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APPENDIX C: ENVIRONMENTAL

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WACCAMAW RIVER,

HORRY COUNTY, SOUTH CAROLINA

FLOOD RISK MANAGEMENT STUDY INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

MAY 2026

MAIN REPORT SUMMARY

The Integrated Feasibility Report and Environmental Assessment (FR/EA), that this appendix addresses, details a collaborative study by the U.S. Army Corps of Engineers (USACE) and Horry County, South Carolina. It aimed at mitigating existing and future flood risks to communities and transportation infrastructure within the Waccamaw River Basin. The study identifies four key flood impact areas: Longs & Red Bluff, Conway, Bucksport, and Socastee.

The flood impacts in each of these areas were independent of each other, so solutions could be evaluated self-reliantly, making any proposed alternative plans separable. The study considered a range of structural, non-structural, and nature-based solutions while incorporating public feedback gathered during meetings. An environmental analysis was completed and a Finding of No Significant Impact is included within the main report. The document completed a public review and comment period while also undergoing internal agency review and adapted to those concerns and suggestions. The report acknowledges the significant flooding event caused by Hurricane Debby in August 2024 and its impact was assessed to further inform the study's conclusions.

The Recommended Plan, based on an evaluation of alternatives, includes Relief Bridges (cross drains) for the Conway area and Barrier Removal for Socastee as both demonstrated favorable benefit-to-cost ratios. It is classified as a National Economic Development Plan. The No Action Alternative is recommended for Longs & Red Bluff and Bucksport. This Appendix provides detailed Environmental information to support these recommendations.

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A WATER RESOURCES IN STUDY AREA

This section provides a detailed description of the surface water and wetland resources within the study area, supplementing the overview provided in Section 2.4 of the main report. The analysis is organized by the five primary Hydrologic Unit Code (HUC) 10 watersheds that intersect the study area's flood impact areas. These watersheds are:

0304020606: Buck Creek-Waccamaw River

0304020605: Kingston Lake

0304020607: Socastee Swamp-Waccamaw River

0304020701: Great Pee Dee River-Winyah Bay

0304020608: Outlet Waccamaw River-AIWW

A.1 Surface Water

A.1.1 Buck Creek-Waccamaw River (east Longs/Red Bluff)

This watershed spans the eastern portion of the Longs/Red Bluff flood impact location and is approximately 69,578 acres in size with tributaries from across the border of North Carolina downstream to Simpson Creek. Land use in the watershed is predominately forested wetland and forested land while about one-third is used for agriculture and urban developments. Although the watershed accepts drainage from about two dozen reaches, Buck Creek, Waccamaw River, and Simpson Creek are the greater surface water systems within the watershed. Collectively, the watershed concentrates 335 stream miles and 84 acres of lake water. All the surface water in the watershed is classified as “FW” (dissolved oxygen not less than 4.0 mg/l and pH between 5.0 and 8.5) (SCDHEC 2015).

Buck Creek is a blackwater system with naturally low dissolved oxygen (DO). Aquatic life and recreational uses are fully supported in the creek, although issues with oxygen demand, turbidity, nitrogen input, and pH have been trending unfavorably. The Waccamaw River is also a blackwater system and shares similarities with Buck Creek. However, nitrogen is less of a concern and both pH and turbidity have shown improving trends. Simpson Creek is fully supportive of aquatic life; however, it does show signs of increasing oxygen demand, and turbidity and recreational uses are partly limited from bouts of fecal coliform bacteria (SCDHEC 2015).

A.1.2 Kingston Lake (north of Conway)

This watershed spans about 83,444 acres and consists of Kingston Lake and its tributaries north of Conway. Land use in the watershed is about half forested wetland and forested land, one-third agricultural, and the remaining land being predominately urban. Kingston Lake itself accepts drainage from Jacks Bay, Alligator Swamp and White Oak Swamp which in turn receive drainage from numerous swamps and creeks, all which finally feed into the Waccamaw River. Collectively, the watershed concentrates 184 stream miles and 162 acres of lake waters, all of which are classified as FW (SCDHEC 2015).

Kingston Lake does not support aquatic life uses due to issues with dissolved oxygen, which has been decreasing over years of monitoring. Additionally, recreational uses are not supported due to presence of fecal coliform bacteria. Upstream monitoring locations along Brown Swamp and Crabtree Swamp show similar issues with generally aquatic life or recreational uses being supported at the most upstream portions of the watershed (SCDHEC 2015).

A.1.3 Socastee Swamp-Waccamaw River (central study area)

This watershed encloses the center of the study area and about 136,304 acres including primarily a lower stretch of the Waccamaw River and tributaries between Simpson Creek and Socastee Creek. Land use in the watershed consists of about half forested wetlands and forested land, a fifth urban areas, and some agricultural land. Upstream portions of the Waccamaw influence this area along with drainages from several creeks, swamps, bays, and lakes. Of particular interest in the study area is where Socastee Swamp and the AIWW merge near Socastee into Socastee Creek and meet the Waccamaw River. In total, the watershed comprises about 226 stream miles and 477 acres of lake waters, all of which is classified as FW (SCDHEC 2015).

As described earlier, Waccamaw River is a blackwater system, and its upstream portions of this watershed fully support aquatic life and recreational uses. However, downstream portions from near Tilly Swamp have had some periods of low dissolved oxygen and issues with turbidity in the recent past. Recreational uses are also only partially supported in this reach of the watershed (fecal coliform bacteria). These conditions improve around Conway and Lake Busbee and throughout the remainder of the Waccamaw River apart from a portion near Keys Field where aquatic life is partially supported and issues exist with DO and phosphorus inputs (SCDHEC 2015).

The Little River to Winyah Bay portion of the AIWW flows through this watershed and is tidally influenced from both ends. Due partly to limited flushing because of the tidal influences, and partly to a significant marsh drainage, DO and pH excursions are common here. Aquatic life and recreational uses are fully supported throughout this section of the watershed (SCDHEC 2015).

Despite aquatic life and recreational uses being supported throughout much of the watershed, a fish consumption advisory has been issued by SCDES for mercury in the Waccamaw River and AIWW.

A.1.4 Great Pee Dee River-Winyah Bay (west of Bucksport)

This watershed originates west of the Bucksport flood impact area and is the final segment of the Great Pee Dee River from the Lynches River through Winyah Bay and their tributaries. The areal extent of this watershed is 223,613 acres and is about half forested wetland and forested land and about 1/7th agriculture and urban development. This low section of the Great Pee Dee River accepts drainage from its upper reaches consisting of innumerous lakes, swamps, creeks, and bays. All streams are classified as FW up until Thoroughfare Creek. Downstream of there, DO is below standard. The watershed contains 352 stream miles, 630 acres of lake waters, and 16,642 acres of estuarine areas.

Along the upper portions of the Great Pee Dee River near the City of Georgetown, aquatic life and recreational uses are fully supported, though increasing fecal coliform bacteria trends have been noted. Downstream portions of the river are largely supportive of aquatic life and recreation with some excursion in DO. Conditions in Winyah Bay are very similar (SCDHEC 2015).

Like in waters of the central study area, this watershed also has a fish consumption advisory for mercury.

A.1.5 Outlet Waccamaw River-AIWW (south of Bucksport and Socastee)

This watershed sits between Georgetown and Horry Counties and is part of the Waccamaw River that accepts drainage from the areas of Bucksport and Socastee. This watershed is 55,599 acres in size and is composed of about half forested wetland and forested land, a fifth urban land, an eighth marsh, and a tenth or less of open water and agricultural land. This is the lowest section of the Waccamaw River, accepting drainage from all its upstream portions and surrounding creeks and swamps. The watershed spans about 117 stream miles, 582 acres of lake waters, and 3,494 acres of estuarine areas.

All the watershed from the upstream portion to Thoroughfare Creek is considered FW while downstream portions that of a higher pH. Recreational uses and aquatic life are fully supported throughout the watershed though there are some variations in pH, turbidity, and oxygen demand in lower reaches (SCDHEC 2015).

A total maximum daily load for oxygen-demanding substances exists in this watershed to address issues measured at monitoring stations on the State's 1998 303(d) list of impaired waters (SCDHEC 2015).

A.2 Wetlands

A.2.1 Forested

Forested wetlands are defined by the Federal Geographic Data Committee (FGDC) (2013) as wetlands where trees (woody plants at least 20 ft in height) are the dominant life form and occupy at least 30% of land cover. This wetland class normally possesses an overstory of trees, an understory of young trees or shrubs, and an herbaceous layer. Forested wetlands in palustrine systems include cedar swamps and bottomland hardwoods.

In the study area, wetlands consist mostly of the broad-leaved deciduous subclass of forested wetlands (72% of all wetlands or 83,934 acres). Common dominant tree species include red maple (*Acer rubrum*), American elm (*Ulmus americana*), ashes (*Fraxinus pennsylvanica* and *F. nigra*), black gum (*Nyssa sylvatica*), tupelo gum (*N. aquatica*), swamp white oak (*Quercus bicolor*), overcup oak (*Q. lyrata*), and swamp chestnut oak (*Q. michauxii*). Soils generally consist of mineral soils or highly decomposed organic soils.

Needle-leaved evergreen wetlands are also common in the study area, making up 16% of all wetlands (18,652 acres). Common dominant trees include Atlantic white cedar (*Chamaecyparis thyoides*) in organic soils and pond pine (*Pinus serotina*) among broad-leaved evergreens and deciduous shrubs.

A.2.2 Riverine

Riverine systems are defined as all wetlands and deepwater habitats contained within a channel with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts of 0.5 parts per trillion (ppt) or greater. Most of the riverine system within the study area is unconsolidated bottom (>25% cover of particles smaller than stones and a vegetative cover <30%).

Unconsolidated bottom riverine wetlands are characterized by a lack of large stable surfaces for plant and animal attachment. These areas are unstable and have variable wave and current action, temperature, salinity, and light penetration conditions. These conditions affect the composition and distribution of organisms found in this wetland type.

In more coarse substrates, macroalgae may attach to surfaces, while in sands and muds, algae can establish below the substrate. Plants may also root where wave action and currents are not too strong. Most animals found in unconsolidated sediments of riverine systems live within the substrate, though more coarse variations may have animals which live on the surface as well.

In the riverine system, the substrate type is largely determined by current velocity, and plants and animals exhibit a high degree of morphologic and behavioral adaptation to flowing water. Certain species are confined to specific substrates, and some are at least more abundant in one type of substrate than in others. Substrates may include cobble-gravel, sand, mud and organic.

A.2.3 Scrub-shrub

Scrub-shrub wetlands are defined by FGDC (2013) as wetlands where woody plants <20 ft in height are the dominant life form and occupy at least 30% of land cover. This wetland class includes true shrubs (young specimens of tree species) and woody plants that are stunted. Shrub wetlands are broadly referred to as shrub swamp, shrub carr, bog, fen, and pocosin.

Among scrub shrub wetlands, the broad-leaved deciduous subclass is most common in the study area (5.1% of all wetlands or 5,945 acres). Common dominant plant species consist of alders (*Alnus* spp.), willows (*Salix* spp.), buttonbush (*Cephalanthus occidentalis*), red osier dogwood (*Cornus stolonifera*), honeycup (*Zenobia pulverulenta*), Douglas' meadowsweet (*Spiraea douglasii*), bog birch (*Betula pumila*), and young red maple (*Acer rubrum*). Needle-leaved evergreen scrub-shrub wetlands also occur in the study area (3.1% of all wetlands or 3,613 acres) and often include young or stunted tamarack (*Larix laricina*) and southern bald-cypress (*Taxodium distichum*).

B BIOLOGICAL RESOURCES IN STUDY AREA

This section provides detailed lists of common and protected species with the potential to occur within the study area's habitats, supplementing the overview provided in Section 2.5 of the main report. The information is organized by taxonomic group.

B.1 Macroinvertebrates

Table B-1: List of macroinvertebrate species which may occur in study area

Common Name	Species Name	Notes
Insects		
American Bumble Bee	*Bombus pensylvanicus*	Often found in agricultural areas and open herbaceous environments which may be more common in upland portions of the study area
Monarch Butterfly	*Danaus plexippus*	Known for using inland swampy areas for breeding in spring, summer and fall seasons where aquatic

Common Name	Species Name	Notes
		milkweed may be abundant (Kendrick and McCord 2023)
Molluscs		
Atlantic Spike Mussel	*Elliptio producta*	Mussels vary considerably between species in habitat types which are occupied but can generally be found inhabiting a range of conditions including temporary bodies of water such as sloughs and oxbow lakes, streams which may experience durations of dry conditions, and impoundments; however, many are adapted to free-flowing rivers and streams and may be unable to survive in stagnant waters. Mussels are generally impacted by habitat degradation through sedimentation and runoff contaminants in waterways and through significant alterations of local hydrology (Bogan et al. 2008)
Carolina Slabshell Mussel	*Elliptio congaraea*	
Eastern Creekshell Mussel	*Villosa delumbis*	
Eastern Elliptio Mussel	*Elliptio complanata*	
Eastern Pondhorn Mussel	*Uniomerus carolinanus*	
Pod Lance Mussel	*Elliptio folliculata*	
Rayed Pink Fatmucket Mussel	*Lampsilis splendida*	
Savannah Lilliput Mussel	*Toxolasma pullus*	
Yellow Lampmussel	*Lampsilis cariosa*	
Crustaceans		
Carolina Sandhills Crayfish	*Procambarus pearsei*	Species like the Waccamaw crayfish tend to inhabit clear, sand-bottomed streams which flow through swampy areas (NCWRC 2024)
Cedar Creek Crayfish	*Procambarus chacei*	
Coastal Plain Crayfish	*Procambarus ancylus*	
Digger Crayfish	*Creaserinus fodiens*	
Santee Crayfish	*Procambarus blandingii*	
Waccamaw Crayfish	*Procambarus braswelli*	
Sources: USFWS 2008, SCDNR 2023		

B.2 Fish

Table B-2: List of fish species that may occur in study area

Habitat Type	Common Name	Latin Name
Freshwater Streams & Rivers	Alewife	*Alosa pseudoharengus*
	American Eel	*Anguilla rostrata*
	American Shad	*Alosa sapidissima*
	Atlantic Croaker	*Micropogonias undulatus*
	Atlantic Menhaden	*Brevoortia tyrannus*
	Banded Killfish	*Fundulus diaphanous*
	Banded Pygmy Sunfish	*Elassoma zonatum*
	Banded Sunfish	*Enneacanthus obesus*
	Blueback Herring	*Alosa aestivalis*
	Brook Silverside	*Labidesthes sicculus*
	Brown Bullhead	*Ameiurus nebulosus*
	Chain Pickerel	*Esox niger*
	Channel Catfish	*Ictalurus punctatus*

Habitat Type	Common Name	Latin Name
	Coastal Shiner	*Notropis petersoni*
	Creek Chubsucker	*Erimyzon oblongus*
	Dollar Sunfish	*Lepomis marginatus*
	Gizzard Shad	*Dorosoma cepedianum*
	Golden Shiner	*Notemigonus crysoleucas*
	Hickory Shad	*Alosa mediocris*
	Ironcolor Shiner	*Notropis chalybaeus*
	Lake Chubsucker	*Erimyzon sucetta*
	Longnose Gar	*Lepisosteus osseus*
	Margined Madtom	*Noturus insignis*
	Redbreast Sunfish	*Lepomis auritus*
	Red Drum	*Sciaenops ocellatus*
	Redfin Pickerel	*Esox americanus*
	Sawcheek Darter	*Etheostoma serriferum*
	Shortnose Sturgeon	*Acipenser brevirostrum*
	Spotted Sucker	*Minytrema melanops*
	Striped Bass	*Morone saxatilis*
	White Perch	*Morone americana*
Coastal & Tidal Waters	Atlantic Croaker	*Micropogonias undulatus*
	Atlantic Menhaden	*Brevoortia tyrannus*
	Blueback Herring	*Alosa aestivalis*
	Bluegill	*Lepomis macrochirus*
	Bowfin	*Amia calva*
	Chain Pickerel	*Esox niger*
	Coastal Shiner	*Notropis petersoni*
	Flathead Catfish	*Pylodictis olivaris*
	Gizzard Shad	*Dorosoma cepedianum*
	Golden Shiner	*Notemigonus crysoleucas*
	Hickory Shad	*Alosa mediocris*
	Longnose Gar	*Lepisosteus osseus*
	Red Drum	*Sciaenops ocellatus*
	Redfin Pickerel	*Esox americanus*
	Redear Sunfish	*Lepomis microlophus*
	Striped Bass	*Morone saxatilis*
	Striped Mullet	*Mugil cephalus*
	Tarpon	*Megalops atlanticus*
Wetlands & Marshes	American Eel	*Anguilla rostrata*
	Band Killfish	*Fundulus diaphanus*
	Banded Sunfish	*Enneacanthus obesus*
	Black Crappie	*Pomoxis nigromaculatus*

Habitat Type	Common Name	Latin Name
	Bluegill	*Lepomis macrochirus*
	Carolina Pygmy Sunfish	*Elassoma boehlkei*
	Creek Chubsucker	*Erimyzon oblongus*
	Dollar Sunfish	*Lepomis marginatus*
	Everglades Pygmy Sunfish	*Elassoma evergladei*
	Golden Shiner	*Notemigonus crysoleucas*
	Ironcolor Shiner	*Notropis chalybaeus*
	Least Killifish	*Heterandria formosa*
	Lined Topminnow	*Fundulus lineolatus*
	Mud Sunfish	*Acantharchus pomotis*
	Redear Sunfish	*Lepomis microlophus*
	Spotted Sunfish	*Lepomis punctatus*
Freshwater Lakes & Ponds	Black Crappie	*Pomoxis nigromaculatus*
	Bluegill	*Lepomis macrochirus*
	Bowfin	*Amia calva*
	Channel Catfish	*Ictalurus punctatus*
	Flat Bullhead	*Ameiurus platycephalus*
	Gizzard Shad	*Dorosoma cepedianum*
	Largemouth Bass	*Micropterus salmoides*
	Redbreast Sunfish	*Lepomis auritus*
	Red Drum	*Sciaenops ocellatus*
	Redfin Pickerel	*Esox americanus*
Other Freshwater Habitats	American Silver Perch	*Bairdiella chrysoura*
	Broadtail Madtom	*Noturus sp.*
	Flat Bullhead	*Ameiurus platycephalus*
	Freshwater Goby	*Gobionellus schufeldti*
	Swampfish	*Chologaster cornuta*
	Tadpole Madtom	*Noturus gyrinus*
	V-lip Redhorse	*Moxostoma papillosum*
Sources: SCDNR 2023, USFWS 2008		

B.3 Essential Fish Habitat

Table B-3: Federally managed species with EFH that may occur within the project area.

Common Name	Species Name	Jurisdiction[1]	FMP[1]
Blacktip Shark	*Carcharhinus limbatus*	NMFS	HMS
Bluefish	*Pomatomus saltatrix*	MAFMC	Bluefish
Slipper Lobster	*Scyllaridae*	SAFMC	Spiny Lobster
Snapper Grouper	*Serranidae*	SAFMC	Snapper Grouper
Spiny Lobster	*Palinuridae*	SAFMC	Spiny Lobster

Common Name	Species Name	Jurisdiction[1]	FMP[1]
Summer Flounder	*Paralichthys dentatus*	MAFMC	Summer Flounder
Tiger Shark	*Galeocerdo cuvier*	NMFS	HMS
[1]Definitions for acronyms used include: SAFMC = South Atlantic Fishery Management Council, MAFMC = Mid-Atlantic Fishery Management Council, and FMP = Fishery Management Plan			

B.4 Birds of Conservation Concern

Table B-4: Birds of Conservation Concern listed for Bird Conservation Region 27 as determined by USFWS (2021b).

