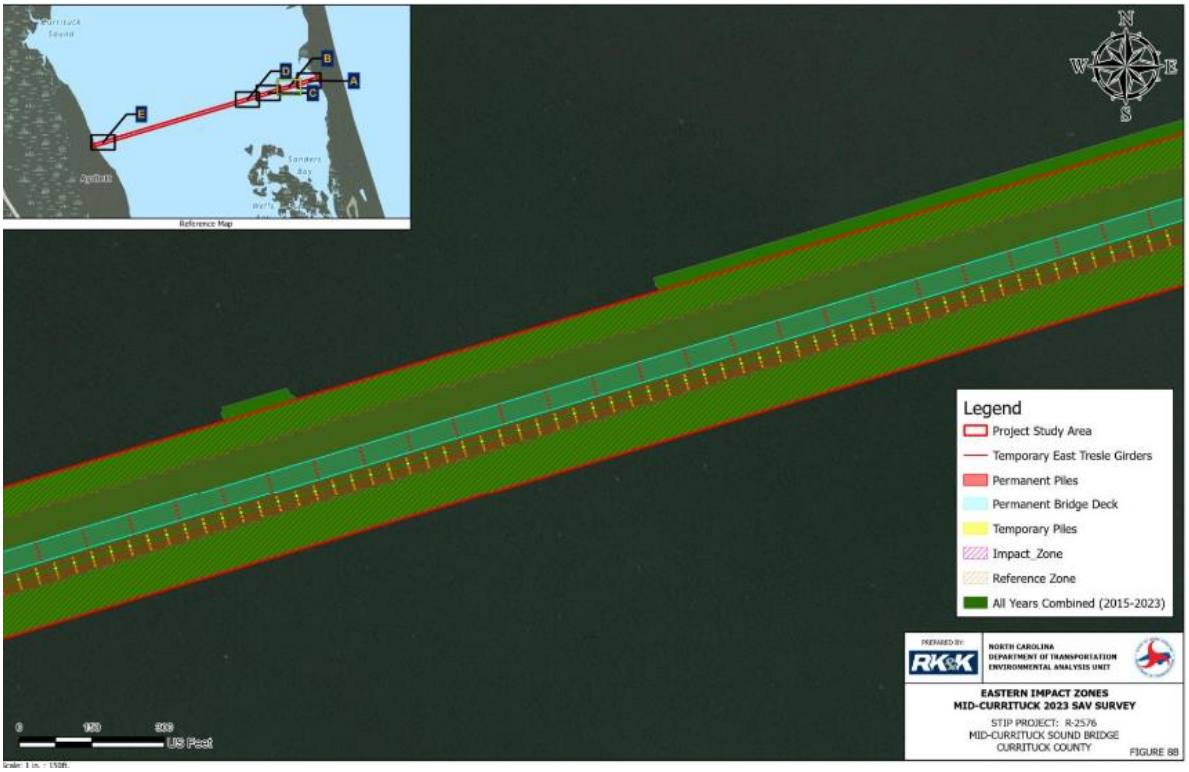


Figure 5b. Toward middle SAV monitoring area indicating reference and impact zones.