Common Name	Scientific Name	Status[1]	Presence in Study Area[2]	Locality
American Kestrel	*Falco sparverius*	B	Y[3]	Throughout study area
American Oystercatcher	*Haematopus palliatus*	B	Y[3]	Waccamaw NWR
Bachman's Sparrow	*Peucaea aestivalis*	B	Y[3]	Conway
Black Skimmer	*Rynchops niger*	B	Rare[4]	-
Black-throated Green Warbler	*Setophaga virens*	B	Y[3]	Waccamaw NWR (Conway)
Brown-headed Nuthatch	*Sitta pusilla*	B	Y[3]	Throughout study area
Cerulean Warbler	*Setophaga cerulea*	B	Rare[4]	-
Chimney Swift	*Chaetura pelagica*	B	Y[3]	Throughout study area
Chuck-will's Widow	*Antrostomus carolinensis*	B	Y[3]	Throughout study area
Dunlin	*Calidris alpina*	NB	Y[3]	Bucksport Sod Farm
Eastern Whip-poor-will	*Antrostomus vociferus*	B	Y[3]	Throughout study area
Grasshopper Sparrow	*Ammodramus savannarum*	B	Y[3]	Conway
Gull-billed Tern	*Gelochelidon nilotica*	B	Rare[4]	-
Henslow's Sparrow	*Ammodramus henslowii*	NB	Y[5]	Waccamaw NWR
Kentucky Warbler	*Geothlypis formosa*	B	Y[3]	Waccamaw NWR
King Rail	*Rallus elegans*	B	Y[3]	Lake Busbee, Waccamaw NWR
Least Tern	*Sternula antillarum*	B	Y[3]	Bucksport, Socastee, Conway
LeConte's Sparrow	*Ammodramus leconteii*	NB	N	-
Lesser Yellowlegs	*Tringa flavipes*	NB	Y[3]	Bucksport Sod Farm, Conway
Marbled Godwit	*Limosa fedoa*	NB	Rare[4]	-
Painted Bunting	*Passerina ciris*	B	Y[3]	Throughout study area
Pectoral Sandpiper	*Calidris melanotos*	NB	Y[3]	Bucksport Sod Farm, Conway
Prairie Warbler	*Setophaga discolor*	B	Y[3]	Throughout study area
Prothonotary Warbler	*Protonotaria citrea*	B	Y[3]	Throughout study area

Common Name	Scientific Name	Status[1]	Presence in Study Area[2]	Locality
Purple Sandpiper	*Calidris maritima*	NB	Rare[4]	-
Red-headed Woodpecker	*Melanerpes erythrocephalus*	B	Y[3]	Throughout study area
Ruddy Turnstone	*Arenaria interpres*	NB	Y[3]	Myrtle Beach Airport
Rusty Blackbird	*Euphagus carolinus*	NB	Y[3]	Throughout study area
Saltmarsh Sparrow	*Ammodramus caudacutus*	NB	Y[5]	Waccamaw NWR
Seaside Sparrow	*Ammodramus maritimus*	B	Y[5]	Waccamaw NWR
Semipalmated Sandpiper	*Calidris pusilla*	NB	Y[3]	Lake Busbee, sewage plants (Conway)
Short-billed Dowitcher	*Limnodromus griseus*	NB	Y[3]	Cox Ferry (Waccamaw NWR)
Snowy Plover	*Charadrius nivosus*	B	N	-
Swallow-tailed Kite	*Elanoides forficatus*	B	Y[3]	Throughout study area
Whimbrel	*Numenius phaeopus*	NB	Y[3]	Highway 501, Myrtle Beach Airport
Willet	*Tringa semipalmata*	B	Y[3]	Bucksport, Socastee, Conway
Wilson's Plover	*Charadrius wilsonia*	B	Y[3]	Lake Busbee
Wood Thrush	*Hylocichla mustelina*	B	Y[3]	Throughout study area
Yellow Rail	*Coturnicops noveboracensis*	NB	N	-

[1]Status of either breeding (B) or non-breeding (NB) based on whether species utilize the study area for breeding purposes or not.

[2]Presence is either identified as documented as present (Y); rare, in isolated or remote areas, or poorly documented (Rare); or as being not documented in the study area (N)

[3]Occurence information derived from eBird (2023)

[4]Occurence data derived from USFWS (2023)

[5]Occurence data derived from USFWS (2008)

B.5 Migratory Birds Found in Study Area

Table B-5: Birds and their habitats known to occur in study area

Guild	Common Name	Scientific Name	Relationship to Habitat
Habitat Generalists	Common Loon	*Gavia immer*	Breeds in lakes, ponds, and rivers, but migrates to coastal waters for winter.
	Pied-billed Grebe	*Podilymbus podiceps*	Found in freshwater lakes, ponds, and marshes.
	Double-crested Cormorant	*Phalacrocorax auritus*	Prefers freshwater and coastal habitats, nesting on islands.

Guild	Common Name	Scientific Name	Relationship to Habitat
	Anhinga	*Anhinga anhinga*	Found in freshwater wetlands, often near slow-moving water.
	Brown Pelican	*Pelecanus occidentalis*	Coastal waters and estuaries, nests on isolated islands.
	Great Blue Heron	*Ardea herodias*	Found in freshwater wetlands, coastal habitats, and estuaries.
	Great Egret	*Ardea alba*	Wetlands, coastal marshes, estuaries, and freshwater lakes.
	Snowy Egret	*Egretta thula*	Coastal areas, wetlands, estuaries, and rivers.
	Little Blue Heron	*Egretta caerulea*	Coastal marshes, estuaries, and freshwater wetlands.
	Tricolored Heron	*Egretta tricolor*	Coastal marshes and shallow wetlands.
	Cattle Egret	*Bubulcus ibis*	Grasslands, farmlands, wetlands, and marshes.
	Green-backed Heron	*Butorides striatus*	Wetlands, ponds, and shallow coastal waters.
	Black-crowned Night-Heron	*Nycticorax nycticorax*	Wetlands, rivers, estuaries, and coastal areas.
	Yellow-crowned Night-Heron	*Nycticorax violaceus*	Coastal marshes, mangroves, and estuaries.
	Glossy Ibis	*Plegadis falcinellus*	Wetlands, estuaries, coastal areas, and marshes.
	White Ibis	*Eudocimus albus*	Coastal marshes, wetlands, and estuaries.
	Fulvous Whistling-Duck	*Dendrocygna bicolor*	Wetlands, flooded fields, and coastal areas.
	Canada Goose	*Branta canadensis*	Lakes, ponds, rivers, and marshes.
	Wood Duck	*Aix sponsa*	Wooded wetlands, ponds, and lakes with dense vegetation.
	Mallard	*Anas platyrhynchos*	Found in ponds, lakes, rivers, and marshes.
	Northern Pintail	*Anas acuta*	Wetlands, shallow lakes, and estuaries.
	Blue-winged Teal	*Anas discors*	Ponds, marshes, and shallow lakes.
	Northern Shoveler	*Anas clypeata*	Wetlands, shallow lakes, and marshes.
	Gadwall	*Anas strepera*	Shallow freshwater lakes and marshes.
	American Wigeon	*Anas americana*	Wetlands, lakes, and coastal estuaries.
	Canvasback	*Aytha valisineria*	Shallow lakes and marshes with submerged vegetation.
	Ring-necked Duck	*Aythya collaris*	Shallow freshwater lakes and ponds.

Guild	Common Name	Scientific Name	Relationship to Habitat
	Greater Scaup	*Aythya marila*	Coastal waters, shallow bays, and lakes.
	Lesser Scaup	*Aythya affinis*	Lakes, ponds, and estuaries.
	Common Goldeneye	*Bucephala clangula*	Coastal waters, lakes, and rivers.
	Bufflehead	*Bucephala albeola*	Ponds, lakes, and coastal waters.
	Common Merganser	*Mergus merganser*	Lakes, rivers, and coastal waters.
	Red-breasted Merganser	*Mergus serrator*	Coastal waters, bays, and estuaries.
	Ruddy Duck	*Oxyura jamaicensis*	Shallow freshwater ponds and marshes.
	Turkey Vulture	*Cathartes aura*	Open fields, forests, and coastal areas.
	Osprey	*Pandion haliaetus*	Coastal areas, rivers, lakes, and wetlands.
	Mississippi Kite	*Ictinia mississippiensis*	Open woodlands, forests, and wetlands.
	Bald Eagle	*Haliaeetus leucocephalus*	Coastal waters, lakes, and rivers.
	Red-tailed Hawk	*Buteo jamaicensis*	Open woodlands, forests, and grasslands.
	American Kestrel	*Falco sparverius*	Open fields, grasslands, and forests.
	Merlin	*Falco columbarius*	Open fields, coastal areas, and wetlands.
	Peregrine Falcon	*Falco peregrinus*	Coastal cliffs, tall buildings, and urban areas.
	Northern Bobwhite	*Colinus virginianus*	Grasslands, farmland, and shrubby areas.
	Virginia Rail	*Rallus limicola*	Marshes, wet meadows, and swamps.
	American Coot	*Fulica americana*	Marshes, lakes, and wetlands.
	Laughing Gull	*Larus atricilla*	Coastal habitats and estuaries.
	Ring-billed Gull	*Larus delawarensis*	Coastal areas, lakes, and large rivers.
	Herring Gull	*Larus argentatus*	Coastal areas, lakes, and rivers.
	Caspian Tern	*Sterna caspia*	Coastal areas, estuaries, and lakes.
	Royal Tern	*Sterna maxima*	Coastal areas and shallow waters.
	Sandwich Tern	*Sterna sandvicensis*	Coastal areas and estuaries.
	Forster's Tern	*Sterna forsteri*	Coastal marshes, estuaries, and lakes.
	Least Tern	*Sternula antillarum*	Coastal areas, beaches, and estuaries.
	Mourning Dove	*Zenaida macroura*	Open fields, woodlands, and urban areas.
	Common Ground-Dove	*Columbina passerina*	Open fields, dry grasslands, and farmland.

Guild	Common Name	Scientific Name	Relationship to Habitat
	Barn Owl	*Tyto alba*	Open fields, grasslands, and farmlands.
	Eastern Screech-Owl	*Megascops asio*	Woodlands, forests, and suburban areas.
	Great Horned Owl	*Bubo virginianus*	Open woodlands, forests, and urban areas.
	Barred Owl	*Strix varia*	Deciduous forests, woodlands, and riparian areas.
	Chimney Swift	*Chaetura pelagica*	Urban areas, forests, and woodlands.
	Ruby-throated Hummingbird	*Archilochus colubris*	Woodlands, gardens, and forests.
	Belted Kingfisher	*Megaceryle alcyon*	Rivers, lakes, and coastal areas.
	Red-headed Woodpecker	*Melanerpes erythrocephalus*	Forests, woodlands, and wooded edges.
	Red-bellied Woodpecker	*Melanerpes carolinus*	Forests, woodlands, and suburban areas.
	Downy Woodpecker	*Picoides pubescens*	Deciduous forests and woodlands.
	Hairy Woodpecker	*Picoides villosus*	Deciduous forests and wooded areas.
	Northern Flicker	*Colaptes auratus*	Open woodlands, fields, and forests.
Habitat Specialists	American Bittern	*Botaurus lentiginosus*	Wetlands, marshes, and dense vegetation.
	Least Bittern	*Ixobrychus exilis*	Dense marsh vegetation and freshwater wetlands.
	Wood Stork	*Mycteria americana*	Wetlands and shallow freshwater habitats.
	Tundra Swan	*Cygnus columbianus*	Wetlands and shallow freshwater lakes.
	Snow Goose	*Chen caerulescens*	Coastal marshes, grasslands, and wetlands.
	Mottled Duck	*Anas fulvigula*	Coastal marshes and freshwater wetlands.
	Green-winged Teal	*Anas crecca*	Shallow wetlands and freshwater ponds.
	Redhead	*Aythya americana*	Shallow freshwater lakes and marshes.
	Hooded Merganser	*Lophodytes cucullatus*	Forested freshwater wetlands and ponds.
	Clapper Rail	*Rallus longirostris*	Coastal marshes and tidal wetlands.
	Black Rail	*Laterallus jamaicensis*	Salt marshes and dense tidal wetlands.
	King Rail	*Rallus elegans*	Freshwater marshes with dense vegetation.
	Sora	*Porzana carolina*	Marshes and wetlands with dense vegetation.
	Purple Gallinule	*Porphyrio martinica*	Wetlands, dense vegetation, and freshwater marshes.

Guild	Common Name	Scientific Name	Relationship to Habitat
	Common Moorhen	*Gallinula chloropus*	Freshwater marshes and ponds.
	Sharp-shinned Hawk	*Accipiter striatus*	Dense forests and woodland edges.
	Cooper's Hawk	*Accipiter cooperii*	Forests and woodlands.
	Red-shouldered Hawk	*Buteo lineatus*	Wooded wetlands, riparian forests, and swampy areas.
	Broad-winged Hawk	*Buteo platypterus*	Forests and wooded areas with open spaces.
	American Kestrel	*Falco sparverius*	Open grasslands, farmlands, and urban areas.
	Peregrine Falcon	*Falco peregrinus*	Coastal cliffs, tall buildings, and urban areas.
	Swainson's Warbler	*Limnothlypis swainsonii*	Wetlands, swamps, and dense underbrush.
	Northern Waterthrush	*Seiurus noveboracensis*	Wetlands, riparian zones, and dense forest edges.
	Kentucky Warbler	*Oporornis formosus*	Dense understory in mature forests.
	Hooded Warbler	*Wilsonia citrine*	Forest edges and dense, shrubby habitats.
	Yellow-breasted Chat	*Icteria virens*	Dense brush, wetlands, and thickets.
	Scarlet Tanager	*Piranga olivacea*	Deciduous forests and mature woodlands.
	Indigo Bunting	*Passerina cyanea*	Open fields and shrubby areas.
	Rufous-sided Towhee	*Pipilo erythrophthalmus*	Dense thickets, brushy areas, and forests.
	Henslow's Sparrow	*Ammodramus henslowii*	Grasslands and tall, dense wetland grasses.
	Seaside Sparrow	*Ammodramus maritimus*	Coastal marshes and tidal salt marshes.
	Sharp-tailed Sparrow	*Ammodramus caudacutus*	Coastal salt marshes and wet meadows.
	Swamp Sparrow	*Melospiza georgiana*	Wetlands, swamps, and dense vegetation.
	White-throated Sparrow	*Zonotrichia albicollis*	Deciduous forests and woodland edges.
	Rusty Blackbird	*Euphagus carolinus*	Wetlands, forests, and swamps.

Guild	Common Name	Scientific Name	Relationship to Habitat
	Boat-tailed Grackle	*Quiscalus major*	Coastal marshes and salt marshes.
	Orchard Oriole	*Icterus spurious*	Riparian forests, woodlands, and open woodlands.
	Purple Finch	*Carpodacus purpureus*	Coniferous forests and northern woodlands.

B.6 Mammals

Table B-6: Mammals found in study area

Habitat Category	Common Name	Latin Name	Habitat Relationship and Notes
Forests and Woodlands	Big Brown Bat	*Eptesicus fuscus*	Found in a variety of habitats, including forests and urban areas, often roosting in buildings and trees.
	Eastern Fox Squirrel	*Sciurus niger*	Prefers forests with large trees for nesting and abundant food sources such as nuts and seeds.
	Golden Mouse	*Peromyscus nuttalli*	Found in forested areas, particularly in brushy and dense underbrush near water sources.
	Longtail Weasel	*Mustela frenata*	Found in forests, grasslands, and wetlands, typically preying on small mammals and birds in dense underbrush.
	Northern Fox Squirrel	*Sciurus niger*	Prefers mature hardwood forests and areas with abundant oak, hickory, and pine trees.
	Pine Vole	*Pitymys pinetorum*	Prefers forested habitats, particularly pine forests, where they build burrows in the soil.
	Rafinesque's Big-eared Bat	*Plecotus rafinesquii*	Found in mature forests and forested wetlands, roosting in tree cavities and abandoned buildings.
	Southeastern Myotis	*Myotis austroriparius*	Associated with forests, often roosts in tree cavities or under bark, and is found in riparian areas.
	Seminole Bat	*Lasiurus seminolus*	Typically found in wooded areas and forested wetlands, often roosting in tree foliage.
	Silver-haired Bat	*Lasionycteris noctivagans*	Found in forests, typically roosting in tree hollows and foraging in open spaces during the night.
Wetlands and Aquatic Areas	Beaver	*Castor canadensis*	Prefers riverbanks, wetlands, and forested areas where they can build dams and lodges.
	River Otter	*Lutra canadensis*	Found in wetlands, rivers, and coastal environments, often near water where they forage for fish and crustaceans.
	Marsh Rabbit	*Sylvilagus palustris*	Found in wetlands, marshes, and coastal areas, often inhabiting dense vegetation along water edges.
	Mink	*Mustela vison*	Prefers wetlands, rivers, and coastal areas, often found near water where they hunt for small mammals and fish.
Grasslands and Open Areas	Hispid Cotton Rat	*Sigmodon hispidus*	Prefers grasslands and wetlands, often in areas with dense vegetation for shelter.
	Meadow Vole	*Microtus pennsylvanicus*	Common in grasslands, wetlands, and open forests, often found in areas with thick grasses and herbaceous plants.

Habitat Category	Common Name	Latin Name	Habitat Relationship and Notes
Habitat Generalists	Black Rat	*Rattus rattus*	Common in urban and suburban areas, especially around human structures, food sources, and vegetation.
	Bobcat	*Lynx rufus*	Found in forests, woodlands, and grasslands. Prefers areas with dense undergrowth for hunting and cover.
	Eastern Cottontail	*Sylvilagus floridanus*	Common in forests, fields, and wetlands, preferring areas with dense underbrush and herbaceous vegetation.
	Opossum	*Didelphis marsupialis*	Prefers forested areas, swamps, and suburban environments, often foraging at night.
	Raccoon	*Procyon lotor*	Found in forests, wetlands, and urban areas, often near water where they forage for food.
	Shorttail Shrew	*Blarina brevicauda*	Found in forests, grasslands, and wetlands, often in areas with dense vegetation or leaf litter for shelter.
	Whitetail Deer	*Odocoileus virginianus*	Found in forests, woodlands, and grasslands, typically in areas with dense cover for browsing and shelter.
	Norway Rat	*Rattus norvegicus*	Common in urban, agricultural, and forested areas, often near human settlements and trash.
	Black Bear	*Ursus americanus*	Found in forests, wetlands, and mountainous areas, often in large tracts of unfragmented habitat.

B.7 Reptiles and Amphibians

Table B-7: Reptiles and amphibians which occur in the study area

Guild	Common Name	Scientific Name	Relationship to Habitat
Habitat Generalists	Green Anole	*Anolis carolinensis*	Found in a variety of habitats, including forests, gardens, and urban areas.
	Southern Fence Lizard	*Sceloporus undulatus undulatus*	Common in forests, woodlands, and open habitats.
	Ground Skink	*Scincella lateralis*	Prefers leaf litter and ground cover in a variety of habitats, including forests and woodlands.
	Five-lined Skink	*Eumeces fasciatus*	Found in woodlands, gardens, and grasslands, often in sunny areas.
	Broadhead Skink	*Eumeces laticeps*	Lives in forests and woodlands, often in decaying logs and fallen tree trunks.
	Southeastern Five-lined Skink	*Eumeces inexpectatus*	Found in woodlands, forests, and open spaces with dense vegetation.
	Six-lined Racerunner	*Cnemidophrus sexlineatus sexlineatus*	Prefers open, dry areas, including grasslands and fields.
	Eastern Glass Lizard	*Ophisaurus ventralis*	Found in forests, grasslands, and open areas with sufficient cover.
	Eastern Slender Glass Lizard	*Ophisaurus attenuatus longicaudus*	Found in dry, open habitats with grassy and shrubby areas.
	Eastern Garter Snake	*Thamnophis sirtalis sirtalis*	A common species in woodlands, grasslands, wetlands, and urban areas.

Guild	Common Name	Scientific Name	Relationship to Habitat
	Eastern Ribbon Snake	*Thamnophis sauritus sauritus*	Found in wetlands, marshes, and along water bodies in wooded areas.
	Pine Wood Snake	*Rhadinaea flavilata*	Prefers dry woodlands and sandy areas, often found under rocks or logs.
	Midland Brown Snake	*Storeria dekayi*	Common in woodlands, gardens, and lawns, often under rocks and logs.
	Eastern Box Turtle	*Terrapene carolina carolina*	Found in woodlands, forests, and grasslands with access to water.
	Florida Cooter	*Chrysemys floridana*	Prefers freshwater ponds, lakes, and marshes with slow-moving water.
	Yellowbelly Slider	*Trachemys scripta scripta*	Common in ponds, lakes, rivers, and wetlands across a variety of habitats.
	Common Musk Turtle (Stinkpot)	*Sternotherus odoratus*	Found in slow-moving streams, ponds, and marshes.
	Common Snapping Turtle	*Chelydra serpentina serpentina*	Found in freshwater lakes, rivers, and ponds with muddy or soft bottoms.
	Eastern Cottonmouth	*Agkistrodon piscivorus piscivorus*	Prefers swamps, marshes, rivers, and coastal wetlands.
	Southern Copperhead	*Agkistrodon contortrix*	Prefers woodlands, forests, and hilly areas with ample cover.
	Corn Snake	*Elaphe guttata guttata*	Found in woodlands, grasslands, and agricultural areas with ample cover.
	Eastern Kingsnake	*Lampropeltis getulus getulus*	Found in forests, woodlands, and grasslands, often near water sources.
	Scarlet Kingsnake	*Lampropeltis triangulum elapsoides*	Prefers woodlands, forests, and grasslands with varied cover.
	Rough Green Snake	*Opheodrys aestivus*	Found in shrubs, trees, and gardens, usually near water bodies.
	Northern Pine Snake	*Pituophis melanoleucus*	Found in pine forests, sandy areas, and grasslands.
	Yellow Rat Snake	*Elaphe obsoleta quadrivittata*	Found in forests, agricultural fields, and urban areas with cover.
	Carolina Pygmy Rattlesnake	*Sistrurus miliarius miliarius*	Prefers pine forests, grasslands, and dry, sandy habitats.
	Timber Rattlesnake	*Crotalus horridus*	Found in deciduous forests, woodlands, and mixed habitats.
	Eastern Diamondback Rattlesnake	*Crotalus adamanteus*	Prefers dry, sandy habitats like coastal plains, pine forests, and open woodlands.
	Broad-striped Dwarf Siren	*Pseudobranchus striatus striatus*	Found in freshwater wetlands with low vegetation and swampy areas.
	Two-toed Amphiuma	*Amphiuma means*	Prefers slow-moving waters, swamps, and marshes with abundant aquatic vegetation.