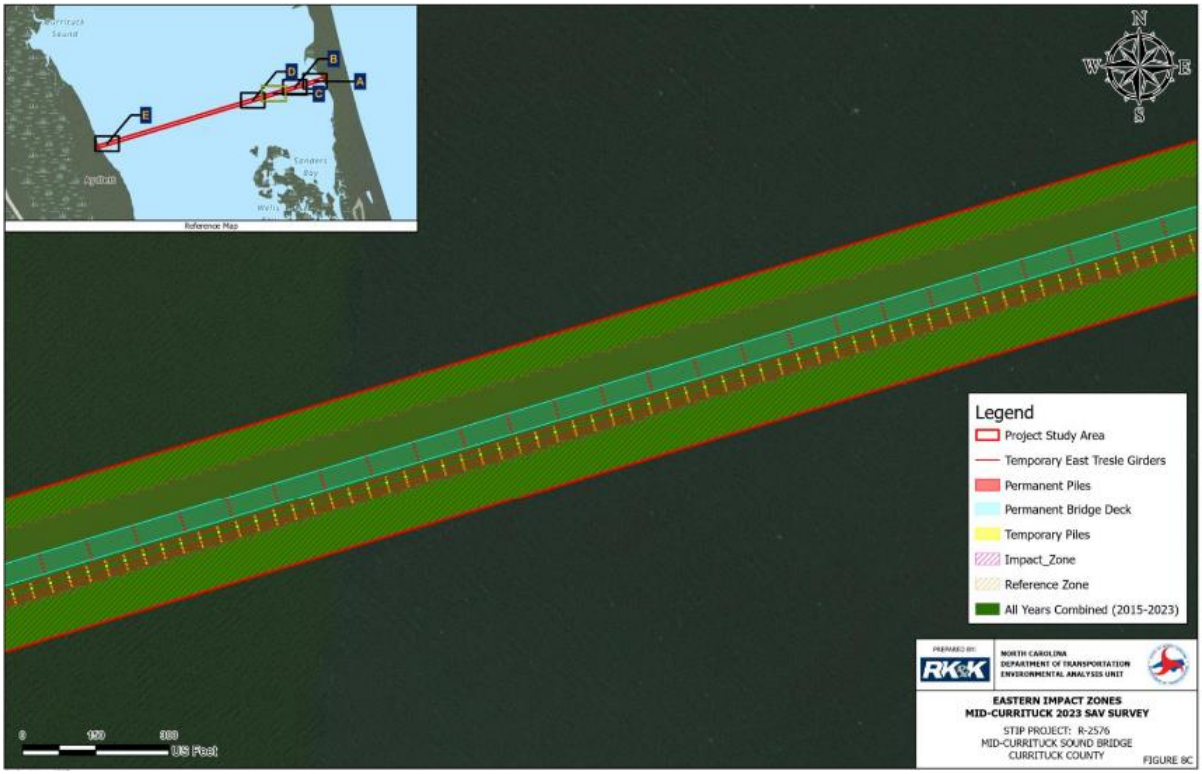


Figure 5c. Middle, farther west, SAV monitoring area indicating reference and impact zones.

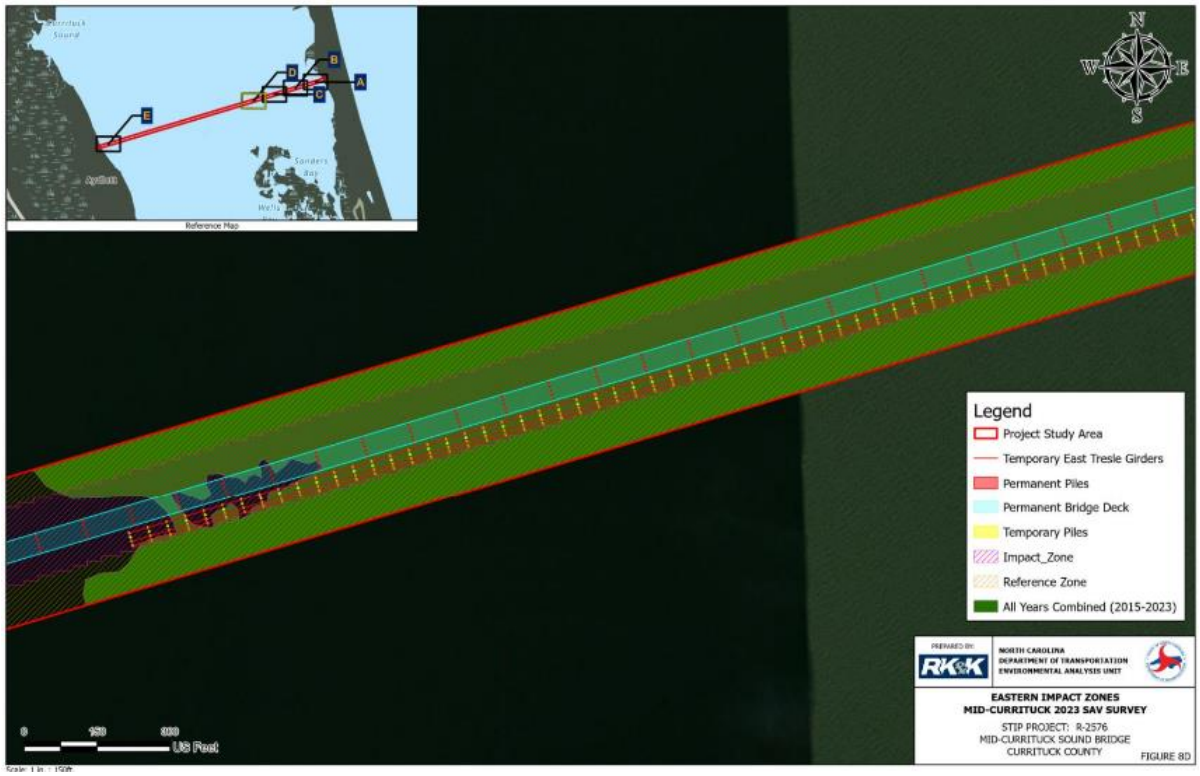


Figure 5d. Western end of middle, SAV monitoring area indicating reference and impact zones.

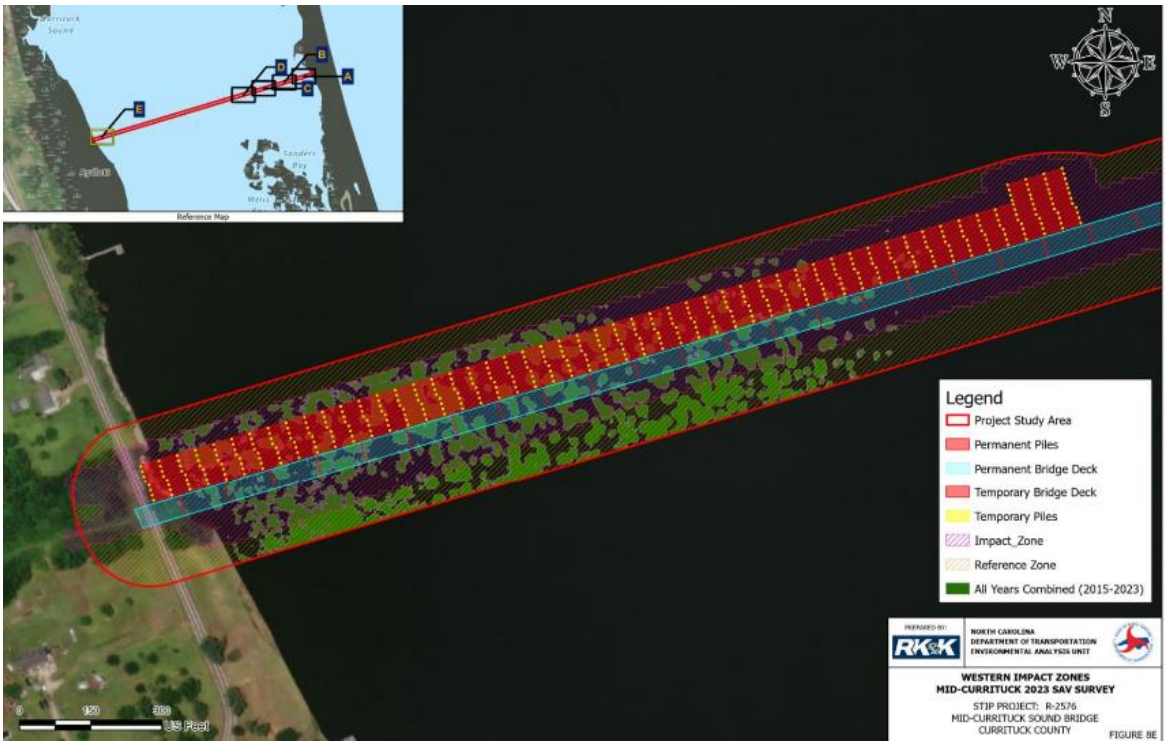


Figure 5e. West side SAV monitoring area indicating reference and impact zones.