Guild	Common Name	Scientific Name	Relationship to Habitat
	Dwarf Waterdog	*Necturus punctatus*	Found in clear, slow-moving waters like streams and springs.
	Southern Cricket Frog	*Acris gryllus gryllus*	Found in ponds, marshes, and shallow water with abundant vegetation.
	Pig Frog	*Rana grylio*	Found in ponds, swamps, and slow-moving waters with dense vegetation.
	River Frog	*Rana heckscheri*	Prefers flowing rivers, streams, and wetlands with shallow waters.
	Carpenter Frog	*Rana virgatipes*	Prefers wetland areas, swamps, and slow-moving waters with ample cover.
	Bronze Frog	*Rana clamitans clamitans*	Found in ponds, lakes, and slow-moving streams.
	Bull Frog	*Rana catesbeiana*	Prefers ponds, lakes, and large slow-moving bodies of water.
	Southern Leopard Frog	*Rana utricularia*	Common in wetlands, ponds, and marshes with dense vegetation.
	Pickerel Frog	*Rana palustris*	Found in clear, cool streams, ponds, and wetlands.
Habitat Specialists	American Alligator	*Alligator mississippiensis*	Prefers freshwater lakes, rivers, and wetlands with abundant vegetation.
	Carolina Diamondback Terrapin	*Malaclemys terrapin centrata*	Coastal salt marshes and estuaries with brackish water.
	Spotted Turtle	*Clemmys guttata*	Prefers freshwater wetlands, bogs, and slow-moving rivers.
	Eastern Chicken Turtle	*Deirochelys reticularia reticularia*	Found in freshwater ponds and marshes with dense aquatic vegetation.
	Striped Mud Turtle	*Kinosternon bauri*	Prefers slow-moving streams and freshwater marshes.
	Eastern Mud Turtle	*Kinosternon subrubrum*	Found in slow-moving streams, rivers, and ponds.
	Gulf Coast Spiny Softshell	*Trionyx spiniferus asperus*	Found in rivers, lakes, and shallow aquatic environments with sandy bottoms.
	Eastern Box Turtle	*Terrapene carolina carolina*	Prefers woodlands, forests, and areas with plenty of ground cover and access to water.
	Eastern Glass Lizard	*Ophisaurus ventralis*	Found in forests and grasslands, with a preference for dry, sandy soils.
	Rough Earth Snake	*Virginia striatula*	Prefers forested areas, grassy fields, and areas with decaying plant material.
	Eastern Worm Snake	*Carphophis amoenus amoenus*	Prefers moist, wooded habitats, often under leaves or logs.
	Southern Hognose Snake	*Heterodon simus*	Found in sandhills, pine forests, and scrubby habitats with sandy soils.

Guild	Common Name	Scientific Name	Relationship to Habitat
	Eastern Hognose Snake	*Heterodon platyrhinos*	Prefers dry, sandy habitats like grasslands and scrublands.
	Northern Scarlett Snake	*Cemophora copei copei*	Prefers dry, open habitats like pine forests and sandhills.
	Glossy Crayfish Snake	*Regina rigida*	Prefers freshwater wetlands and slow-moving streams with abundant crayfish.
	Carolina Black Swamp Snake	*Seminatrix pygaea paludis*	Found in swampy areas and wetlands with slow-moving waters.
	Southern Black Racer	*Coluber priapus priapus*	Prefers open woodlands, grasslands, and scrubby areas with plenty of cover.
	Eastern Coachwhip	*Masticophis flagellum flagellum*	Prefers open, dry habitats like grasslands, scrub, and sandy areas.
	Rainbow Snake	*Farancia erytrogramma erytrogramma*	Found in slow-moving rivers, swamps, and marshes with aquatic vegetation.
	Eastern Mud Snake	*Farancia abacura abacura*	Prefers slow-moving, stagnant waters in marshes and wetlands.
	Eastern Coral Snake	*Micrurus fulvius fulvius*	Prefers dry woodlands and forests with loose, sandy soils.
	Greater Siren	*Siren lacertina*	Found in slow-moving rivers, swamps, and marshes with low-lying vegetation.
	Eastern Lesser Siren	*Siren intermedia intermedia*	Prefers shallow, slow-moving waters with mud or soft bottoms.
	Eastern Tiger Salamander	*Ambystoma tigrinum*	Found in wetlands, marshes, and breeding ponds in forested areas.
	Spotted Salamander	*Ambystoma maculatum*	Found in deciduous forests, breeding in vernal pools and ponds.
	Marbled Salamander	*Ambystoma opacum*	Prefers wooded areas with access to temporary ponds for breeding.
	Southern Dusky Salamander	*Desmognathus auriculatus*	Found in moist, wooded habitats and streams with rocky or muddy bottoms.
	Eastern Mud Salamander	*Pseudotriton montanus montanus*	Prefers moist habitats such as marshes, swamps, and slow-moving waters.
	Three-lined Salamander	*Eurycea longicauda guttolineata*	Prefers cool, clear streams and wetlands with aquatic vegetation.
	Dwarf Salamander	*Eurycea quadridigitata*	Found in moist, damp environments with access to small streams or marshes.
	South Carolina Slimy Salamander	*Plethodon variolatus*	Prefers moist, shaded forested habitats with abundant cover.
	Southern Two-lined Salamander	*Eurycea cirrigera*	Found in cool, moist streams and spring-fed streams in wooded areas.
	Broken-striped Newt	*Notophthalmus viridescens dorsalis*	Prefers cool, clear, slow-moving waters in forested areas.
Sources: USFWS 2008			

B.8 ESA-listed Species

Table B-8: Federally listed threatened and endangered species under jurisdiction of the Services in the study area.

Common Name	Scientific Name	Status 1	Presence in Study Area2	Jurisdiction
Atlantic sturgeon	*Acipenser oxyrinchus*	E, CH	Y	NMFS
Shortnose sturgeon	*Acipenser brevirostrum*	E	Y	NMFS
Wood stork	*Mycteria americana*	T	Y	USFWS
Eastern black rail	*Laterallus jamaicensis jamaicensis*	T	U	USFWS
Red-cockaded woodpecker	*Picoides borealis*	E	Y	USFWS
Piping plover	*Charadrius melodus*	T	N	USFWS
Red knot	*Calidris canutus rufa*	T	R	USFWS
Northern long-eared bat	*Myotis septentrionalis*	E	U	USFWS
Tricolored bat	*Perimyotis subflavus*	PE	U	USFWS
West Indian manatee	*Trichechus manatus*	E	Y	USFWS
Green sea turtle	*Chelonia mydas*	T	N	USFWS/NMFS
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	N	USFWS/NMFS
Leatherback sea turtle	*Dermochelys coriacea*	E	N	USFWS/NMFS
Loggerhead sea turtle	*Caretta caretta*	T	N	USFWS/NMFS
Magnificent Ramshorn	*Planorbella magnifica*	E	N	USFWS
Monarch butterfly	*Danaus plexippus*	PT	Y	USFWS
American chaffseed	*Schwalbea americana*	E	U	USFWS
Pondberry	*Lindera melissifolia*	E	U	USFWS
Cooley’s Meadowrue	*Thalictrum cooleyi*	E	N	USFWS
Rough-leaved Loosestrife	*Lysimachia asperulaefolia*	E	N	USFWS
Canby’s dropwort	*Oxypolis canbyi*	E	U	USFWS

[1]Status designations are abbreviated as follows: E – Endangered, PE - Proposed Endangered, T – Threatened, and PT – Proposed Threatened

[2]Presence indicators are abbreviated as follows: documented in study area (Y), presence possible, but not well documented in study area (U), presence is rare (R), no presence documented in study area (N)

C GREENHOUSE GAS ANALYSIS – RECOMMENDED PLANS

This section provides a detailed quantitative analysis of greenhouse gas (GHG) emissions to supplement the qualitative discussion in Section 4.2 of the main report. This analysis is provided for informational purposes to fully disclose the potential impacts of the federal action under NEPA. The analysis estimates the carbon dioxide equivalent (CO2e) emissions from construction and operational activities for the recommended plan.

Relief Bridges	Construction	4 Months		
Onroad Equipment Name	**Equipment Quantity**	**Hours Per Day**	**Days In Use**	**Total Hours**
Flatbed Truck	2.00	8.00	20.00	160.00
Dump Truck - for hauling material away	1.00	8.00	60.00	480.00
Boom Truck (not based on MPG)	1.00	8.00	100.00	800.00
Nonroad Equipment Name				
Boring Machine	1.00	8.00	100.00	800.00
Crawler Crane	1.00	2.00	30.00	60.00
Onroad Equipment Name (Cont.)	**GPH**	**Fuel Type**	**Fuel Volume**	**Vehicle Type**
Flatbed Truck	2.28	Regular	364.68	Gasoline Heavy-Duty Vehicle (assumed 2015)
Dump Truck - for hauling material away	4.86	Diesel	2,333.82	Medium- and Heavy-Duty Vehicles
Boom Truck (not based on MPG)	10.85	Diesel	8,680.00	Medium- and Heavy-Duty Vehicles
Nonroad Equipment Name (Cont.)				
Boring Machine	4.41	Diesel	3,525.64	Construction/Mining Equipment (Diesel Equip.)
Crawler Crane	5.41	Diesel	324.86	Construction/Mining Equipment (Diesel Equip.)
Onroad Equipment Name (Cont.)	**Estimated Fuel Economy (MPG)**	**Estimated Vehicle-Miles**	**Emissions Factor CO2 (g/G)**	**Emissions Factor CH4 (g/vehicle-mile)**
Flatbed Truck	5.50	2,005.74	8,078.00	0.03
Dump Truck - for hauling material away	5.00	11,669.10	10,210.00	0.01
Boom Truck (not based on MPG)	5.00	43,400.00	10,210.00	0.01
Nonroad Equipment Name (Cont.)	**Estimated Fuel Economy (MPG)**		**Emissions Factor CO2 (g/G)**	**Emissions Factor CH4 (g/G)**
Boring Machine	-	-	10,210.00	1.01
Crawler Crane	-	-	10,210.00	1.01
Onroad Equipment Name (Cont.)	**Emissions Factor N2O (g/vehicle-mile)**	**Emissions (g) CO2**	**Emissions (g) CH4**	**Emissions (g) N20**
Flatbed Truck	2.10E-03	2,945,922.88	66.59	4.21
Dump Truck - for hauling material away	0.04	23,828,288.55	110.86	502.94
Boom Truck (not based on MPG)	0.04	88,622,800.00	412.30	1,870.54
Nonroad Equipment Name (Cont.)	**Emissions Factor N2O (g/G)**	**Emissions (g) CO2**	**Emissions (g) CH4**	**Emissions (g) N20**
Boring Machine	0.94	35,996,760.45	3,560.89	3,314.10
Crawler Crane	0.94	3,316,870.27	328.11	305.37
Proposed Action Alternative	**Emissions Total (g)**	**Emissions Total (lbs)**	**Emissions Total (Metric tons)**	
CO2	154,710,642.16	341,078.86	0.34	
CH4	4,478.75	9.87	9.87E-06	
N2O	5,997.16	13.22	1.32E-05	
	O&M	Annually over 50 year Life Span		
Onroad Equipment Name	**Equipment Quantity**	**Hours Per Day**	**Days In Use**	**Total Hours**
Dump Truck	1.00	8.00	50.00	400.00
Nonroad Equipment Name				
Excavator	1.00	8.00	50.00	400.00
Onroad Equipment Name (Cont.)	**GPH**	**Fuel Type**	**Fuel Volume**	**Vehicle Type**
Dump Truck	4.86	Diesel	1,944.85	Medium- and Heavy-Duty Vehicles
Nonroad Equipment Name (Cont.)				
Excavator	2.28	Diesel	911.71	Construction/Mining Equipment (Diesel Equip.)
Onroad Equipment Name (Cont.)	**Estimated Fuel Economy (MPG)**	**Estimated Vehicle-Miles**	**Emissions Factor CO2 (g/G)**	**Emissions Factor CH4 (g/vehicle-mile)**
Dump Truck	5.00	9,724.25	10,210.00	0.01
Nonroad Equipment Name (Cont.)	**Estimated Fuel Economy (MPG)**		**Emissions Factor CO2 (g/G)**	**Emissions Factor CH4 (g/G)**
Excavator	-	-	10,210.00	1.01
Onroad Equipment Name (Cont.)	**Emissions Factor N2O (g/vehicle-mile)**	**Emissions (g) CO2**	**Emissions (g) CH4**	**Emissions (g) N20**
Dump Truck	0.04	19,856,907.13	92.380375	419.115175
Nonroad Equipment Name (Cont.)	**Emissions Factor N2O (g/G)**	**Emissions (g) CO2**	**Emissions (g) CH4**	**Emissions (g) N20**
Excavator	0.94	9,308,576.58	920.83	857.01
Proposed Action Alternative	**Emissions Total (g)**	**Emissions Total (lbs)**	**Emissions Total (Metric tons)**	**Total 50 yrs**
CO2	29,165,483.70	64,298.94	0.06	3.21
CH4	1,013.21	2.23	2.23E-06	1.12E-04
N2O	1,276.12	2.81	2.81E-06	1.41E-04

Weir Removal	Construction (no O&M)	6 Months		
Onroad Equipment Name	**Equipment Quantity**	**Hours Per Day**	**Days In Use**	**Total Hours**
Dump Truck	1.00	8.00	60.00	480.00
Nonroad Equipment Name				
Excavator	2.00	8.00	60.00	480.00
Crawler Crane	1.00	2.00	5.00	10.00
Dozer	1.00	4.00	5.00	20.00
Onroad Equipment Name (Cont.)	**GPH**	**Fuel Type**	**Fuel Volume**	**Vehicle Type**
Dump Truck	4.86	Diesel	2,333.82	Medium- and Heavy-Duty Vehicles
Nonroad Equipment Name (Cont.)				
Excavator	5.39	Diesel	2,589.19	Construction/Mining Equipment
Crawler Crane	5.41	Diesel	54.14	Construction/Mining Equipment
Dozer	4.41	Diesel	88.14	Construction/Mining Equipment
Onroad Equipment Name (Cont.)	**Estimated Fuel Economy (MPG)**	**Estimated Vehicle-Miles**	**Emissions Factor CO2 (g/G)**	**Emissions Factor CH4 (g/vehicle-mile)**
Dump Truck	5.00	11,669.09	10,210.00	0.01
Nonroad Equipment Name (Cont.)			**Emissions Factor CO2 (g/G)**	**Emissions Factor CH4 (g/G)**
Excavator	-	-	10,210.00	1.01
Crawler Crane	-	-	10,210.00	1.01
Dozer	-	-	10,210.00	1.01
Onroad Equipment Name (Cont.)	**nissions Factor N2O (g/vehicle-mi**	**Emissions (g) CO2**	**Emissions (g) CH4**	**Emissions (g) N20**
Dump Truck	0.04	23,828,288.55	110.86	502.94
Nonroad Equipment Name (Cont.)	**Emissions Factor N2O (g/G)**	**Emissions (g) CO2**	**Emissions (g) CH4**	**Emissions (g) N20**
Excavator	0.94	26,435,621.62	2,615.08	2,433.84
Crawler Crane	0.94	552,811.71	54.69	50.90
Dozer	0.94	899,919.01	89.02	82.85
Proposed Action Alternative	**Emissions Total (g)**	**Emissions Total (lbs)**	**Emissions Total (Metric tons)**	
CO2	51,716,640.90	114,015.77	0.11	
CH4	2,869.65	6.33	6.33E-06	
N2O	3,070.52	6.77	6.77E-06	

D AGENCY SCOPING AND ICT MEETING RECORD

The following is a list of local governments included in initial scoping and/or additional Interagency Coordination Team (ICT) meetings where representatives which were invited after initial scoping are indicated by the date invitations were sent. Please see further records below of invitations and meeting notes. These were also recipients of the draft FR/EA distributed on October 9, 2024.

Horry County

City of Conway

The following is a list of all agencies included in initial scoping and/or additional ICT meetings where representatives which were invited after initial scoping are indicated by the date invitations were sent. Please see further records below of invitations and meeting notes. These were also recipients of the draft FR/EA distributed on October 9, 2024.

National Marine Fisheries Service (NMFS)

- Habitat Conservation Division
- Office of Protected Resources

National Park Service

South Carolina Department of Archives and History (SCDAH)

South Carolina Department of Environmental Services (SCDES)

- Bureau of Coastal Management
- Bureau of Water

South Carolina Department of Natural Resources (SCDNR)

- Office of Environmental Programs
- Hydrology Section
- State Climatology Office

US Department of Agriculture Natural Resources Conservation Service

US Environmental Protection Agency (EPA)

US Geological Survey

US Fish and Wildlife Service (USFWS)

- South Carolina Ecological Services Field Office
- Waccamaw River National Wildlife Refuge

The following non-government organizations were also recipients of the draft FR/EA:

- The Nature Conservancy
- Audubon South Carolina
- South Carolina Coastal Conservation League
- South Carolina Wildlife Federation
- South Carolina Sierra Club

From:	Hughes, Andrea W CIV USARMY CESAC (USA)
To:	Lorianne Riggin; Stout, Christopher; Hightower, Charles; Pace Wilber - NOAA Federal; tom_mccoy@fws.gov; harderS@dnr.sc.gov; MizellH@dnr.sc; Mark Caldwell; Kajumba, Ntale; Singh-White, Alya; Cynthia Cooksey - NOAA Federal; Stacie Crowe; Johnson, Elizabeth; Maggie Jamison; Culbreath, S. Michele; marshall_sasser@fws.gov; Smith, Whitney R
Cc:	Ward, Bethney P CIV USARMY CESAC (USA); Parrish, Nancy A CIV USARMY CESAC (USA); Buchanan, Jami L CIV USARMY CELRH (USA); Backus, Pamela N CIV USARMY CESAS (USA); mhyman@cityofconway.com; Markunas, Andrew
Subject:	Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite
Date:	Friday, October 28, 2022 8:22:00 PM
Attachments:	Agency Scoping Letter and Study Area Map.pdf

Dear Agency Colleagues,

In accordance with Section 1005 of the Water Resources Reform and Development Act of 2014 and other applicable laws and regulations, the U.S Army Corps of Engineers, Charleston District plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study". Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) compliance.

Please contact me by email at andrea.w.hughes@usace.army.mil regarding questions. WebEx information and an agenda will be sent out prior to the meeting.

Regards,

Andrea

Andrea W. Hughes
Biologist, Planning and Environmental Branch
U.S. Army Corps of Engineers, Charleston District
69-A Hagood Avenue
Charleston, South Carolina 29403
843.566.3857

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, CHARLESTON DISTRICT
69A HAGOOD AVENUE
CHARLESTON, SOUTH CAROLINA 29403-5107

28 October 2022

Planning and Environmental Branch

Dear Agency Colleague:

The U.S. Army Corps of Engineers, Charleston District (USACE) is initiating a feasibility study to develop and analyze alternatives for a flood risk management study located within the Waccamaw River Basin. This study, entitled the *Waccamaw River, Horry County, South Carolina,* is authorized by the Rivers and Harbor Acts of June 14, 1880, and of July 3, 1930; and Section 216 of the 1970 Flood Control Act (P.L. 91-611). The non-Federal sponsor for this study is Horry County.

The objectives of the study are to reduce the risk of damages from flooding within affected communities, decrease the risk to structures, industry, and public infrastructure, and to reduce life and safety risk associated with storm surge and riverine events. The study area includes the portion of the Waccamaw River Basin that lies within Horry County, South Carolina. The Waccamaw River Basin is located within the coastal plain of North and South Carolina and has a 1,640 square mile-drainage area: 598 square miles in South Carolina, and 1,042 square miles in North Carolina. The Waccamaw River is approximately 161 miles long and flows approximately 140 miles from Lake Waccamaw in Columbus County, North Carolina, southwesterly to Winyah Bay at Georgetown, South Carolina, which opens to the Atlantic Ocean. The lower 20 miles of the Waccamaw River are interconnected with the Pee Dee River. The study area encompasses approximately 81 miles of the Waccamaw River, and 546 square miles of the basin, including the City of Conway which is the county seat. Part of the Waccamaw River in Horry County is also the Atlantic Intracoastal Waterway.

Flood risk management measures that are currently being considered include: traditional structural measures such as barrier removal, channel modifications, channel diversions, levees/flood walls, retention/detention basins, floodplain benching, bank stabilization, and transportation-related recommendations; non-structural measures such as flood-proofing, home acquisition and relocation, structure elevation, and emergency planning; and natural and nature-based measures such as watershed farming, and riparian plantings. The study is still within the scoping phase, and therefore the list above may not include all management measures that are ultimately considered for the project; additional measures may be considered, and measures may be removed from consideration, as the study develops.

Pursuant to compliance with the National Environmental Policy Act (NEPA) and associated environmental laws and regulations, [including the Endangered Species Act, Fish and Wildlife Coordination Act, Clean Water Act, National Historic Preservation Act], USACE will be preparing a NEPA decision document to analyze the potential effects of identified alternatives. Information gathered during this scoping effort and over the course of the study will assist us in determining the appropriate NEPA compliance pathway. At this time we request your feedback on the scope of issues to be addressed, any resources or habitats of concern in

the study area, information on ongoing projects in the area, and any feedback you may have on the management measures we are considering.