Bridge Shading Tool (New Section)

To help understand the shading influence of transportation structures on SAV, the North Carolina Department of Transportation (NCDOT) contracted Rummel, Klepper and Kahl (RK&K) and CSA Ocean Sciences Inc. (CSA) to create a standalone, interactive Tool (Shadow Toolbox [ST_01_ver02], CSA 2019) that allows Users to input the structural geometry (e.g., height, width) of an over-water structure to derive a geographically and temporally accurate projection of shading produced by that structure. The amount of light reduced by shading and the percentage of time that a given area of habitat is shaded along with ambient water column attenuation may then be related to changes (if any) in SAV abundance (e.g., biomass, cover). The general approach of the Tool is to utilize the solar angle for a given geographic location, day of the year, and time of day to cast a shadow from a selected bridge structure on the surrounding environment.

Prior to the development and use of the Shade Tool, shading impacts from bridge projects were considered to be in the area directly under the bridge dripline. NCDOT now utilizes this tool, or predictive model, to fine tune the prediction of how much actual shade is realized due to the bridge structure. This is the premise behind the NCDOT standard procedure for a 5-year post construction monitoring period to determine the exact amount of permanent and/or temporary SAV impact that occurs from a project and would be mitigated.

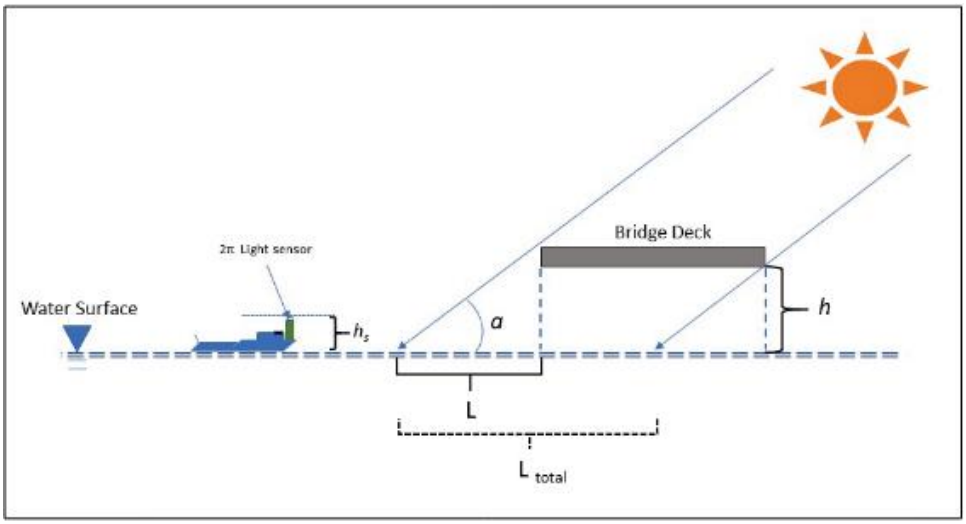


Figure 2. Diagrammatic representation of the geometric framework solved by the Shadow Toolbox. Shown also is a survey vessel (blue outline) with the 2π light sensor mounted above the water surface (hs). h = height of the bridge deck above the water surface, a = solar angle at that time of day for that geographic location, L = the length of a shadow cast by the bridge from the shadowed side of the bridge, and Ltotal = the total width of the shadow cast by both margins of the bridge at any given time CSA, 2019).

Short-Term and Temporary Impacts (2011 EFH Report Section 5.1)

Potential short term and temporary impacts to EFH have changed only in the amount of SAV that may be impacted by temporary pile placement and shading over the current extent of SAV as shown in Table 5.

Permanent and Long-Term Impacts (2011 EFH Report Section 5.2)

Some permanent loss or alteration of SAV habitat (including existing beds), subtidal and intertidal flats, shoreline modifications, and estuarine waters would result from shading in the higher shading zones as modeled by NCDOT (CSA Ocean Sciences, 2019), and pile placement associated with bridge construction across Currituck Sound with the Selected Alternative.

Based on the most recent SAV mapping and the results of the 2023 Shading Tool model run, there could be permanent impacts of up to 22.45 acres (this includes permanent piles) as shown in Table 5. In addition to permanent loss of habitat resulting from pile placement, the Selected Alternative could generate several other impacts, including changes in water quality, water flow, and light levels of the area both underneath the bridge and for some distance surrounding the bridge.