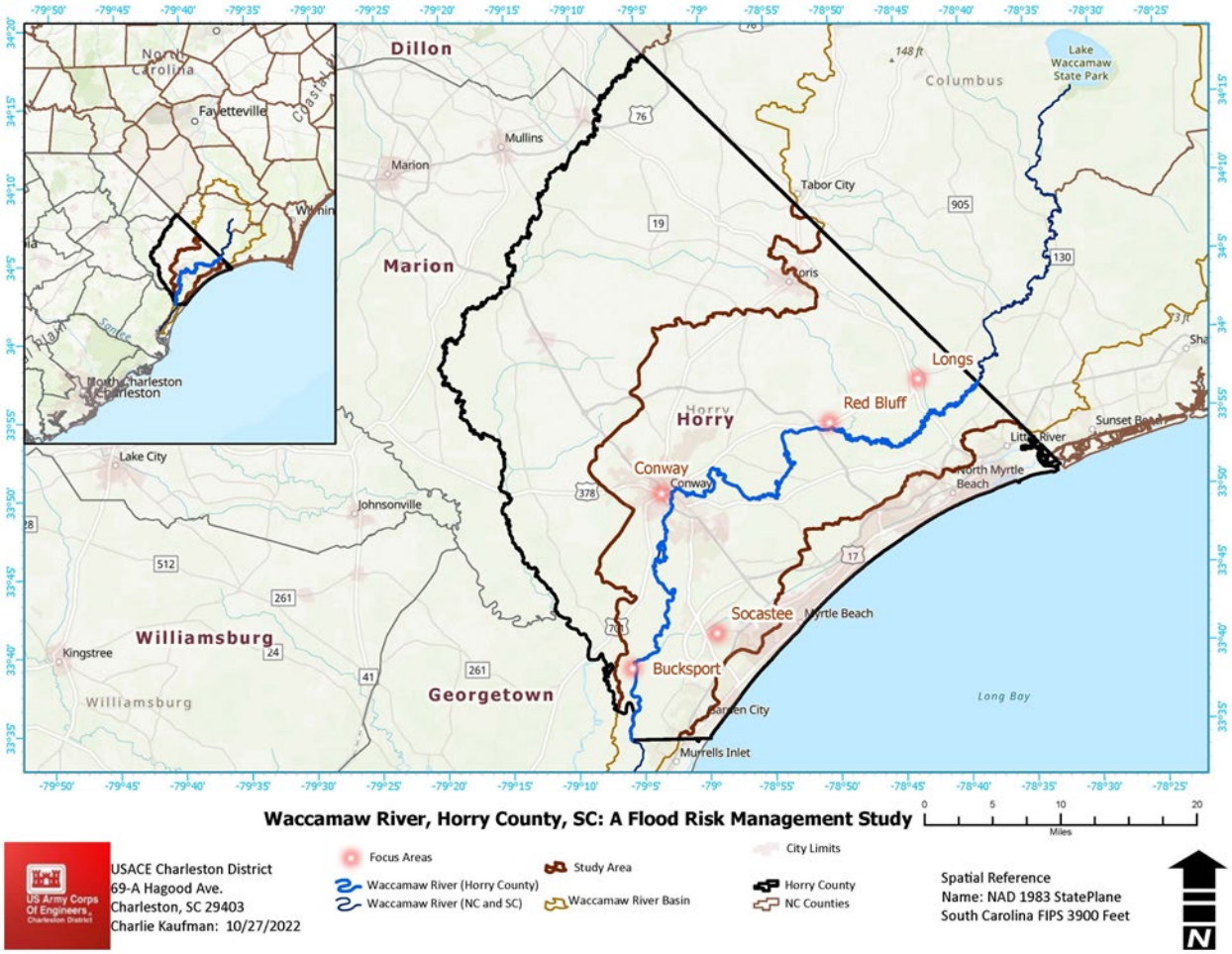
We hope that you will be able to attend the Interagency Coordination Team (ICT) meeting scheduled for 15 November 2022. The meeting will be an opportunity for the agencies to gain additional information on the study and the measures being considered. We request that written feedback be provided within 30 days of receipt of this letter. If you have any questions on this matter, please feel free to contact Andrea Hughes by e-mail at andrea.w.hughes@usace.army.mil.

Sincerely,

for Nancy Parrish
Chief, Planning and Environmental Branch

Enclosure

2


Waccamaw River, Horry County, SC: A Flood Risk Management Study
Dillon
Marion
Horry
Williamsburg
Georgetown
Longs
Red Bluff
Conway
Socastee
Bucksport
Lake Waccamaw State Park
Columbus
Tabor City
Loris
Mullins
Marion
Fayetteville
North Carolina
North Charleston
Charleston
Lake City
Johnsonville
Kingstree
Williamsburg
Little River
Sunset Beach
North Myrtle Beach
Myrtle Beach
Garden City
Murrells Inlet
Long Bay
Miles
0
5
10
20
USACE Charleston District
69-A Hagood Ave.
Charleston, SC 29403
Charlie Kaufman: 10/27/2022
US Army Corps Of Engineers, Charleston District
Focus Areas
Waccamaw River (Horry County)
Waccamaw River (NC and SC)
Study Area
Waccamaw River Basin
City Limits
Horry County
NC Counties
Spatial Reference
Name: NAD 1983 StatePlane
South Carolina FIPS 3900 Feet
N

From:	Singh-White, Alya
To:	Hughes, Andrea W CIV USARMY CESAC (USA)
Cc:	Dean, Kenneth; Buskey, Traci P.
Subject:	[Non-DoD Source] EPA Scoping Comments on the Waccamaw River Flood Risk Management Study
Date:	Monday, November 28, 2022 9:59:02 AM

Ms. Andrea Hughes
Biologist, Planning and Environmental Branch
U.S. Army Corps of Engineers, Charleston District
69A Hagood Avenue
Charleston, South Carolina 29403-5107
andrea.w.hughes@usace.army.mil

Re: EPA Scoping Comments on the Waccamaw River Flood Risk Management Study in Horry County, South Carolina

Dear Ms. Hughes:

The U.S. Environmental Protection Agency (EPA) has reviewed the letter, dated October 28, 2022, from Nancy Parrish of the U.S. Army Corps of Engineers (USACE), Charleston District, regarding the Waccamaw River, Horry County, South Carolina Study, in accordance with Section 309 of the Clean Air Act and Section 102(2)(C) of the National Environmental Policy Act (NEPA). According to the letter, the USACE is initiating a feasibility study to develop and analyze alternatives for flood risk management within the Waccamaw River Basin in Horry County, South Carolina. The purpose of the study is to reduce life safety risk and flood damage to communities, structures, industry, and infrastructure associated with storm surge and riverine events. The USACE has not yet determined the type of NEPA document that it will complete for the study.

The USACE is considering the following flood risk management measures for the study which may be altered as the project progresses: traditional structural measures such as barrier removal, channel modifications, channel diversions, levees/flood walls, retention/detention basins, floodplain benching, bank stabilization, and transportation-related recommendations; non-structural measures such as flood-proofing, home acquisition and relocation, structure elevation, and emergency planning; and natural and nature-based measures such as watershed farming, and riparian plantings. The type and location of flood risk management measures that will be implemented has yet to be determined.

Based on the EPA's review of the available information, the following scoping comments are provided for your consideration.

(1) **Environmental Justice (EJ):** Executive Order 12898 directs federal agencies to identify and address the disproportionately high and adverse human health on environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. The EPA encourages the use of EJScreen (https://www.epa.gov/ejscreen), EPA's nationally consistent environmental justice screening and mapping tool, when conducting environmental justice scoping efforts. The tool provides information on environmental and socioeconomic indicators as well as pollution sources, health disparities, critical service gaps, and climate change data. The tool can help identify potential community vulnerabilities by calculating EJ Indexes and displaying other environmental and socioeconomic information.

EJScreen is a useful first step in highlighting locations that may be candidates for further analysis. The EPA recommends conducting a complete EJ analysis in order to identify people of color, indigenous and low-income communities within the project area, assess the potential impacts of the project on these communities, and determine whether such impacts are disproportionately high and adverse The EPA also recommends meaningfully engaging communities with EJ concerns early and throughout the NEPA process. To address potential barriers to meaningful engagement, consider using adaptive and innovative approaches to both public outreach and participation to meet the needs of the local community and businesses (i.e., engage local community leaders and groups in project planning, share project information at community events/meetings, virtual meetings, etc). The Environmental Justice Interagency Working Group's *Promising Practices for EJ Methodologies in NEPA Reviews* (*Promising Practices)*, dated March 2016, provides guiding principles agencies can consider (https://www.epa.gov/sites/default/files/2016-08/documents/nepa_promising_practices_document_2016.pdf).

The EPA recommends that the environmental document identify and address any disproportionate impacts on people of color, indigenous, and low-income populations. The EPA also recommends the environmental document discuss the input, concerns, and engagement of the affected communities. Furthermore, the EPA recommends the environmental document describe how community concerns or recommendations are used to develop proposed mitigation options or to further avoid or minimize impacts to human health and the environment.

(2) **Contaminated Sites:** The study area contains numerous RCRA facilities and underground storage tanks (UST) that have been identified in NEPAssist and the South Carolina Department of Health and Environmental Control UST registry. The EPA recommends conducting a Phase I and possibly a Phase II contamination site assessment to identify all contaminated site features within the study area. Contaminated sites should be avoided when selecting the location of certain project features (i.e., flood walls and retention basins). If avoidance is not possible, the site should be properly remediated prior to its use.

(3) **Federal Lands:** The Waccamaw National Wildlife Refuge is located within the project study area and is a diverse habitat to many species of flora and fauna. The refuge is managed by the U.S. Fish and Wildlife Service (USFWS); therefore, the EPA encourages the USACE to coordinate early with the USFWS regarding potential impacts to species and habitat within the wildlife refuge.

Thank you for the opportunity to provide scoping comments on the proposed study. If you have any questions regarding the EPA's comments, please contact me by phone at 404-562-9339 or via email at Singh-White.Alya@epa.gov.

Sincerely,

Alya Singh-White
Biologist | NEPA Project Manager
U.S. EPA Region 4
Office of the Regional Administrator
Strategic Programs Office | NEPA Section
61 Forsyth St SW

South Carolina Department of Natural Resources

Robert H. Boyles, Jr.
Director

Lorianne Riggin, Director
Office of Environmental Programs

November 22, 2022

U.S. Army Corps of Engineers
Planning & Environmental Branch
Attention: Andrea Hughes
andrea.w.hughes@usace.army.mil

Electronic submission

RE: Waccamaw River Flood Risk Management Study, Horry County, South Carolina

Dear Mrs. Hughes,

The South Carolina Department of Natural Resources (SCDNR) is the state agency charged by state law with the management, protection and enhancement of wildlife, fisheries and marine resources in South Carolina. Additionally, the SCDNR is responsible for formulating comprehensive policies for water resources through a State Water Plan to address issues affecting water supply, water quality, navigation, hydroelectric power, outdoor recreation, fish and wildlife needs, and other water resource interests.

Due to the SCDNR's responsibilities as a steward for the state's natural resources, the comments enclosed are for the purpose to aid in the development of National Environmental Policy Act (NEPA) documents to assess flood risk solutions in Horry County.

The SCDNR appreciates the opportunity to provide feedback for consideration in the development of NEPA measures to balance environmental protection and the potential flood risk solutions. Should you have any questions, please do not hesitate to contact me via email at RigginL@dnr.sc.gov or by phone at 803-734-4199.

Sincerely,

Lorianne Riggin

Lorianne Riggin
PO Box 167
Columbia, SC 29202
803-734-4199
rigginl@dnr.sc.gov

Waccamaw River Flood Risk Management Feasibility Study
Waccamaw River, Horry County, South Carolina

Project Summary

The U.S. Army Corps of Engineers Charleston District (USACE) is initiating a feasibility study, in conjunction with Horry County as a non-federal sponsor, to develop and analyze alternatives for a flood risk management study within the Waccamaw River Basin. The objectives of the study are to reduce the risk of damages from flooding within affected communities; decrease the risk to structures, industry and public infrastructure; and to reduce life and safety risk associated with storm surge and riverine events. The study area includes the portion of the Waccamaw River Basin that lies within Horry County; the basin has a 1,640 square mile drainage area (598 square miles in South Carolina) and contains the 161-mile long Waccamaw River. The study will encompass 81 miles of the Waccamaw River and 546 square miles of the basin, including the City of Conway.

The following flood risk management measures are currently being considered at the initiating phase of the feasibility study: traditional structural measures such as barrier removal, channel modifications, channel diversions, levees/flood walls, retention/detention basins, floodplain benching, bank stabilization, and transportation-related recommendations; non-structural measures such as flood-proofing, home acquisition and relocation, structure elevation, and emergency planning; and natural and nature-based measures such as riparian plantings.

SCDNR Comments

The Waccamaw River is vital to supporting a multitude of species, plant and animal, as it winds from the North Carolina to its terminus at Winyah Bay. The South Carolina Wildlife Action Plan (SWAP) was originally created in the Wildlife Conservation and Recreation Program created under the federal Appropriations Act of 2001 with a purpose to develop a wildlife conservation planning and restoration strategy for rare and sensitive species. Species are listed in the SWAP because they are rare or designated as at-risk due to knowledge deficiencies; species common in South Carolina but listed rare or declining elsewhere; or species that serve as indicators of detrimental environmental conditions. The 2015 SC SWAP states that the upper Waccamaw River in Horry County is one area of primary conservation concern due to the habitat located there for the following SWAP conservation priority species – the Carolina Pygmy Sunfish (*Elassoma boehlkei*), the Broadtail Madtom (*Noturus* sp. c.f. *leptacanthus*), and the Waccmaw spike (*Elliptio waccamawensis*).

Tables 1 and 2 attached include a list of all the SWAP conservation priority species, state protected species and federally protected species that need to be considered when developing flood risk management solutions in and around the Waccamaw River. Please note that the take of state threatened, and endangered species is prohibited under S.C. Code of Laws §50-15-20 and §50-15-30 respectively. Additionally, S.C. Code of Laws §16-11-590 provides additional protections for the Venus flytrap, a federal at-risk species and SWAP species of high conservation priority, that is now known from only a few populations in the world – two populations in Horry County, SC and in a few coastal counties of NC. This statute requires

landowner consent for the cutting, collection, breaking or other destruction to this globally rare plant species. The SCDNR will work with landowners where Venus flytrap may be impacted to remove and relocate these rare plants where minimization and avoidance of destruction of these species cannot occur.

The SC Geological Survey has existing geological map coverage of the proposed project area and should be useful when it comes to delineating deep versus braided Waccamaw River channels and the older floodplains that are evident in LiDAR. The Geological Survey maps can be found at the following link: https://www.dnr.sc.gov/geology/

Additionally, two papers regarding the drainage of the Waccamaw River are attached that were conducted in North Carolina; much of this will also be applicable to South Carolina regarding coastal wetlands and geology.

The SCDNR in collaboration with the NC Wildlife Resources Commission conducted a comprehensive fish community study in the Waccamaw River for the summer months of 2015, 2016 and 2017. Sampling efforts divided the river into segments based on the varying levels of dissolved oxygen. During the September 2018 flooding event associated with Hurricane Florence, dissolved oxygen levels in the Waccamaw River reached hypoxic levels, causing a river-wide fish kill event. Following this event, once water levels receded to within the banks of the river, in late October 2018, SCDNR conducted a sampling effort to get a snapshot of the fish kill. Standardized sampling was initiated again in the summer of 2019 to document the full extent of the fish kill and was continued until the summer of 2021. The results of the post Hurricane Florence study are also provided in the attached.

While this is a federal project, the SCDNR would like to note that the Fish and Wildlife Coordination Act (16. U.S.C 661 et seq) requires consultation with the state where ". . . waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever, including navigation and drainage by any department or agency of the United States or by any public or private agency under Federal permit or license, such department or agency shall first consult with the United States Fish and Wildlife Service, Department of the Interior, and with the head of the agency exercising administration over the wildlife resources of the particular State wherein the impoundment, diversion, or other control facility is to be constructed, with a view to the conservation of wildlife resources by preventing loss of and damage to such resources as well as providing for the development and improvement thereof in connection with such water-resource development." Therefore, the species identified in Tables 1 and 2, including those of SWAP conservation priority should be considered.

The SCDNR encourages the USACE to explore natural and nature-based solutions where possible. Additionally, any opportunities to assess increasing fishing pier or bank fishing access on the Waccamaw River as a part of this study would be of great interest to the SCDNR and a benefit to the public.

Attachment

Table 1. Animal Species for consideration during study development.

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
INSECT				
Bombus pensylvanicus	American Bumble Bee	At-Risk Species	Not Applicable	Not Applicable
Danaus plexippus	Monarch Butterfly	Candidate for listing	Not Applicable	Highest
FRESHWATER MUSSEL				
Elliptio complanata	Eastern Elliptio	Not Applicable	Not Applicable	Moderate
Elliptio congaraea	Carolina Slabshell	Not Applicable	Not Applicable	Moderate
Elliptio folliculata	Pod Lance	Not Applicable	Not Applicable	High
Elliptio producta	Atlantic Spike	Not Applicable	Not Applicable	High
Lampsilis cariosa	Yellow Lampmussel	Not Applicable	Not Applicable	Highest
Lampsilis splendida	Rayed Pink Fatmucket	Not Applicable	Not Applicable	High
Toxolasma pullus	Savannah Lilliput	Not Applicable	Not Applicable	Highest
Villosa delumbis	Eastern Creekshell	Not Applicable	Not Applicable	Moderate
CRAYFISH				
Procambarus ancylus	Coastal Plain Crayfish	Not Applicable	Not Applicable	Moderate
Procambarus blandingii	Santee Crayfish	Not Applicable	Not Applicable	Moderate
Procambarus braswelli	Waccamaw Crayfish	Not Applicable	Not Applicable	High
Procambarus chacei	Cedar Creek Crayfish	Not Applicable	Not Applicable	Moderate
Procambarus pearsei	Carolina Sandhills Crayfish	Not Applicable	Not Applicable	Moderate
FISH				
Acipenser brevirostrum	Shortnose Sturgeon	Federally Endangered	State Endangered	Highest
Acipenser oxyrinchus	Atlantic Sturgeon	Federally Endangered	Not Applicable	Highest
Alosa aestivalis	Blueback Herring	Not Applicable	Not Applicable	Highest
Alosa mediocris	Hickory Shad	Not Applicable	Not Applicable	Highest
Alosa sapidissima	American Shad	Not Applicable	Not Applicable	Highest
Ameiurus brunneus	Snail Bullhead	Not Applicable	Not Applicable	Moderate
Ameiurus catus	White Catfish	Not Applicable	Not Applicable	Moderate

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
Ameiurus platycephalus	Flat Bullhead	Not Applicable	Not Applicable	Moderate
Anguilla rostrata	American Eel	Not Applicable	Not Applicable	Highest
Chologaster cornuta	Swampfish	Not Applicable	Not Applicable	Moderate
Elassoma boehlkei	Carolina Pygmy Sunfish	Not Applicable	State Threatened	Highest
Enneacanthus obesus	Banded Sunfish	Not Applicable	Not Applicable	Moderate
Etheostoma serrifer	Sawcheek Darter	Not Applicable	Not Applicable	Moderate
Fundulus diaphanus	Banded Killifish	Not Applicable	Not Applicable	Moderate
Notropis chalybaeus	Ironcolor Shiner	Not Applicable	Not Applicable	Moderate
REPTILE				
Chelydra serpentina	Snapping Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Clemmys guttata	Spotted Turtle	At-Risk Species	State Threatened	High
Deirochelys reticularia	Chicken Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Heterodon simus	Southern Hog-nosed Snake	Not Applicable	State Threatened	Highest
Kinosternon baurii	Striped Mud Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Ophisaurus attenuatus	Slender Glass Lizard	Not Applicable	Not Applicable	Moderate
Pituophis melanoleucus	Pinesnake	Not Applicable	Not Applicable	Highest
Terrapene carolina	Eastern Box Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
BIRD				
Anhinga anhinga	Anhinga	Migratory Bird Treaty Act	Not Applicable	Moderate
Ardea alba	Great Egret	Migratory Bird Treaty Act	Not Applicable	Not Applicable
Ardea herodias	Great Blue Heron	Migratory Bird Treaty Act	Not Applicable	Moderate
Butorides virescens	Green Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Dryobates borealis	Red-cockaded Woodpecker	Federally Endangered	State Endangered	Highest
Egretta caerulea	Little Blue Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Egretta thula	Snowy Egret	Migratory Bird Treaty Act	Not Applicable	Moderate
Elanoides forficatus	Swallow-tailed Kite	Migratory Bird Treaty Act	State Endangered	Highest

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
Haliaeetus leucocephalus	Bald Eagle	Bald & Golden Eagle Protection Act	State Threatened	High
Icterus galbula	Baltimore Oriole	Migratory Bird Treaty Act	Not Applicable	High
Mycteria americana	Wood Stork	Federally Threatened	State Endangered	Highest
Nyctanassa violacea	Yellow-crowned Night-Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Nycticorax nycticorax	Black-crowned Night-Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Sternula antillarum	Least Tern	Migratory Bird Treaty Act	State Threatened	Highest
MAMMAL				
Corynorhinus rafinesquii	Rafinesque's Big-eared Bat	Not Applicable	State Endangered	Highest
Eptesicus fuscus	Big Brown Bat	Not Applicable	Not Applicable	Highest
Lasiurus borealis	Eastern Red Bat	Not Applicable	Not Applicable	Highest
Lasiurus cinereus	Hoary Bat	Not Applicable	Not Applicable	Highest
Lasiurus seminolus	Seminole Bat	Not Applicable	Not Applicable	Highest
Myotis austroriparius	Southeastern Bat	Not Applicable	Not Applicable	Highest
Sciurus niger	Eastern Fox Squirrel	Not Applicable	Not Applicable	Moderate
Trichechus manatus	Florida Manatee	LT: Federally Threatened	State Endangered	Highest
Ursus americanus	American Black Bear	Not Applicable	Not Applicable	Moderate

Table 2. Plant Species for consideration during study development.