The nature of shading impacts on EFH or managed species has not changed from those described in the 2011 EFH document. What has changed and is described in this addendum is the amount of SAV habitat that may be affected.

Water Quality (2011 EFH Report Section 5.2.1)

The North Carolina Department of Transportation (NCDOT) Bridge Stormwater Project (BSP) was initiated in November 2008 to comply with Session Law 2008-107, Section 25.18, "Stormwater Runoff from Bridges" (NCGA, 2008). The law required NCDOT to provide a final report to the Joint Legislative Transportation Oversight Committee by July 1, 2010. That report summarized the efforts of the two-year project that addressed the stated objectives of the law and resulted in a five-year cost estimate for implementing stormwater controls for all waterway bridges in North Carolina. The results of the BSP have led to the following conclusions and recommendations:

- The weight-of-evidence considered in this study indicates that bridge deck runoff does not have a widespread effect on receiving waters and that NCDOT's current use of stormwater control measures for the mitigation of bridge deck runoff is protective of surface waters.

- Results of the bridge deck runoff effect analysis and subsequent weight-of-evidence (WOE) evaluation indicate the following:
    - quality and pollutant loading in bridge deck runoff is similar to roadway and urban runoff;
    - bioassessments made upstream and downstream of bridges provided similar results; periodic toxicity of bridge deck runoff is possible, but not common (periodic toxicity observed may be linked to roadway deicers
    - bridge deck runoff did not contribute to stresses from organics or nutrient enrichment; and localized hydromodification and potential erosion due to concentrated flow from bridge decks could impact receiving waters.

NCDOT currently implements structural stormwater control measures (SCMs) to treat discharges to sensitive waters and SCMs to reduce potential erosion and hydromodification. Consequently, results of the study indicated that NCDOT's current approach to SCM implementation is protective of state surface waters. As such, the current NCDOT stormwater practices, with some simplifying assumptions and enhancements, were the primary basis for assessing the statewide SCM quantity estimates and developing a statewide cost estimate for SCM implementation. Some of the enhancements that were incorporated into the basis of estimate have also resulted in recommendations of the BSP report (NCDOT 2012).

The amount of runoff and associated impacts to water quality are dependent upon the method implemented to manage bridge runoff. NCTA would comply with NC Session Law 2008-11 (An Act to Provide for Improvements in the Management of Stormwater in the Coastal Counties in Order to Protect Water Quality) to the maximum extent practicable for the additional impervious surface area created by this project. The long-term consequences of run-off from the bridge may have effects to the area near the bridge but are not expected to be substantial, in part because of the implementation of a stormwater management plan. As stated earlier, a final stormwater management plan for minimizing the potential impact of pollutants would be developed in association with NCDEQ-DWQ, as well as other appropriate state and federal environmental resource and regulatory agencies, during final design and permitting of the Selected Alternative.

Potential Impacts to Individual Species (2011 EFH Report Section 5.3)

Potential short-term and permanent/long-term impacts to EFH on individual species present in the project area have not changed from those presented in the original 2011 EFH document.

AGENCY ACCEPTED SAV MONITORING and MITIGATION PLAN SUMMARY (New Section)

The exact acreage of SAV that will require mitigation due to permanent and/or temporary impacts is unknown at this time. Mitigation for impacts to SAV (e.g., bridge piling, temporary construction trestles, and shading) will be performed if warranted, to the extent necessary as determined from pre- and post-construction SAV monitoring surveys in comparison to local reference baseline. Unlike marine SAV communities, the SAV communities in Currituck Sound appear to be more spatially and temporally dynamic. This inherent variability will ultimately influence overall mitigation levels and monitoring strategy in order to discriminate natural variability from potential bridge impacts. Recent studies of Currituck Sound overall supported by NCDOT and directed surveys of the bridge corridor provide a useful pre-construction portrait of the SAV resources and their inherent variability in the area.

The Shading model developed for, and now in use by, the NCDOT indicates that there are different levels of shading impact based on bridge dimensions and orientation plus time of year sun angles. This is the primary reason for the current mitigation standard protocol of monitoring before, during and for a period post construction to determine the exact amount of SAV impact that would require mitigation.