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
Agalinis aphylla	Scale-leaf Agalinis	Not Applicable	Not Applicable	Moderate
Calamovilfa brevipilis	Pinebarren Sandreed	Not Applicable	Not Applicable	Moderate
Carex decomposita	Cypress-knee Sedge, Epiphytic Sedge	Not Applicable	Not Applicable	High
Carex elliottii	Elliott's Sedge	Not Applicable	Not Applicable	Moderate
Ceratiola ericoides	Rosemary, Florida Rosemary, Sandhill Rosemary, Sand Heath	Not Applicable	Not Applicable	Moderate
Cladium mariscoides	Twig-rush, Fen-sedge, Smooth Sawgrass	Not Applicable	Not Applicable	Moderate
Coreopsis rosea	Rose Coreopsis	Not Applicable	Not Applicable	High
Dionaea muscipula	Venus Flytrap, Meadow Clam, Tippitiwitchet	At-Risk Species	Not Applicable	High
Eleocharis vivipara	Viviparous Spikerush	Not Applicable	Not Applicable	Moderate
Eupatorium recurvans	Recurved Eupatorium	Not Applicable	Not Applicable	Moderate

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
Fimbristylis perpusilla	Harper's Fimbry	At-Risk Species	Not Applicable	High
Gentiana autumnalis	Pinebarren Gentian	Not Applicable	Not Applicable	High
Lachnocaulon minus	Brown Bogbutton	Not Applicable	Not Applicable	Moderate
Lechea torreyi var. congesta	Sandhill Pinweed	Not Applicable	Not Applicable	Not Applicable
Lilaeopsis carolinensis	Carolina Lilaeopsis	Not Applicable	Not Applicable	Moderate
Lioplax subcarinata	Ridged Lioplax	Not Applicable	Not Applicable	High
Litsea aestivalis	Pondspice	Not Applicable	Not Applicable	High
Ludwigia brevipes	Long Beach Seedbox, Coastal Plain Water-purslane	Not Applicable	Not Applicable	High
Ludwigia lanceolata	Lanceleaf Seedbox	Not Applicable	Not Applicable	High
Ludwigia ravenii	Raven's Seedbox	At-Risk Species	Not Applicable	Not Applicable
Macbridea caroliniana	Carolina Birds-in-a-nest, Carolina Macbridea	Not Applicable	Not Applicable	High
Orthochilus ecristatus	Spiked Medusa, Smooth-lipped Eulophia	Not Applicable	Not Applicable	High
Oxypolis ternata	Savanna Cowbane	Not Applicable	Not Applicable	High
Parnassia caroliniana	Carolina Grass-of-Parnassus, Savanna Parnassia, Eyebright	Not Applicable	Not Applicable	High
Peltandra sagittifolia	Spoonflower, White Arrow-arum	Not Applicable	Not Applicable	Moderate
Plantago sparsiflora	Pineland Plantain	Not Applicable	Not Applicable	High
Rhexia aristosa	Awned Meadow-beauty, Bristly Meadow-beauty	Not Applicable	Not Applicable	High
Rhynchospora pallida	Pale Beaksedge	Not Applicable	Not Applicable	High
Sabatia decandra	Bartram's Rose-gentian	Not Applicable	Not Applicable	Moderate
Sabatia kennedyana	Plymouth Gentian	Not Applicable	Not Applicable	High
Sagittaria weatherbiana	Weatherby's Arrowhead	Not Applicable	Not Applicable	Moderate
Schwalbea americana	Chaffseed	Federally Endangered	Not Applicable	Highest
Solidago pulchra	Beautiful Goldenrod, Carolina Goldenrod	Not Applicable	Not Applicable	High
Spiranthes laciniata	Lace-lip Ladies'-tresses	Not Applicable	Not Applicable	Moderate
Sporobolus teretifolius	Wireleaf Dropseed	At-Risk Species	Not Applicable	High
Xyris brevifolia	Shortleaf Yellow-eyed-grass	Not Applicable	Not Applicable	Moderate
Xyris flabelliformis	Savanna Yellow-eyed-grass	Not Applicable	Not Applicable	Moderate

Additional Studies for Scoping

1. Stakeholder Perceptions of Wetland Restoration on Timber Land within the Waccamaw River Watershed
2. SCDNR Rivers and Streams Monitoring Waccamaw River Survey Post-Hurrican Florence
3. The Waccamaw Drainage System: Geology and Dynamics of a Coastal Wetland, Southeastern North Carolina

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
https://www.fisheries.noaa.gov/region/southeast

December 5, 2022 F/SER47:FR/pw

(Sent via Electronic Mail)

Lt. Colonel Andrew Johannes, Commander
U.S. Army Corps of Engineers Charleston District
69A Hagood Avenue
Charleston, South Carolina 29403-5107

Attention: Andrea Hughes

Dear Colonel Clark:

NOAA's National Marine Fisheries Service (NMFS) reviewed the letter requesting scoping comments on significant resources or issues of concern with regard to the proposed feasibility study to implement flood risk management measures in the Waccamaw River Basin, Horry County, South Carolina. As the nation's federal trustee for the conservation and management of marine, estuarine, and diadromous fishery resources, the NMFS provides the following comments pursuant to the authorities of the Fish and Wildlife Coordination Act and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

The Waccamaw River Basin is within the Coastal Plain of North and South Carolina and has a 1,640 square mile-drainage area. The Waccamaw River is approximately 161 miles long and flows approximately 140 miles from Lake Waccamaw in Columbus County, North Carolina, southwesterly to Winyah Bay at Georgetown, South Carolina, which opens to the Atlantic Ocean. The lower portion of the Waccamaw River connects with the Pee Dee River. The study area encompasses approximately 81 miles of the Waccamaw River, and 546 square miles of the basin, including the City of Conway. The Waccamaw River in Horry County includes part of the Atlantic Intracoastal Waterway.

Possible solutions to manage flood risks include both structural measures, such as dams, reservoirs, levees, and channel modifications, and nonstructural measures, such as elevating or relocating structures, flood proofing, and educating the public. Natural and nature-based features, such as green infrastructure, floodplain/channel restoration, and agricultural best management practices, will also be considered. The NMFS recommends the study include examination of living shorelines as a nature-based feature.

The mainstem Pee Dee River is designated critical habitat for the Carolina Distinct Population Segment of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Because the Pee Dee and Waccamaw River are connected, Atlantic sturgeon are likely to occur within the study area. The study area also includes spawning or nursery habitat for American shad (*Alosa sapidissima*) and blueback herring (*Alosa aestivalis*). The many tributaries in the basin provide habitat for the catadromous American eel (*Anguilla rostrata*). Within the estuarine portion of the Waccamaw

River, the river and associated creeks provide essential fish habitat (EFH) for a number of NOAA-trust resource species, such as bluefish (*Pomatomus saltatrix*), summer flounder (*Paralichthys dentatus*), brown shrimp (*Farfantepenaeus aztecus*), and white shrimp (*Litopenaeus setiferus*).

Issues of concern to the NMFS are the potential structural measures. The NMFS has been actively working with other resource agencies in removing dams in the Coastal Plain of South Carolina to restore access to historical anadromous spawning and nursery areas. The NMFS would likely oppose any new dams and associated reservoirs. Additionally, levees and channel modifications frequently fail to reduce flooding. Levees increase the speed of the water, which will increase erosion of the shoreline downstream. Levee construction can also increase flooding of areas downstream of the levee. Channel modifications can also have the same negative impacts. It is unlikely the NMFS would support these measures if proposed.

Thank you for the opportunity to provide these comments. Please direct related questions or comments to the attention of Ms. Cynthia Cooksey at our Charleston Field Office. She can be reached at Cynthia.Cooksey@noaa.gov.

Sincerely,

WILBER.THOMAS.PAYSON.1365820186 Digitally signed by WILBER.THOMAS.PAYSON.1365820186 Date: 2022.12.05 12:29:56 -05'00'

/ for

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division

cc: COE, Andrea.W.Hughes@usace.army.mil
DHEC, trumbumt@dhec.sc.gov
SCDNR, CroweS@dnr.sc.gov
SAFMC, Roger.Pugliese@safmc.net
EPA, Laycock.Kelly@epa.gov
FWS, Mark_Caldwell@fws.gov
F/SER47, Cynthia.Cooksey@noaa.gov

Waccamaw River, Horry County, SC FRM Feasibility Study
Interagency Coordination Team Meeting
November 15, 2022 1:00 to 3:00 PM EST

Webinar Information:
URL: https://usace1.webex.com/meet/andrea.w.hughes
Call-in toll-free number: 1-844-800-2712
Access code for webinar and call-in: 1998 91 1089; Security code: 1234

Purpose:
This meeting constitutes the initial formation of the Interagency Coordination Team (ICT) for the Waccamaw River, Horry County, SC Flood Risk Management Study. The objectives for this meeting are to inform the ICT about the study and to gather input that will inform the scoping process.

MEETING NOTES

Attendees:

Elizabeth Johnson (SCDAH)	Mary Catherine Hyman (Conway)
Robert Larsen (SCDAH	John Rogers (Conway)
Lorianne Riggin (SCDNR)	Brandon Harrelson (Conway)
Cynthia Cooksey (NOAA)	Brandon Wagner (Horry County)
Pace Wilber (NOAA)	Tom Roth (Horry County)
Chris Stout (SCDHEC-OCRM)	Andrew Markunas (Horry County)
Mark Caldwell (USFWS)	Andrea Hughes (PDT)
Craig Sasser (USFWS)	Andrea Farmer (PDT)
Alya Singh-White (USEPA)	Pamela Backus (PDT)
Whitney Smith (USGS)	Nancy Parrish (PDT)
Adam Emrick (Conway)	Bethney Ward (PDT)

Welcome, Introductions, Review Agenda: Andrea H. welcomed the ICT and reviewed the agenda. Participants and the PDT introduced themselves.

Study Overview and Process: Pamela provided an overview of the study purpose, authorities, and planning process.

Progress on Scoping: Andrea H. reviewed the problems, objectives and constraints, and opportunities. Andrea also presented the PDT's progress on scoping that included the identified damage areas and the proposed measures currently being considered.

ICT Input: All agency participants were provided the opportunity to comment on the study. Many participants indicated it's too early in the process to be able to provide comment but will do so as more information becomes available. Also, several agencies indicated they support NNB measures. The comments that were received during the meeting are listed below:

Name	Affiliation	Comments
Chris Stout	OCRM	There are buyouts in the Socastee area associated with the SC Office of Resiliency. These are taking place separately from Federal funding. OCRM is currently reviewing a project in the Bucksport area at Cowford Swamp.
Mark Caldwell	USFWS	Recommends providing tax incentives for people to prevent the sale of lands for development. For buyouts, better to buy multiple properties to provide a large area that could be used for water storage.
Craig Sasser	USFWS	Refuge has been working with Ducks Unlimited, Nature Conservancy, and others to purchase and protect lands. Refuge has also been impacted by flooding. NRCS has the WRP program that provides funds for protecting, restoring and enhancing wetland areas. The funding amounts are based on timber values which do not provide enough incentive. Need additional funding resources to support this.
Elizabeth Johnson	SCDAH	Advised that information on cultural/historic sites is available on SC Archsite. Also recommended that we contact Alex Butler, the director at the SC Office of Resilience. (L. Riggin provided the web address)
Lorianne Riggin	SCDNR	DNR is in the process of purchasing property in the area. Lorianne suggested we use doodle poll for the next couple of meetings and requested a copy of presentation be sent out to attendees.

Wrap Up: Andrea H. advised PDT will continue to refine measures and work towards developing alternatives. She thanked participants for their attendance and input and indicated they could contact her if they thought of additional information that might be useful to the study. A doodle poll will be sent out for the next meeting.

Waccamaw River, Horry County, SC FRM Feasibility Study
Interagency Coordination Team Meeting
March 14, 2023 2:00 to 3:30 PM EST

Webinar Information:
URL: https://usace1.webex.com/meet/andrea.w.hughes
Call-in toll-free number: 1-844-800-2712
Access code for webinar and call-in: 1998 91 1089; Security code: 1234

Purpose:
The purpose of the meeting was to share new information regarding proposed measures/alternatives for the study.

MEETING NOTES

Attendees:

Andrea Hughes (USACE)
Tom McCoy (USFWS)
Cathy Breaux (USFWS)
Lorianne Riggin (SCDNR)
Chris Stout (SCDHEC-OCRM)

Welcome, Roll Call: Andrea H. welcomed the ICT and took roll call.

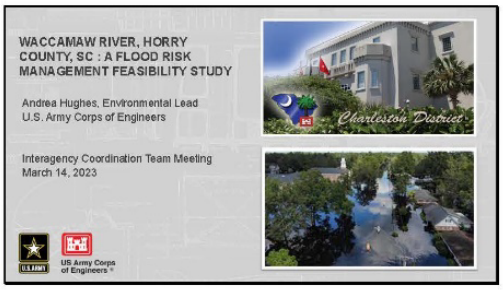
Review: Andrea H. provided a brief review of of the study purpose and authority, schedule, and conceptual measures from last meeting.

Progress on Scoping: Andrea H. provided visuals and descriptions for the potential structures and locations. Advised that any of these potential structures could change or be eliminated as USACE begins their econ and engineering modeling to determine feasibility. ** USACE engineers recently conducted a site visit to review a few of the potential measures. Notes are in the presentation.**

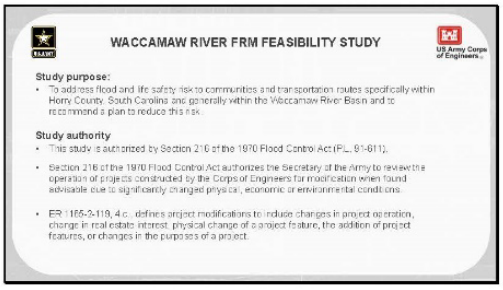
ICT Input: Discussion occurred during review of potential structures/locations. Information is included in the notes sections in the attached ppt.

Wrap Up: A doodle poll will be sent out for the next ICT meeting anticipated to occur in late May or early June 2023.

Slide 1

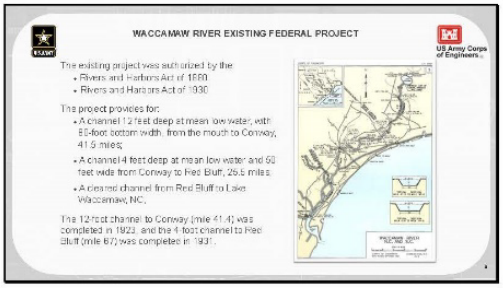


Slide 2



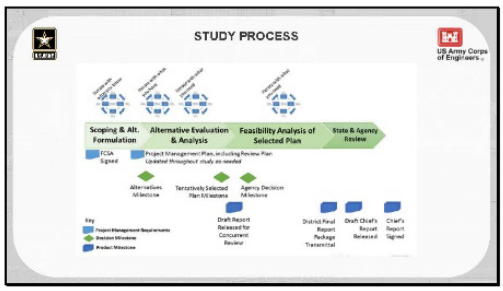
Recap from the last ICT meeting. Note the study authority is 216 which allows for review of Federal projects for modifications.

Slide 3



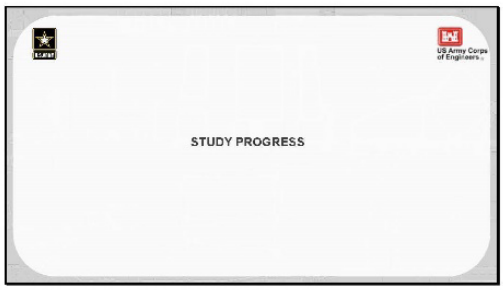
This is the existing federal project description. From the NC/SC line to Red Bluff, we are currently authorized to clear, not dredge. **Question during meeting: When was the last time the Waccamaw River was dredged? From the section of the Waccamaw River that is also the AIWW, the last dredging event occurred in 2002. USACE no longer dredges this segment of the AIWW because the current depth is sufficient. I contacted our navigation division to inquire about the rest of the Waccamaw River Federal Project and it has been at least 50 years (maybe more) since the river was dredged. It is not being maintained at this time.

Slide 4



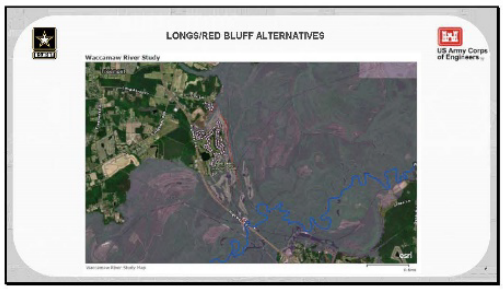
Typically, feasibility studies take 3 years; however, we have requested an extension due to the amount of modeling that will be required. The study is now projected to be a 4-year study.

Slide 5



The next slides will show the locations of proposed structural measures. At this time, the exact footprint of the structures has not been determined. Our engineers and economists are conducting modeling to determine the feasibility of the structures. This presentation does not reflect non-structural measures. We are still exploring buyouts, elevations, wet-proofing, dry-proofing, etc. **Question regarding alternatives – is each measure considered an alternative. For the final array of alternatives, each alternative should include a combination of measures – each measure would not stand alone as an alternative.

Slide 6



The red lines are the proposed structures. The pink dots indicate homes that have been damaged by flooding in the past. (Damages can range from 10% to complete loss.) While there could be an estimated length or height of a structure in the description, this may change once modeling is complete.

- <u>Levee/Floodwall along Buck Creek</u>: Estimated approximate 1.1 mile sheet pile floodwall or earthen levee to protect the Aberdeen neighborhood. Height of the wall is estimated at 7ft at this time, therefore a sheet pile wall would require a more extensive footing/foundation (height exceeds 5ft). Close proximity to Buck creek limits the space for this measure. Evacuation of this area is not always feasible because of an older population. Likely need a connection through the flood wall for irrigation purposes at the Aberdeen golf course. Site clearing would be required

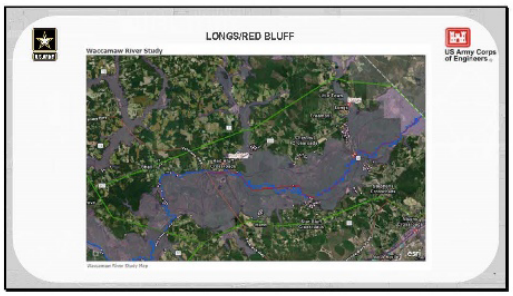
for this measure, possible environmental impacts.

- Levee/Floodwall near Rolling Ridge Drive: This is the smaller area adjacent to Cox Lane. Estimated approximate 0.2 mile sheet pile flood wall or earthen levee to protect the homes along Rolling Ridge Drive area. Height of the wall is estimated at 7ft at this time, therefore a sheet pile wall would require a more extensive footing/foundation (height exceeds 5ft). Site clearing would be required for this measure, possible environmental impacts.

- **Post engineering site visit: Floodwalls are still a measure that will need to be modeled. If floodwall were to be constructed, would have to consider opening to allow golf course water withdrawals. Group noted that Buck Creek was channelized in one area with large berm adjacent. Some discussion on possible modifications to reduce flooding – benching, etc.

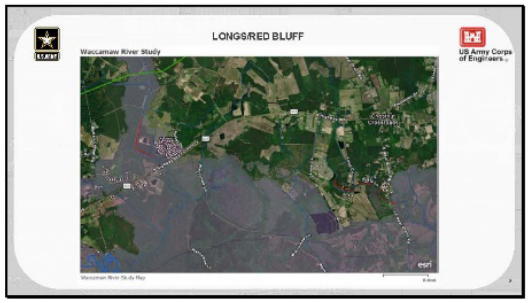
- ***Comment from agencies***: Advised that Cowpens Mitigation Bank and Phase 2 of Waccamaw Mitigation Bank are located in the study area.

Slide 7



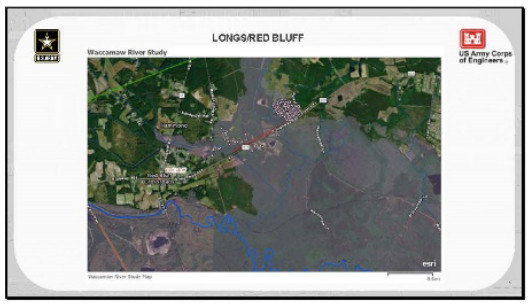
Channel modification + Bank stabilization: Approximately 15.5 miles length of channel modification to the Waccamaw River to increase conveyance of the stream and reduce flood depths in the Longs/Red Bluff area. The channel modification would extend from the NC/SC border to Veterans Hwy. Channel modification activities would include both clearing and snagging and possible excavation in areas where sediment accumulation has narrowed the channel width. This measure would also require concurrent bank stabilization measures along the river.
Question during the meeting: Can we provide the specific locations where excavation is proposed? I have reached out to our planner and engineers and requested specific locations where excavation is being considered. As soon as I have additional information, I will send this out in an e-mail. * Although engineers did not review this area during site visit, they clarified that at this time they are looking only considering clearing/snagging unless modeling indicates an issue with areas of the Waccamaw that have narrowed. ***

Slide 8



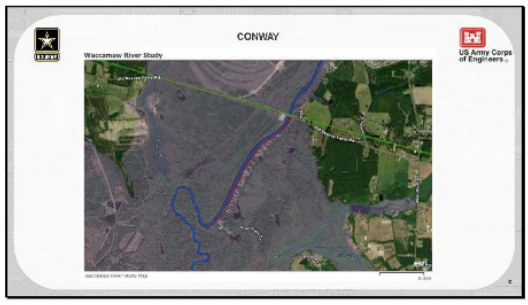
Benching: Floodplain benching using excavation methods upstream of HWY 905 along Simpson Creek and from Tributary 1 to Cold Water Branch. This measure would increase conveyance in these areas to reduce flood elevations around the adjacent damage areas that include residential homes.
**Question during meeting regarding what "benching" implied. Clarified that the proposal was to create a floodplain bench to provide additional storage during high water events. **
Site visit confirmed houses in the area are slab on grade. Noted a drainage ditch alongside Creek. Still considering creating a floodplain bench above the bridge to alleviate flooding.