The NCDOT will monitor temporary construction impacts and shading impacts from the permanent bridge and the temporary construction trestles during construction and for at least five years post construction. Any shading impacts to SAV that are determined by NCDOT and the appropriate agencies to be permanent impacts shall be mitigated using the best science available at the end of the five-year post construction monitoring period.

Monitoring

The project area consists of the impact area which includes the permanent bridge footprint, the shading impact area for the proposed bridge and all temporary trestle impact areas. All areas previously within the 300-foot-wide project area outside of the impact area will be considered reference. The original 300-foot-wide area is now increased on the west terminus due to changes in the trestle location. Monitoring methodology of these areas will not change (see Figure 5).

Baseline data will be collected during the growing season within the study area and reference area to include SAV presence/absence, percent cover, and species composition and distribution. Monitoring of the temporary and potential shading impacts will begin as soon as portions of the bridge are completed and will occur throughout the entire study area and consist of the following metrics:

- Verify biannual SAV delineation
- Seagrass species percent cover and composition/distribution via random sampling
- Monitoring of the shadow produced by the structure, targeting areas where the shadow passes through seagrass cover
- Measurement of Photosynthetically Active Radiation (PAR) reaching the water surface at fixed grids
- Comparison of pre and post construction data sets
- Temporary impact areas will be monitored for recovery including number of growing seasons for grass to return, if temporarily impacted.

This plan may be adjusted as necessary by NCDOT and the appropriate agencies to address construction schedule and methods. An annual report will be submitted, as well as a final report at the end of the monitoring period. Annual field meetings may be scheduled as needed.

Potential Mitigation Options

The mitigation ideas suggested for consideration in the mitigation plan include both in-kind and out-of-kind mitigation. It is understood that in-kind options would be mitigated at a ratio of at least 1:1 and any out-of-kind options chosen could be mitigated at a higher ratio.
The final scale of any selected mitigation option will be determined in coordination with NCDOT and the agencies following review of results of a multiple year post construction monitoring effort and the findings of any project-related research. This flexibility in selecting options after monitoring could allow for the use of multiple mitigation options to address impacts to the various functions of SAV (e.g. fisheries functions vs. waterfowl).

Several mitigation options have been proposed and are designated as either at, or offshore from, the shoreline. These options include, but are not limited to:

- Living shorelines, both at the shore and offshore
    - utilize the WEMo results from the SAVE Currituck Study (Corbet, et.al., 2018) to expand on the initial analysis provided by Atkins (2013) to determine if wavebreak structures could be used to enhance or restore SAV habitat around the marsh island areas.
- Restoration or enhancement of SAV Habitat

In coordination with the regulatory agencies, finalization of any option or combination of options will be further informed and determined by subsequent surveys of physical conditions and SAV distribution at the mitigation site. Wave exposure on SAV using the noted wave height and energy maps of the Currituck Sound, including that of the bridge alignment will be consulted along with any subsequently generated survey data to inform the most appropriate alternative for a given site. Additional options may be added for consideration in the future. Finalization of any option or combination of options will also be subject to a review of potential impacts that may be incurred to other coastal resources such as public trust usage and shallow bottom habitat by implementation of the mitigation option. The final option or options may require additional regulatory review and approval, which could include notification to adjacent riparian landowners, public notice, etc. The ability to permit any mitigation option in this plan has not yet been determined.

Beginning in 2015, the NCDOT requested research proposals to help identify the current drivers of SAV growth or change in the Sound. This research is continuing through 2025. The research has three primary objectives relevant to understanding SAV and shoreline mitigation strategies: 1) evaluate shoreline change rates on multiple timescales, including influence of storms near the bridge landing; 2) use the geospatial management tool as guide to collect higher resolution data to assess SAV mitigation sites; and 3) establish a better understanding of changes in energy dynamics in the bridge corridor associated with construction.

It is critical to have more information on the current local dynamics to better predict the changes associated with bridge construction. This research will focus on expanding data collection near the bridge corridor and developing a predictive model of waves and currents to be used as a predictive tool post construction. The project will further develop the SAV mitigation tool by collecting the necessary higher resolution data (e.g., shoreline position, bathymetry, SAV presence, proximity to existing vegetation) to focus future SAV mitigation sites.