Slide 9



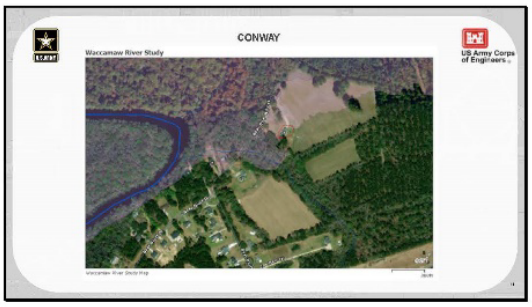
Drainage Improvements and Bank Stabilization: Look at adding culverts/water connection to HWY 905 between Todd Swamp and Simpson Creek where bottlenecking occurs. Clear out stream under bridge and add culverts or increase width at the bridge crossing over Simpson Creek. This could potentially be a collaboration project with SCDOT. Would alleviate flooding in the adjacent damage shown on map.
**Question during meeting: What storm event do we use to calculate storm damages? The Expected Annual Damages is a weighted average of the modelled events. Usually 2yr, 5yr, 10yr, 20yr, 50yr, 100yr, 200yr, and 500yr. The program used is HEC-FDA. Expected Damages are a summation of [(2-yr $damages * 50%) + (5-yr $damages * 20%) + … (500-yr $damages * 0.2%)]. The HEC-FDA program fills in/interpolates the gaps.

Slide 10



Floodwall along Gray Oaks Dr., estimated 0.93 miles in length. **Did not review during site visit**

Slide 11



Potential ring levee around 6194 Bear Bluff Road, estimated 0.08 miles in length. **Did not review during site visit**

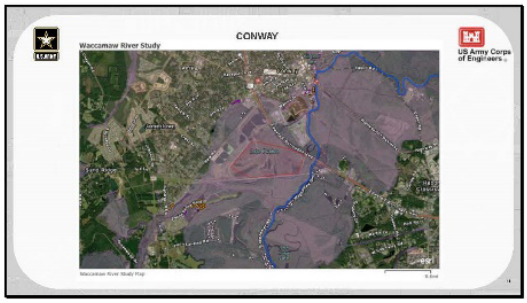
Slide 12

Proposed floodwall on outer bend downstream of oxbow on Lees Landing Circle, estimated 0.98 miles in length.
Proposed floodwall in Riverside drive area on the outer bend, estimated 0.78 miles in length. ** Did not review during site visit**

Slide 13

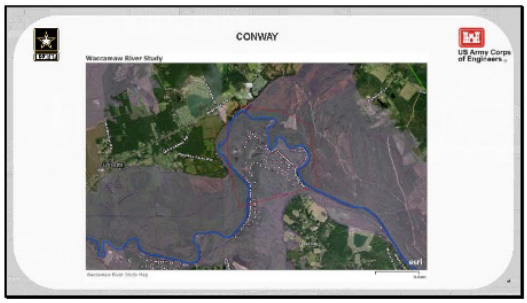
Potential floodwall along Waccamaw Drive, estimated 0.77 miles in length. **Did not review during site visit**

Slide 14



Dam/Retention: Lake Busbee was previously dammed and used for retention, it is currently drained. This measure would potentially restore the dam and retention area at Lake Busbee to reduce flood elevations in the surrounding damage area. Contamination of soils in this area may need to be mitigated prior to use of water storage. Area is approximately 800 acres, required depth is unknown at this time. ***Discussion on this proposal during meeting – Coal fired plant - Santee Cooper reclamation site for air. Lower dike was breached and area restored to wetlands. In order to restore the lake, the lower dike would need to be rebuilt. ***Question: Trying to understand how restoring this lake will protect structures in the surrounding area -what "damage area" would be addressed by restoration of the lake? Also, impacts to wetlands would require mitigation. Potentially mitigate for loss of reclamation AND loss of wetlands associated with restoration of dike. ** Did not review during site visit**

Slide 15



Clear and Snag*: Clear and snag debris from the oxbow around the Lees Landing area to increase conveyance and reduce flood elevations in the adjacent damage areas. Measure could also include removing accumulated sediment deposits if needed but would not change the sinuosity of the river. **During site visit they noted the area did not need clearing and snagging and homes along river were already elevated. This measure removed from consideration.**

Slide 16

Relief Bridge: Consider adding relief bridges/culverts at Highways 501, 905 and 378 to increase conveyance through these areas where potential bottlenecking is occurring. Relief Bridge(s) at 905 would require estimated 0.88 miles of elevation of the 4-lane road. Potential interference with a railroad crossing at 905 would require mitigation. ** Looking at potentially adding spans and clearing under existing bridge. Spans would need to be 80 feet apart per code which would be extensive. There is a canal on one side with an adjacent dirt road potentially for staging. **

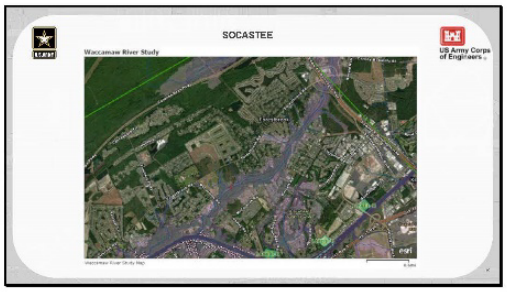
Slide 17

Floodwall: Proposed sheet pile wall approximately 1.35 miles on western outer bend of Socastee Creek to protect the Forestbrook neighborhood damage area. Sheet pile wall estimated 2.06 miles on eastern outer bend of Socastee Creek to protect the adjacent damage area around McCormick and Burcale Rd. If height of the wall exceeds 5 ft, would require a more extensive footing/foundation. ***Note: damages for Forestbrook, McCormick and Burcale Road are not shown on this figure. **Comment: Not aware of flood damages in the Forestbrook area. Most damages occur along the AIWW in the Socastee area. **Noted during site visit that the county is working on a project involving creating a floodplain bench in the Socastee area."

Slide 18

Dam/Retention with Channel to Socastee Creek: Approximate 55-acre space south of the 501 bridge could serve as a detention pond area with levees/flood barrier. Depth of the detention pond is unknown at this time. This would reduce flood elevations to the adjacent damage area (damage locations not shown on map). Would require excavation of a diversion channel from Socastee Creek to the retention/detention area. (There is an existing stream in this area.) ** Site visit notes - Currently a fire station is proposed between bridge and creek but has not started construction. Area of proposed retention is forested. Would need to be cleared.**

Slide 19

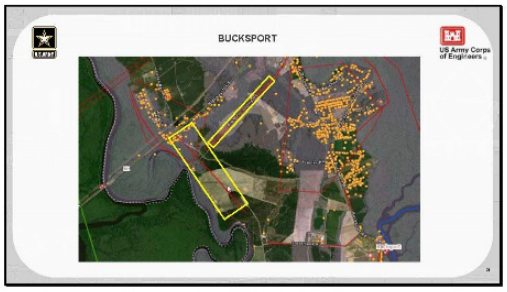


Barrier Removal: Remove the two existing weirs on the Socastee Creek Federal Project. Weirs were originally constructed to maintain a certain ground water level to mitigate loss of wetland area. With increased development in this area, weirs may not be needed to maintain water level. Water currently flows around the weirs, eroding the area and causing damage to the weir structures. This measure would increase conveyance in the adjacent damage area. **During site visit it was noted that water was high and flowing around the weirs and eroding banks. There was a house very close to one structure that received flood damages. Could potentially install a gate or remove the weirs. If they were to install a floodwall in this area there is not much room so could not create a levee. Would have to consider a different structure.**

Slide 20

Elevate/create levee out of the Pee Dee Hwy
Elevate or create levee out of the Pee Dee Hwy with 3.33 miles of pee dee river in floodplain. The Pee Dee River is a major source of flooding in Bucksport, with some flooding occurring from Waccamaw River. The downstream area of the Pee Dee Highway often floods in storms above 4% AEP. The elevation of the Pee Dee highway is 15-19 ft NAD27. Increase in elevation of roadway would range from 3-7 ft to protect Bucksport. Although other red lines (structures) are shown in the figure above – the only structure proposed for a levee is the Pee Dee Highway. The other potential structures were not carried forward.

Slide 21



Only the red lines that are outlined in yellow are locations carried forward. The other proposed structures shown (Treatment Rd, Bucksport Rd, etc) were removed.
Floodgate
Floodgate along the Pee Dee River to slow backwater, south of HWY 701. Estimated 0.92 miles that runs from upstream crossing under 701 bridge. Floodgate to prevent flows coming in from the Pee Dee with exact location and distance undefined. Corroborated with sponsor and projected to prevent 90% of the flooding in Bucksport with combination of road elevation of Big Bull Landing (approximately raising 7-8ft), which is a project that Horry County is in the process of submitting designs for permitting. This floodgate can prevent high flow events from the Pee Dee River. The flood stage for the Bucksport USGS gage is 19ft. The floodgate would need to be

6ft above to protect from the 1% AEP (annual exceedance probability-100year) and more frequent events. ***This measure received the most discussion/opposition. The Pee Dee River is designated critical habitat for sturgeon (under jurisdiction of NMFS). Any impacts to waters that drain to the Pee Dee River (Cowford Swamp) could be considered an impact to critical habitat and would require a biological opinion from NMFS. ***
**During recent site visit engineers looked at two potential locations for the floodgate at bridges over Cowford Swamp near intersection with Pee Dee River. One bridge is at Highway 701 and other is at Big Bull Landing Rd. Not much room for staging if this measure is carried forward so potential to block traffic during construction. **

Waccamaw River, Horry County, SC FRM Feasibility Study
Interagency Coordination Team Meeting
September 27, 2023 2:00 to 3:30 PM EST

Webinar Information:
URL: https://usace1.webex.com/meet/andrea.w.hughes
Call-in toll-free number: 1-844-800-2712
Access code for webinar and call-in: 1998 91 1089; Security code: 1234

Purpose:
The purpose of the meeting was to share new information regarding current array of alternatives for the study.

MEETING NOTES

Attendees:

Andrea Hughes (USACE)
Nicole Sikula (USFWS)
Fritz Rohde (NMFS)
Stacie Crowe (SCDNR)
Chris Stout (SCDHEC-OCRM)
Michelle Culbreath (SCDHEC)
Alya Singh-White (USEPA)
Niko Brown (USACE)
Erica Stone (USACE)
Andrea Hughes (USACE)

Welcome/Administrative: Andrea H. welcomed the ICT and advised she would be retiring. Niko Brown will be taking over environmental responsibilities for the study and Erica Stone will serve as lead for the Interagency Coordination Team. E-mail contact information is below:

Niko.R.Brown@usace.army.mil

Erica.L.Stone@usace.army.mil

Progress on Alternatives: Andrea H. provided an overview of the current array of alternatives for the study (see attachment).

Main Points: USACE is still working towards the final array. The highlighted measures/alternatives have been removed. Modeling and geotechnical work is currently underway and the results could further refine this list. We hope to have a final array of alternatives in the next few months. The next step will be to choose the Tentatively Selected Plan (TSP) by April 2024.

Agency Input:

Fritz Rohde: Supports relief bridges. These were successfully incorporated into flood studies in NC. Would prefer to avoid in-water modifications but would support non-structural measures such as elevation and wet/dry floodproofing. NMFS supports alternative C5 (Conway) that includes relief bridges, elevation, and wet/dry floodproofing. Bucksport: NMFS supports road elevation but does not support floodgates. For Socastee, floodwalls on both sides of Socastee Creek could cause issues. NMFS supports weir removal and floodproofing.

Chris Stout: For Bucksport, advised County is proposing a relief ditch from Cowpers Swamp to the Waccamaw River (Waccamaw is lower elevation) in addition to floodgates for the Big Bull Landing road elevation project. (Project is out on public notice.)There are concerns with the project and with the proposed floodgate alternative for Bucksport. If the relief ditch is constructed, would there still be a need for the proposed gate? (The information will be passed on to the engineers to evaluate.) Chris advised that buyouts in this area are not feasible due to many properties being "heir property". The family member that originally owned the property died without a will and the home has been passed down from generation to generation. The family members have been living on the properties and paying taxes but their names are not on the deed which disqualifies them from applying for grant funds.

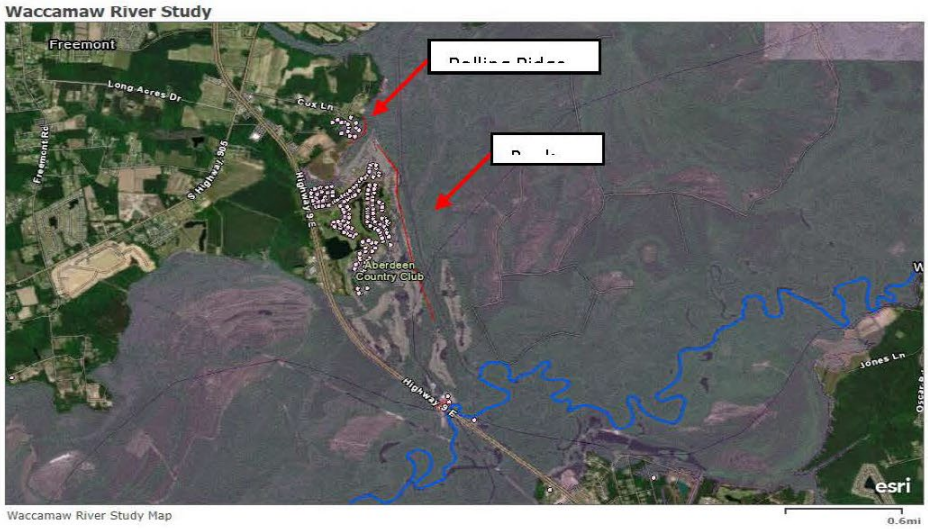
Socastee: Are the floodwalls necessary? Most of the damages are downstream. (NMFS agreed). Previous views of this area showed only a handful of structures identified as "damaged" from floods. Currently the Rosewood area located downstream of Forestbrook area is being demolished and will become green space. Also, could the Bucksport alternatives help with the flooding in Socastee? Will the modeling show this? (This information will be given to the engineers. The modeling should show if the Bucksport alternatives will affect the flooding in the Socastee area.)

Andrea provided that the next step is to finalize the array of alternatives and then select the TSP. She advised that the PDT would be notified of concerns raised today. If anyone has additional comments, please provide feedback now so they can be taken into account.

Erica Stone will schedule the next PDT meeting. The meeting will occur once modeling is complete and alternatives have been finalized.

Longs/Red Bluff

1. **LR1** - Levee/Floodwall along buck creek and rolling ridge drive:
   ~1.1 mile long and 5 to 9 ft high flood barrier (e.g., sheet pile floodwall or earthen levee) along Buck Creek by the Aberdeen Country Club and neighborhood AND ~0.2 mile long and 5 to 9 ft high flood barrier near Rolling Ridge Drive and Cox Lane.



2. **LR2 -** ~~Channel modification + bank stabilization + wet/dry floodproofing~~
3. **LR3 -** Benching upstream of 905, ~~add benching to Trib 1 to Cold Water Branch~~ Relief Bridges + wet/dry floodproofing

Simpson Creek Area Channel Benching/Terracing : Create terraces, or benches, between the channel and uplands along Simpson Creek from Highway 905, and from Tributary 1 of the Waccamaw River to Cold Water Branch near Dusty Lan and Loop Circle

4. **LR4 -** ~~Drainage improvements + bank stabilization + benching + wet/dry floodproofing~~
5. **LR5 –** (NS Plan) Elevation + Wet/Dry Floodproofing
6. **LR6 -** Levee/Floodwall along buck creek and rolling ridge drive + relief bridges + benching + wet/dry floodproofing

Relief Bridges: create relief bridges between Highway 905, Todd Swamp, and Simpson Creek with culverts and clearing under existing bridges to increase conveyance and alleviate backflow near Parker Driver, McNeil Chapel Road, Jefferson Road, and Mountain Drive.

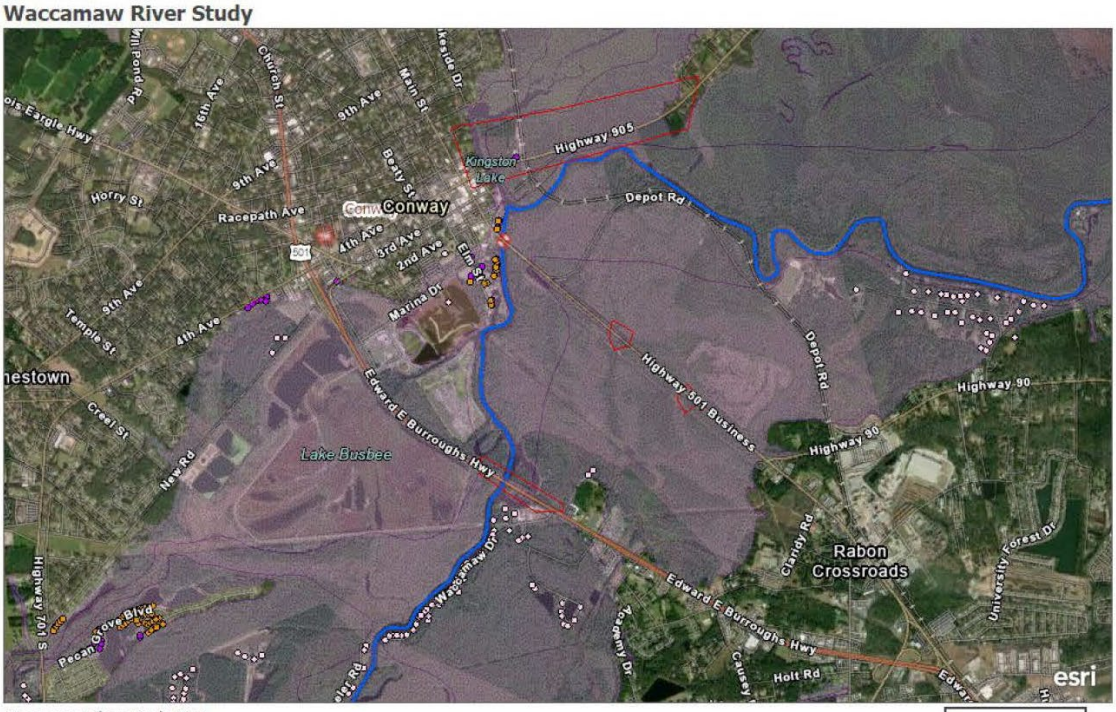
Conway

1. ~~**C1** – Floodwall along Grey Oaks + Ring Levee around Bear Bluff + floodwall in Riverdale Drive area + Floodwall along Waccamaw Drive + Floodwall along Lee's Land (these are independent of each other)~~
2. **C2 –** Lake Busbee Modification + Elevation + Wet/Dry Floodproofing

   Modification could include weir structures/gates instead of restoring dam.
3. ~~**C3** – Clear and Snag + Relief Bridges~~
4. **C4 –** (NS Plan) Elevation + Wet/Dry Floodproofing
5. **C5 -** ~~Clear and Snag~~ + Relief Bridges + Elevation + Wet/Dry Floodproofing

   Add relief bridges/culverts at 501, 905 and 378 to increase conveyance through these areas where potential bottlenecking is occurring. Relief Bridges at 905 would require 0.88 miles of elevation of the 4-lane road.

Waccamaw River Study



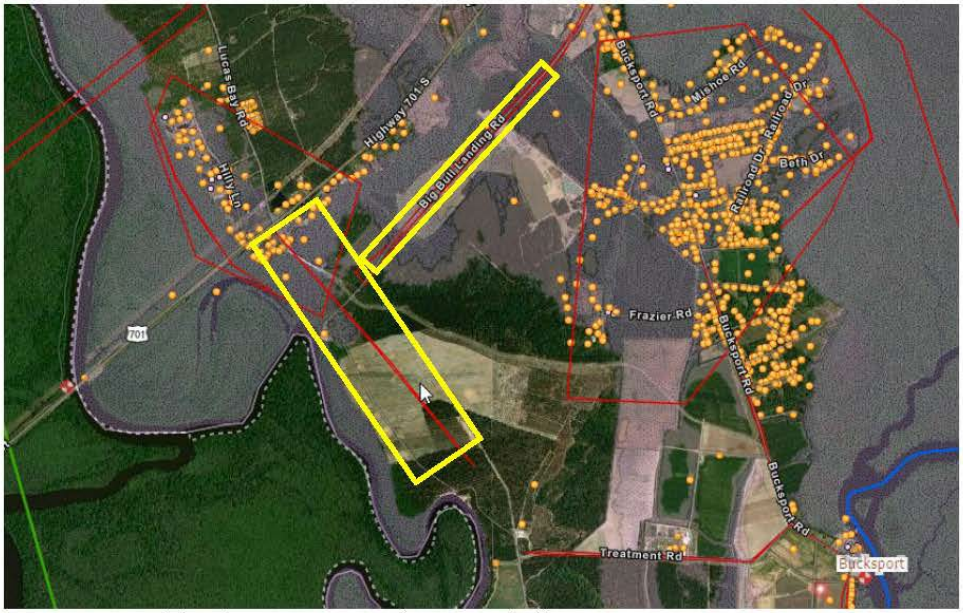
Waccamaw River Study Map

0.6mi

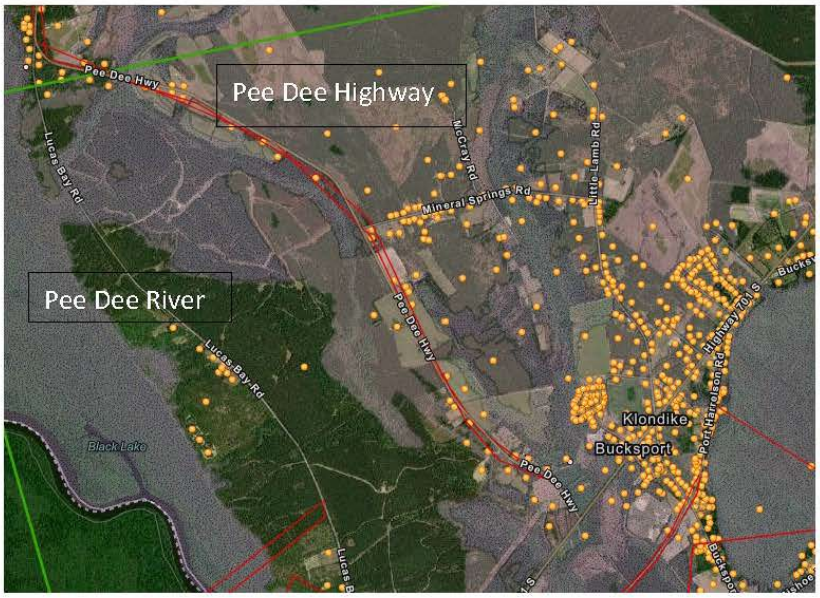
Bucksport

1. **B1 -** Floodgate

   Floodgate along the Pee Dee River to slow backwater, south of HWY 701. Approximately 0.92 miles that runs from upstream crossing under 701 bridge. Floodgate to prevent flows coming in from the Pee Dee with exact location and distance undefined.