FINDINGS AND CONCLUSIONS (2011 EFH Report Section 6.0)

The Selected Alternative would avoid sound-fringing wetlands at both the mainland and Outer Banks landing sites. Permanent loss or alteration of SAV habitat (including existing beds), intertidal flats, and tidal freshwater aquatic bed would result directly from shading and/or pile placement. Permanent loss from pile impacts to EFH would total 0.064 acre. Up to 22.45ac of SAV lies within the modeled shading zones of the bridge.

Temporary and permanent impacts to EFH in the project area remain the same as those discussed in the 2011 EFH Report. The amount of SAV coverage that is now occupying seafloor in the current project area has increased. Another change since the 2011 EFH Report is the amount of acreage subject to potential impact from shading. The predictive model now in use by the NCDOT measures the level of shading predicted to occur during the day based on factors such as bridge height, width and orientation. These factors obviously change throughout the seasons so this addendum has described the greatest amount of acreage that could be impacted by shading. This final impact number will be determined by a 5-year period of monitoring after construction. This monitoring is described in the "SAV Monitoring and Mitigation Plan" section of this addendum.

The Selected Alternative likely would result in short-term and possibly long-term adverse effects to EFH and managed species, but measures under consideration would keep those impacts to a minimum. Consequently, the Selected Alternative would not have a substantial long-term adverse impact on EFH or managed species for the following reasons:

- Pile impacts resulting in the permanent loss of EFH would be 0.064 acre. In addition, there would be no impacts to EFH from fill or clearing activities.
- A Mid-Currituck Bridge would result in some level of shading to a total of 22.45acres of existing SAV (2023) (see Table 5). However, Currituck Sound is large (97,920 acres) compared to the small area that would be affected by shading.
- Shading would not affect fish passage. Mitigation is planned for shading impacts.
- Bridge pilings would increase habitat complexity and provide some hard structure that would potentially provide additional habitat for some managed species.

Temporary impacts will occur during construction, but the aquatic substrate generally would be expected to recover after construction. Impacts would result in primarily bottom disturbance and associated resuspension of sediments, but fish are mobile in most life stages and would actively avoid direct impacts. Some impairment of ability of EFH managed species to find prey items could occur, but this effect would be temporary and spatially limited to the immediate vicinity of construction activities. Currently planned construction techniques for the Mid-Currituck Bridge include specific plans to minimize construction impact in SAV habitat (including existing beds).

The Mid-Currituck Bridge would introduce a new source of pollution (via bridge runoff) into Currituck Sound. Pollutants discharged into Currituck Sound near the bridge may dissipate slowly because of poor water circulation and could result in higher sediment pollutant levels and bioaccumulation near the bridge. NCTA would comply with NC Session Law 2008-211 (An Act to Provide for Improvements in the Management of Stormwater in the Coastal Counties in Order to Protect Water Quality) to the maximum extent practicable for the additional impervious surface area that would be created by the construction of the Selected Alternative. The Bridge Stormwater Project revealed that current NCDOT stormwater protection measures are adequate to protect the receiving waters.

Final construction and stormwater management plans for minimizing impacts to EFH would be developed in association with appropriate state and federal environmental resource and regulatory agencies during final design and permitting of the Preferred Alternative.

Although the proposed bridge construction and resulting bridge would alter existing EFH, substantial adverse impacts to EFH and managed species are unlikely to occur. There would be no dredging of Currituck Sound and bottom disturbing in-water construction activity would not occur during the established moratorium period in SAV habitat (including existing beds) as defined by the North Carolina Marine Fisheries Council. Permanent impacts to water quality would be minimal as a result of the stormwater management plan. Existing patterns of water flow through Currituck Sound are expected to be minimally affected by the presence of bridge pilings, and the pilings could provide additional habitat for some species. Shading would potentially affect the managed species in small areas of SAV habitat (including existing beds), subtidal and intertidal flats, and estuarine waters found in the project area, but shading impacts would be mitigated, likely with SAV habitat restoration in nearby areas.

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ATTACHMENTS

2019 Re Evaluation of the FEIS

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