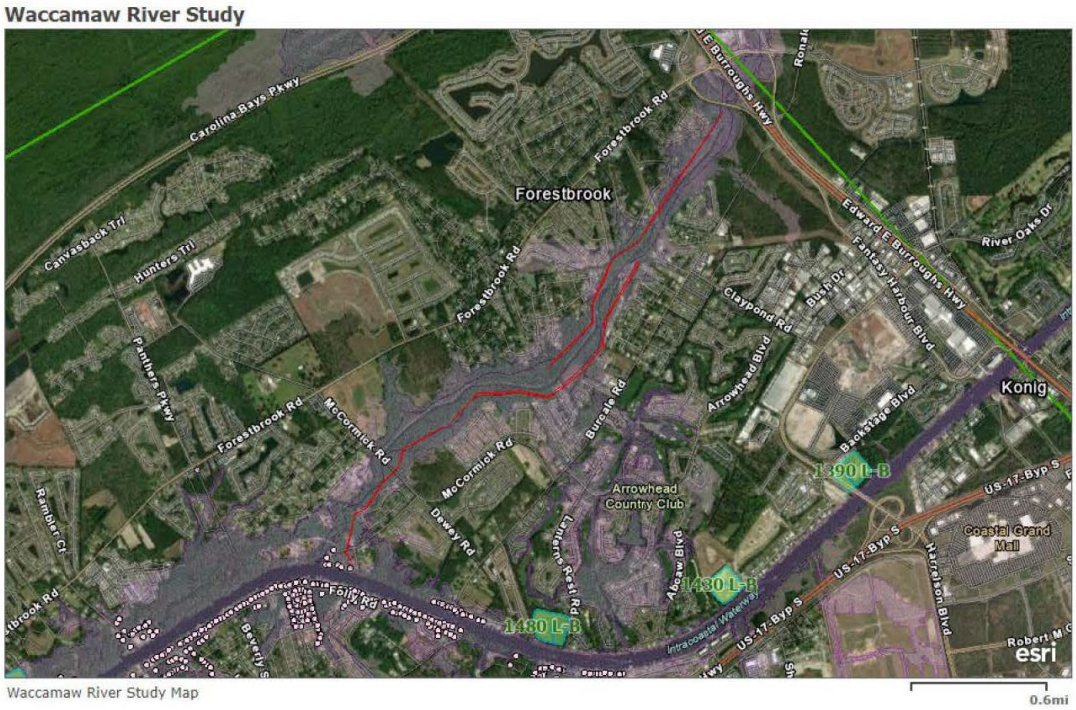
2. **B2** - Road elevation – PeeDee HWY (Lucas Bay Blvd)



3. **B3** – (NS Plan) Elevation + Wet/Dry Floodproofing

Socastee

1. **S1 -** Floodwall along Forestbrook ~~plus sheetpile wall near the bend of paw paw lane~~ +barrier removal (weirs)



2. **S2 -** Detention with channel to Socastee Creek + Structure Elevation + Floodproofing

3. **S3 -** Barrier removal + ~~benching~~ + Floodproofing
4. **S4 -** Floodwall along Forestbrook + Detention south of 501 with channel to Socastee Creek + Structure Elevation + Floodproofing
5. ~~**S5 –** (NS Plan) Elevation + Wet/Dry Floodproofing (some near the federal project are slab on grade and may be harder to elevate)~~

ICT Meeting February 16, 2024

-OPEN- 10 AM

Roll Call

USACE

Erica Stone, Niko Brown, Pamela Backus, Andrea Farmer, Lindsey LaRocque, Lance Maher, Bethney Ward

FWS

Craig Sasser, Julia Plasynski

SCDNR

Lorianne Riggin

EPA

Alya Singh-White

NMFS (HCD)

Fritz Rhode

NMFS (PRD?)

Andy Herndon

(SCDHEC) OCRM

Chris Stout

NRCS, (SCDHEC) BOW, USGS, NPS

None

Horry County

Andy Markunas, Brandon Wagner

Flood Impact Areas

Longs

Floodwall:

Fritz Rhode: Can you explain in detail plans for floodwall along Buck Creek?

Erica Stone: Providing details of alternative worksheet

Fritz Rhode: Trying to see where it relates to river?

Erica: Not on river

Lorianne from chat:

LRBNS7 – Water Farming - This option appears to potentially have impacts to Waccamaw HP and the Carter Stilley Mitigation Bank. Acquisition not possible for conservation land

Are we actively directing water there?

LRBNS3 - There is a Wood Stork Rookery near Dusty Road/Bear Grass Lane just north of Waccamaw HP boundary. Disturbance from construction is a concern

Conway

Craig Sasser working with FEMA and Ducks Unlimited acquiring land near relief bridges – will discuss with Craig offline.

Craig (in chat) Can you define elevation and acquisition please?

EN: Elevation is to lift structure above 1% AEP plus 2 ft of freeboard

EN: Acquisition is buyout

Fritz: please explain water farming

EN: Essentially acquisition? (Didn't get good notes on this)

Chris Stout: Office has been reviewing acquisition in Socastee along Rosewood and Lockwood Landing (30+ properties) and its demo of existing houses and driveways and becoming green space.

Bethney: We're aware of buyouts. If already been raised or buyout happened, wouldn't duplicate effort. We do not yet have inventory of properties applied to specifically.

from Craig Sasser to everyone: 10:32 AM

We are considering restoration (ie reforestation) for acquisitiuon tracts that DU and FEMA are working on. We added these areas to the refuge acquisition boundary for this opportunity.

from Lorianne Riggin to everyone: 10:33 AM

Just FYSA, any flowage easement or deed restriction proposed for addition to state property could be an issue. As mentioned earlier, Heritage Preserves are dedicated into the Corpus of the Trust and those restrictions include no intentional flooding. Any additional restrictions would have to be compliant with the intent the property was purchased. Additionally, the Department of Adminsitration would also have to sign off on any additional restrictions.

from Lorianne Riggin to everyone: 10:35 AM

Alternatively, keep in mind any areas adjacent to Waccamaw River HP that could be purchased for flood mitigation purposes could be additions after the fact to the existing HP. It would be something that would need to be creatively worked through between the County and the State.

Socastee

Floodwall and barrier removal

Fritz - I believe there was a lot of discussion about not using hard structures in this area?

Erica - Concerns have been considered and alternative is still being included

EN – consideration – under modeling phase of FWOP and it will be considered in TSP

Pamela – NS plan is meant in a way to offset impacts

Bucksport

Floodgate

Craig: Where would flap gate be located?

Lindsey: Pee Dee side of bridge, 25 along bridge, allows for flow up to 5 year

Erica: Big bull Landing is included in FWOP and modeling

from Lorianne Riggin to everyone: 10:48 AM

With the modeling - assume the frequency of closure will be provided with consideration of this alternative, correct?

Lindsey – yes

Fritz: would flood gate protect area in purple

Lindsey: Yes

Craig – DOT determined Cowford is actually tidal wetlands and has daily tides and was reason for shifting bridge upstream. If it experiences tidal exchange, want to know how modeled – there are also freshwater mussels in Cowford

Lindsey -modeled coastal and tidal influence, so we are investigating

Craig – we documented swallow tailed kite nests on backside of Cowford Swamp – concern with construction time of year

from Lorianne Riggin to everyone: 10:52 AM

With all of these alternatives, will the report include life of structure with consideration given to project sea level rise?

Lindsey: Life of project is 50-years to 2085

Raising Pee Dee Hwy

from Craig Sasser to everyone: 10:57 AM

Would purchasing additional ROW be necessary for elevating Pee Dee Highway?

Erica and EN: mentioned easement boundaries

Water Farming

from Lorianne Riggin to everyone: 10:57 AM

FYI - this property (south of Treatment Road in Bucksport) is in the Safe Harbor Program for red-cockaded woodpecker.

Fritz: What is water farming?

Erica - Perpetual easement to overflow flood and submerge unoccupied land...

from Craig Sasser to everyone: 10:59 AM

Are you all aware that GSWSA has wastewater lagoons in the water farming area proposed for Bucksport. These lagoons are the possible sources for invasive aquatic plants that are entering the waterways after flood events. Salvinia in particular. Areas should be excluded

Erica:

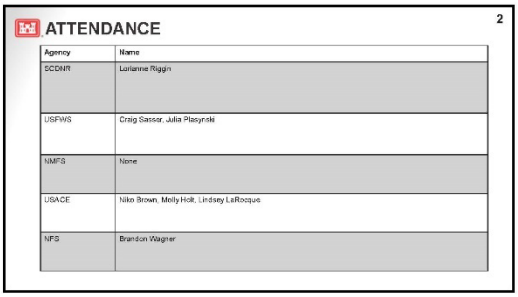
Reminder that official comments will be with draft report

Any additional comments?

None

-CLOSE- around 11:00

1



ATTENDANCE

2

Agency	Name
SCDNR	Lorianne Riggin
USFWS	Craig Sasser, Julia Plasynski
NMFS	None
USACE	Niko Brown, Molly Holt, Lindsey LaRocque
NFS	Brandon Wagner

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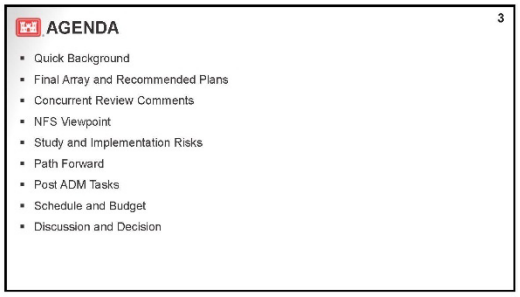
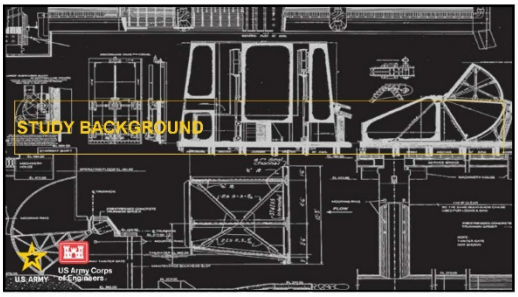


AGENDA

3

- Quick Background
- Final Array and Recommended Plans
- Concurrent Review Comments
- NFS Viewpoint
- Study and Implementation Risks
- Path Forward
- Post ADM Tasks
- Schedule and Budget
- Discussion and Decision

3



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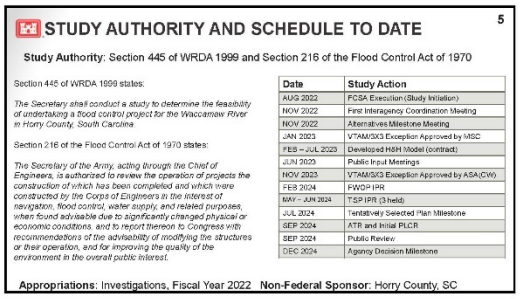

STUDY AUTHORITY AND SCHEDULE TO DATE

5

Study Authority: Section 445 of WRDA 1999 and Section 216 of the Flood Control Act of 1970

Section 445 of WRDA 1999 states:

The Secretary shall conduct a study to determine the feasibility of undertaking a flood control project for the Waccamaw River in Horry County, South Carolina.

Section 216 of the Flood Control Act of 1970 states:

The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to significantly changed physical or economic conditions, and to report thereon to Congress with recommendations of the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest.

Date	Study Action
AUG 2022	FCSA Execution (Study Initiation)
NOV 2022	First Interagency Coordination Meeting
NOV 2022	Alternatives Milestone Meeting
JAN 2023	VTM/SX3 Exception Approved by MSC
FEB – JUL 2023	Developed H&H Model (contract)
JUN 2023	Public Input Meetings
NOV 2023	VTM/SX3 Exception Approved by ASA(CW)
FEB 2024	FWOP IPR
MAY – JUN 2024	TSP IPR (3 held)
JUL 2024	Tentatively Selected Plan Milestone
SEP 2024	ATR and Initial PLCR
SEP 2024	Public Review
DEC 2024	Agency Decision Milestone

Appropriations: Investigations, Fiscal Year 2022 **Non-Federal Sponsor**: Horry County, SC

5

STUDY BACKGROUND

6

Study Area: Waccamaw River Basin – Horry County, SC
Size: Horry County 1,255 sq mi
Population: Horry County ~400,000 (Census 2023)
Study Purpose: To investigate flood risk reduction solutions to reduce flood damages from the Waccamaw River throughout Horry County, SC
Flooding Sources: Waccamaw River Basin riverine flooding and coastal storms with backwater flooding and storm surge
Formulation Strategy: Separate array of alternatives for each flood damage population areas (Longs and Red Bluff, Conway, Socastee, Bucksport). Include structural, nonstructural, natural and nature-based solutions.

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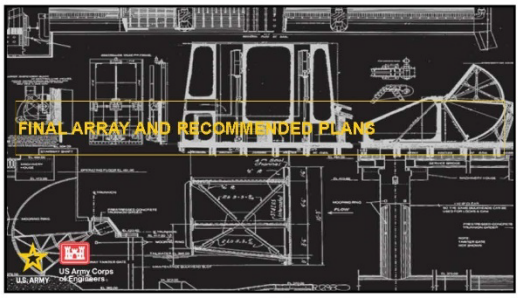

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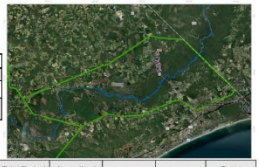
FINAL ARRAY – LONGS/RED BLUFF

8

RMP	Name
LR1	Levee/Floodwall
LR3	Benching and relief bridge
LR6	Levee/Floodwall, Benching and relief bridge



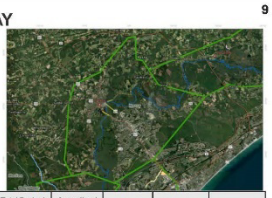
Plans	Plan Type	Average Annual Benefits	Total Project Cost	Annualized Cost	Net Benefits	BCR	Comp Benefits
LR 1	Flood Wall	$113,000	$76,124,600	$2,930,800	($2,817,800)	0.04	0
LR 3	Floodplain benching and relief bridge	$42,500	$76,618,700	$3,615,800	($3,573,300)	0.02	4
Structural Combo	Floodwall + Benching + relief Bridges	$136,000	$149,742,200	$5,546,600	($5,410,600)	0.02	4

9

FINAL ARRAY - CONWAY

9

RMP	Name
C3	Relief Bridges (Cross Drains)
C5	Comprehensive Structural and Non-structural Plan
CN S1	Acquisition
CN S2	Elevation



Plans	Plan Type	Average Annual Benefits	Total Project Cost	Annualized Cost	Net Benefits	BCR	Comp Benefits
C3	Relief Bridges (Cross Drains)	$1,500,000	$7,640,000	$274,000	$1,200,000	5.48	5
C5	Comprehensive Structural Relief Bridges/Culverts + Nonstructural Plan	$1,778,000	$17,530,000	$640,000	$1,138,000	2.7	5
Nonstructural	Elevation (n=19) + Acquisition (n=7)	$276,000	$9,860,000	$366,000	($90,000)	0.75	0

10

FINAL ARRAY - SOCASTEE

10

RMP	Name
S1	Floodwall and Barrier Removal
S2	Detention Pond with Channel to Socastee Creek
S3	Barrier removal
S4	Comprehensive Structural and Nonstructural Plan
SNS3	Elevation
SNS4	Acquisition

Plans	Plan Type	Average Annual Benefits	Total Project Cost	Annualized Cost	Net Benefits	BCR	Comp Benefits
S1	Floodwall & barrier removal	($278,000)	$136,652,300	$5,663,200	($5,941,200)	0.05	-2
S2	Detention with channel to Socastee Creek	$974,000	$96,822,500	$3,586,400	($2,612,400)	0.27	-3
S3	Barrier Removal	$968,000	$1,036,000	$90,700	$877,300	10.67	1
Structural combo	Floodwall + Barrier Removal + Detention Pond	$790,000	$295,306,000	$8,716,000	($7,926,000)	0.09	0
	Barrier removal + Nonstructural	$1,370,000	$46,600,000	$1,700,000	($355,479)	0.79	
Non structural	Elevation (n=37) + Acquisition (n=7)	$219,500	$44,700,000	$1,600,000	($857,000)	0.43	7

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FINAL ARRAY - BUCKSPORT

11

RMP	Name
B1	Floodgate
B2	Fixed Elevation
BN S1	Acquisition
BN S2	Elevation

Plans	Plan Type	Average Annual Benefits	Total Project Cost	Annualized Cost	Net Benefits	BCR	Comp Benefits
B1	Floodgate	$518,000	$22,403,400	$829,800	($311,800)	0.62	0
B2	Fixed elevation	$830,000	$80,468,500	$9,990,600	($9,371,600)	0.20	2
B3	Floodgate + Fixed Elevation	$499,000	$192,871,000	$9,810,500	($9,311,500)	0.13	
	Floodgate + Nonstructural	$673,000	$33,730,800	$1,249,400	($576,400)	0.54	
Nonstructural	Elevation (n=14) + Acquisition (n=5)	$155,000	$11,327,000	$419,600	($264,600)	0.37	5

12

RECOMMENDED PLAN

12

Conway: Relief Bridges (C3)

- Add relief bridges/Cross Drains at Hwy 501 business, Hwy 501 bypass, and Hwy 905 to increase conveyance through these areas where potential bottlenecking is occurring.
- **Total Cost: $7,386,000**
- **Net Benefits: $1,200,000**
- **BCR: 5.48**

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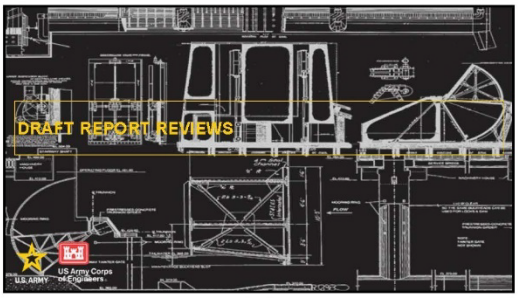

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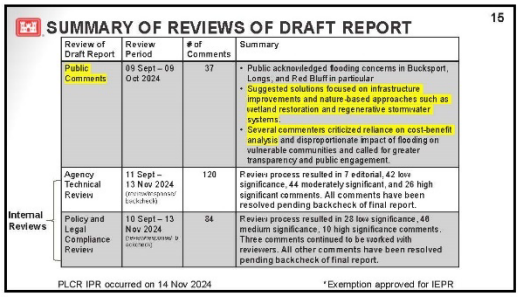

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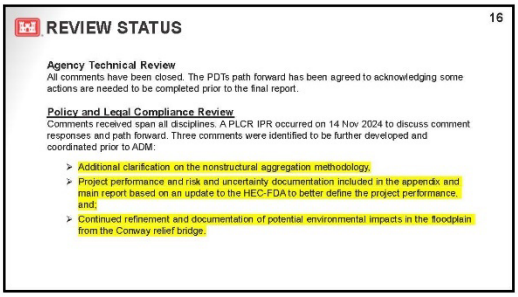

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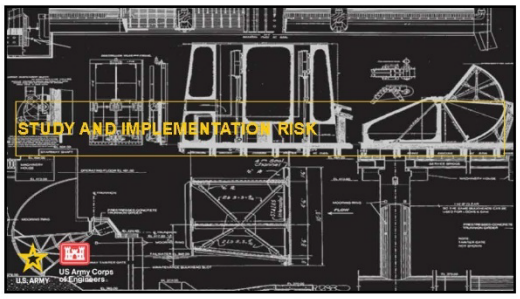

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18

STATUS OF ENVIRONMENTAL COMPLIANCE

19

An Interagency Coordination Team (ICT) was formed in October 2022 with four subsequent ICT meetings - most recently in February 2024.

Compliance Complete:

- ✓ ESA informal consultation was initiated for MANLAA determinations on tricolored bat and West Indian manatee. Concurrence obtained December 16, 2024. TCB consultation will formally conclude upon listing.
- ✓ CZC and 401 certification were received on November 4 and October 3, 2024, respectively.
- ✓ Letter of concurrence from NMFS on EFH no significant adverse impacts received Sept 27, 2024.
- ✓ Relief bridge in Conway considered exempt under FPPA based on coordination with state NRCS.
- ✓ Actions do not meet criteria under the CBRA.
- ✓ Coordination with USFWS, NMFS and SCDNR has occurred in fulfillment of FWCA obligations. A final CAR will be included with the final report.

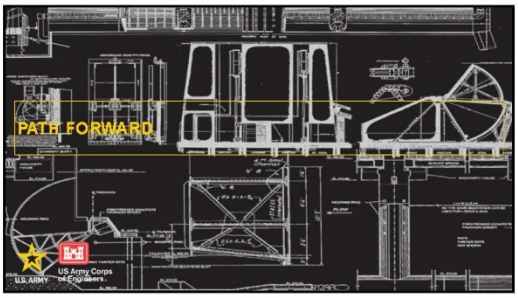
Compliance Ongoing – Will be completed before Final Report:

- FPPA Consultation on weir removal may be required based on outcome of farmland impact evaluation
- A Programmatic Agreement to perform cultural resources surveys during PED is under development in consultation with SHPO and should be fully executed by completion of the final report.

NEPA:

- Currently, direct, indirect and cumulative effects of TSP would be insignificant. **EA is still appropriate.**
- Evaluation of shifts in hydrology based on quantitative comparison of hydrological modeling results could result in habitat and farmland mitigation.

19



20

PATH FORWARD

21

- Additional refinement activities for the Recommend Plans (see next slide)
- Update costs; certify (MCX)
- Complete NEPA/Environmental compliance activities
- Complete the Final Report
- Conduct reviews on the Final Report package
- Route the Final Report package for transmittal to HQ

21

POST-ADM PLAN REFINEMENT ACTIVITIES

22

Future With Project Impacts Analysis

- Update H&H modeling for Socastee Creek
- FFE surveys (where needed)
- Extend assessment of WSE changes

Real Estate needs

- Takings analysis
- Flowage easements
- Utility easements
- Relocations

Environmental Assessment

- Greenhouse gas analysis
- Evaluate floodplain impacts and develop mitigation planning if necessary
- Finalize CAR

General

- Recommended plan refinement
- Geotech surveys
- Utility relocation plan
- Cost update and certification

Post-ADM activities will result in a Class 3 cost estimate for the Final Report

22

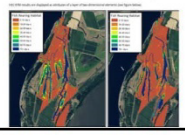
FLOODPLAIN IMPACT ANALYSIS – MITIGATION NEEDS AND HEC-EFM

23

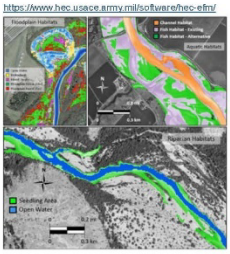
Analysis of data created during study to further consider ecological impacts – HEC-EFM modeling

Model certified for National Use September 2024

HEC-EFM (5.0) analyses involve: 1) statistical analyses of relationships between hydrology and ecology, 2) hydraulic modeling, and 3) use of Geographic Information Systems (GIS) to display results and other relevant spatial data.



https://www.hec.usace.army.mil/software/hec-efm/



23

FLOODPLAIN IMPACT ANALYSIS – MITIGATION NEEDS AND HEC-EFM

24

HEC-EFM relies on generation of "relationships" to model effects using a combination of expert knowledge and scientific literature

An example includes relevant information of species which are generally indicators or umbrella species and may include:

- -seasonal reproduction periods
- -duration of necessary habitat components
- -how frequently these conditions are needed

A previous CAR on Socastee Creek identified wood duck, redbreast sunfish, barred owl and gray squirrel as *species of special emphasis* and useful model species for HSIs.

Other ecological modeling parameters could potentially be based simply on habitats such as deciduous forested wetlands

4.1.1 Little minnow spawning habitat

The little minnow is a threatened species of fish indigenous only to the Rolling River basin. Little minnow populations have declined (in magnitude and range) as dams and diversions limited access to spawnsites (river stretches and in floodplain areas, critical to little minnow spawning, were transitioned to agricultural lands. Little minnow spawn in **shallow (not deeper than 1.5 m) and fast-flowing (not exceeding 0.5 m/s)** waters, typically during **bankfull high flows** (for approximately **21 to 28 days** before hatching. Little minnow reach sexual maturity in their first or second year and have a lifespan of approximately 6 years. Scientists suggest using the conditions within each spawning season that generate the **largest extent** of effective spawning habitat as an indicator of success for each year's spawn. Further, scientists suggest that good spawning conditions do not need to occur every year – it would be sufficient if there were good conditions in **20% of years**, so that, on average, each little minnow would have a chance to spawn in their lifespan.

HEC-EFM Relationship:

- *Season*: 21 to 5/31
- *Duration*: 28 days, *Minimum* (sustained high) and then *Maximum* (largest extent)
- *Rate of change*: Not applied
- *Percent exceedance*: 25% (4 yr) - *Flow frequency*

Suggestions for indicator/HSI species of habitats to consider in modeling of Conway and Socastee?:

24

MILESTONE SCHEDULE

25

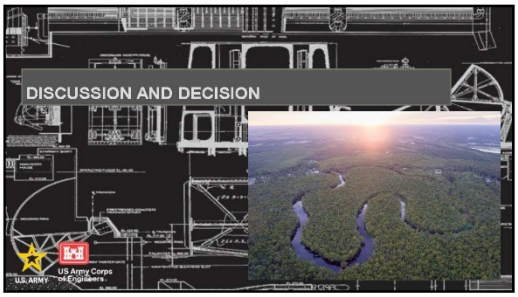
Schedule exemption approved NOV 2023 for 48 months (4 years)

Code	P2 Reporting Milestone	Date	P2 Baseline Date
CW130	FCSA Execution	18 AUG 2022 (A)	
CW142*	Required 90-Day Interagency Meeting	15 NOV 2022 (A)	
CW218	Alternatives Milestone	18 NOV 2022 (A)	
CW143*	Vertical Team Alignment Memo Signed	23 JAN 2023 (A)	
CW282	Tentatively Selected Plan Milestone	02 JUL 2024 (A)	16 MAY 2024
CW250	Release Draft Report (public & concurrent review)	06 SEP 2024 (A)	04 SEP 2024
CW283	Agency Decision Milestone	13 Dec 2024	
CW160	**District Transmittal of Final Report for PLCR**	**12 JAN 2026**	
CW260	**MSC Transmittal of Approved Final Report**	**16 MAR 2026**	
CW270	**Signed Chief's Report**	**19 AUG 2026**	

PMP and Review Plan updated June 2024 to reflect new TSP and Draft Report schedule; no change in scope

*New CW Planning milestone, added retroactively

25



26

COMMENTS/QUESTIONS

27

Agency	Comment/Question
	None

27

Summary:

Initiations were sent to individuals who responded to polling on availability for meeting. All attendee information is recorded in PPT referenced here. Niko Brown (USACE) gave presentation of information (see "Waccamaw Post-ADM ICT Meeting 1-27-25"). Information included a background review (i.e. study authority, schedule, study area and purpose), identification of recommended plans and rationale, summary of review to-date, residual risks and environmental compliance information, and next steps/remaining schedule. The only questions asked during the period of the meeting are captured below in "Notes" as paraphrased.

Notes:

Craig Sasser (FWS): Can you prevent traffic interruption? (when constructing the relief bridges [cross drains] on 501)

Brandon Wagner (Horry): Could with jack and bore apparatus.

Lorianne: DNR developed index functional conditional assessment method in regulatory and could potentially be used on the project (for further evaluating potential mitigation needs related to recommended plans)

Chat Transcript:

Brown, Niko R CIV USARMY CESAC (USA) joined the conversation.

Brown, Niko R CIV USARMY CESAC (USA) joined the conversation.

Thursday

Brown, Niko R CIV USARMY CESAC (USA) named the meeting RE: Waccamaw, Horry County, Flood Risk Management Study - Recommended Plan.

Brown, Niko R CIV USARMY CESAC (USA) named the meeting RE: Waccamaw, Horry County, Flood Risk Management Study - Recommended Plan.

Holt, Molly E CIV USARMY CESAC (USA) and Stone, Erica L CIV USARMY CESAC (USA) were invited to the meeting.

Holt, Molly E CIV USARMY CESAC (USA) and Stone, Erica L CIV USARMY CESAC (USA) were invited to the meeting.

Today

Meeting started at 2:54 PM

2:54 PM Meeting started

Lorianne Riggin, SCDNR (Unverified) was invited to the meeting.

Lorianne Riggin, SCDNR (Unverified) was invited to the meeting.

Craig Sasser (Unverified) was invited to the meeting.

Craig Sasser (Unverified) was invited to the meeting.

Brandon Wagner (Unverified) was invited to the meeting.

Brandon Wagner (Unverified) was invited to the meeting.

Julia Plasynski (Unverified) was invited to the meeting.

Julia Plasynski (Unverified) was invited to the meeting.

LaRocque, Lindsey CIV USARMY CESAC (USA) was invited to the meeting.

LaRocque, Lindsey CIV USARMY CESAC (USA) was invited to the meeting.

Niko, can these be installed without stoppi... by Craig Sasser (Unverified)

Craig Sasser (Unverified)

3:11 PM

Niko, can these be installed without stopping road traffic?

See the Stream Quantification Tool - Data C... by Lorianne Riggin, SCDNR (Unverified)

Lorianne Riggin, SCDNR (Unverified)

3:28 PM

See the Stream Quantification Tool - Data Collection and Analysis Manual and look at the Biology - Fish Biotic Index - https://dnr.sc.gov/environmental/streamrestoration.html

The Fish BI is based off of the Denison pap... by Lorianne Riggin, SCDNR (Unverified)

Lorianne Riggin, SCDNR (Unverified)

3:29 PM

The Fish BI is based off of the Denison paper - https://link.springer.com/article/10.1007/s00267-021-01479-6

Brandon Wagner (Unverified) left the chat.

Brandon Wagner (Unverified) left the chat.

Craig Sasser (Unverified) left the chat.

Craig Sasser (Unverified) left the chat.

Lorianne Riggin, SCDNR (Unverified) left the chat.

Lorianne Riggin, SCDNR (Unverified) left the chat.

Julia Plasynski (Unverified) left the chat.

Julia Plasynski (Unverified) left the chat.

E FISH AND WILDLIFE COORDINATION ACT REPORT COMPLIANCE RECORD

From: McCoy, Thomas (Tom)
To: Hughes, Andrea W CIV USARMY CESAC (USA)
Subject: [Non-DoD Source] Re: [EXTERNAL] Waccamaw River FRM CAR
Date: Thursday, June 29, 2023 12:58:55 PM

Hi Andrea,
Steve reached out to me last week and asked if it looked okay. I assumed that he reached out to you.
Sorry for that.

Based on my conversation last week with Steve, I would move forward and just document that you reached out several times.
Again sorry for the inconvenience it has caused.

Have 4th to you and your family!

If you have any questions, please reach out.
Thank you for your assistance in this matter.

Tom
Thomas (**Tom**) D. McCoy
Fish and Wildlife Administrator - Regional BIL/IRA Coordinator
Department of the Interior - U.S. Fish and Wildlife Service
Southeast Region (Region 4) Ecological Services
Charleston, South Carolina 29412
Cell Phone: 843.576.9862
Email: thomas_mccoy@fws.gov

NOTE: This email correspondence and any attachments to and from this sender is subject to the Freedom of Information Act (FOIA) and may be disclosed to third parties.

From: Hughes, Andrea W CIV USARMY CESAC (USA) <Andrea.W.Hughes@usace.army.mil>
Sent: Thursday, June 29, 2023 12:36 PM
To: McCoy, Thomas (Tom) <thomas_mccoy@fws.gov>
Subject: RE: [EXTERNAL] Waccamaw River FRM CAR

Hi Tom,

I hate to have to bother you, but we still haven't heard back from Steve. Do you think its okay for Niko to proceed based on our discussions with you before Steve came on board? Maybe he's hoping to wait until they have a replacement, but it would be nice if Niko could start drafting sections.

Thanks again for your assistance.

Hope you have a great holiday.

Andrea

Andrea W. Hughes
Biologist, Planning and Environmental Branch
U.S. Army Corps of Engineers, Charleston District
69-A Hagood Avenue
Charleston, South Carolina 29403
843.754.4268

From: McCoy, Thomas (Tom) <thomas_mccoy@fws.gov>
Sent: Tuesday, June 20, 2023 2:10 PM
To: Hughes, Andrea W CIV USARMY CESAC (USA) <Andrea.W.Hughes@usace.army.mil>
Subject: [Non-DoD Source] Re: [EXTERNAL] Waccamaw River FRM CAR

Hi Andrea,
I apologize and sorry for the inconvenience. Please let me know if Steve does not reach back out to you by the end of the week as I sent him an email to respond. He would be the only one able to respond.

If you have any questions, please reach out.
Thank you for your assistance in this matter.

Tom
Thomas (**Tom**) D. McCoy
Fish and Wildlife Biologist – Regional IRA/BIL Coordinator
Department of the Interior - U.S. Fish and Wildlife Service
Southeast Region (Region 4) Ecological Services
Charleston, South Carolina 29412
Cell Phone: 843.576.9862
Email: thomas_mccoy@fws.gov

NOTE: This email correspondence and any attachments to and from this sender is subject to the Freedom of Information Act (FOIA) and may be disclosed to third parties.

From: Hughes, Andrea W CIV USARMY CESAC (USA) <Andrea.W.Hughes@usace.army.mil>
Sent: Tuesday, June 20, 2023 1:58 PM
To: McCoy, Thomas (Tom) <thomas_mccoy@fws.gov>
Subject: [EXTERNAL] Waccamaw River FRM CAR

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Hi Tom,

I apologize for having to bother you in your new position but I'm not sure where the CAR stands for Waccamaw now that you are gone. When I last discussed this with you (via e-mail) I mentioned Niko Brown from our office drafting the CAR with oversight by FWS – similar to how we handled the Charleston Peninsula FRM study. When I received Nancy's e-mail about your new position, I contacted Steve Ricks to confirm FWS would still be on board with Niko. Unfortunately, he hasn't responded. Niko has started gathering data and drafted a report outline but I've advised him to hold off for now. Can you advise? Is there someone else I should contact besides Rick?

Thanks so much for any assistance you can provide. I hope you are enjoying your new position. Just to let you know you are certainly missed here!

Andrea

Andrea W. Hughes
Biologist, Planning and Environmental Branch
U.S. Army Corps of Engineers, Charleston District
69-A Hagood Avenue
Charleston, South Carolina 29403
843.754.4268

Fish and Wildlife Coordination Act Report

on

Waccamaw River Flood Risk Management

Horry County, South Carolina

Prepared by:

Charleston District

U.S. Army Corps of Engineers

For:

U.S. Fish & Wildlife Service

Charleston Ecological Services Field Office

Habitat Conservation Division, Southeast Regional Office NOAA National Marine Fisheries Service

State Fish and Wildlife Agency Concurrence Letter

State of South Carolina
Department of Natural Resources

P.O. Box 167
Columbia, S.C. 29202
803-734-4199

Robert H. Boyles, Jr., *Director*
Lorianne Riggin, *Director, Office of Environmental Programs*

August 7, 2024

Julia Plasynski
SC Ecological Services Field Office
U.S. Fish and Wildlife Service (Region 4)
176 Croghan Spur Rd #100,
Charleston, SC 29407

Niko Brown
Charleston District
U.S. Army Corps of Engineers
69-A Hagood Avenue
Charleston, SC 29403

Electronic submittal

RE: Draft Fish & Wildlife Coordination Act Report, Waccamaw River Flood Risk Management Study.

Dear Mrs. Plasynski and Mr. Brown,

The Fish and Wildlife Coordination Act (FWCA) requires consultation with the fish and wildlife agencies of States where the "*...waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified...by any public or private agency under Federal permit or license...*". Consultation is to be undertaken for the purpose of "*...preventing loss of and damage to wildlife resources.*" (16 U.S.C. 661 et seq.). Therefore, personnel with the South Carolina Department of Natural Resources (SCDNR) reviewed and provided comments on the Draft Fish and Wildlife Coordination Act Report (DFWCAR) prepared by the United States Fish and Wildlife Service (USFWS) for the U.S. Army Corps of Engineers and Horry County Waccamaw River Flood Risk Management Study. Based on the information the SCDNR provided, and comments from the National Marine Fisheries Service, the SCDNR concurs with the assessment of impacts and recommendations to avoid impact that have been provided.

Sincerely,

Lorianne Riggin

Lorianne Riggin
RigginL@dnr.sc.gov
803-734-4199

Live Life Outdoors | **dnr.sc.gov**

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INTRODUCTION

Study Purpose

Since 2015, Horry County and all eight of its municipalities have faced multiple catastrophic flood events, exacerbated by factors such as tidal effects, relatively flat topography, and low elevation. These conditions contribute to slow draining and intensify the impact of flooding. The inundation of major transportation routes leaves coastal communities isolated from critical infrastructure and resources. For instance, Hurricane Joaquin resulted in 400 buildings with flood damage, and Hurricane Matthew resulted in 1,200 buildings with flood damage. Impacts from Hurricane Florence were more severe, with 2,000 buildings damaged at an estimated total market loss of $400 million. In the weeks following the storm, Highway 501 was the only accessible road from west of the Waccamaw River to Myrtle Beach communities and hotels.

The study will primarily investigate the reduction of flood risk to communities and transportation routes within Horry County. Since previous studies, sea level, storm frequency, and population has increased; therefore, the entire Waccamaw watershed needs to be studied to determine the most appropriate mitigation measures. This area is also continuously developing inland towards Conway and the Waccamaw River, so understanding flood risk management is vital.

The general scope of the study will be to consider a series of structural and non-structural management measures and develop implementable solutions to reduce flood risk.

Study Objectives

The following objectives have been identified to help achieve the study goal:

- Reduce the risk of damages to structures, industry, and public infrastructure within affected communities from flooding,
- Increase the reliability of evacuation and supply routes during flood events, and
- Reduce life-safety risk associated with the inundation of structures and public infrastructure throughout the study area.

Purpose of CAR

This Fish and Wildlife Coordination Act Report (CAR) is authorized by the Fish and Wildlife Coordination Act (FWCA) (16 U.S. Code Section 661 through 667e; the Act of March 10, 1934; Ch. 55; 48 Stat. 401). It provides for the U.S. Fish and Wildlife Service's (Service) and the respective State agency exercising administration over the wildlife resource of the State involvement in evaluating potential impacts to fish and wildlife resources from proposed water resource development projects, to make recommendations for preventing their loss or damage, and to offer improved measures. USACE Charleston District prepared this CAR in collaboration with the Service and comments from The National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS, jointly the Services).

Authorities

The authority to investigate a flood control project for the Waccamaw River in Horry County, South Carolina is provided in Section 445 of Water Resources Development Act (WRDA) 1999 (P.L. 106-53).

Section 445 states:

> *The Secretary shall conduct a study to determine the feasibility of undertaking a flood control project for the Waccamaw River in Horry County, South Carolina.*

A completed U.S. Army Corps of Engineers (USACE) navigation project overlaps the study area. Section 445 of WRDA includes the authority to recommend Flood Risk Management (FRM) measures including structures or changes to the river in the footprint of this completed USACE navigation project, which was originally authorized by the Rivers and Harbor Acts of June 14, 1880 -S. Ex. Doc. 117, 46th Cong., 2d session and Annual Report, 1880, p. 848, and of July 3, 1930 - H. Doc. 82, 70th Cong, 1st session.

There are multiple completed USACE FRM projects within the Waccamaw River basin in Horry County, South Carolina. Section 216 of the Flood Control Act of 1970 (33 U.S.C. 549a) provides authority to review the operation of these FRM projects and recommend modifications. Section 216 states:

> *The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due the significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest.*

These completed FRM projects were originally authorized under the following Continuing Authorities Program (CAP) authorities, Section 205 of the Flood Control Act of 1948, and Section 208 of the Flood Control Act of 1954.

Description of the Study Area

Overview

The entire study area is distributed into four flood impact areas within Horry County. These are segmented according to geographic relation to developed municipalities and defined based-on measures of impacts to structures from previous flooding events. These four flood impact areas are identified as Longs/Red Bluff, Conway, Socastee, and Bucksport (Figure A). This report will analyze the study area as a whole—or region of influence (ROI)—and the impacts of the proposed flood-mitigation measures on fish and wildlife.

Geographic and Ecological Features

The study area encompasses approximately 81 miles of the Waccamaw River from the North Carolina-South Carolina border to Wachesaw Landing in Horry County, South Carolina and equates to 345 square miles (mi^2) of the Lower Pee Dee Basin (HUC-6 030402). Within the broader Lower Pee Dee Basin, the study area functionally overlaps with at least three smaller basins being primarily the Waccamaw River (HUC-8 03040206), as well as partially within the Little Pee Dee (HUC-8 03040204) and Coastal Carolina-Sampit (HUC-8 03040207) basins. The ROI supports numerous different habitat types, including open water, freshwater marsh, managed wetlands, and others (Table 1, *Appendix A*).

The Waccamaw River Basin itself encompasses approximately 1,651 mi2 in southeastern North Carolina and northeastern South Carolina (597 mi^2 of which are in South Carolina). The Waccamaw River stems from Lake Waccamaw in Columbus County, NC, and flows 140 miles southwest accepting drainage from

Kingston Lake and the Atlantic Intracoastal Waterway via Socastee Creek and flowing further downstream to join the waters of the Great Pee Dee River before reaching Winyah Bay in Georgetown County, SC. Major tributaries to the river in Horry County include: Buck Creek, Simpson Creek, Todd Creek, Crabtree Swamp, and Tilly Swamp. The Waccamaw River has a maximum width of 4,000 feet in the tidal reaches of Winyah Bay, narrowing quickly (within two miles) to 2,000 feet and then narrowing gradually to 190 feet at Conway (river mile 42). From Conway to Red Bluff (river mile 67) widths range from 90 to 180 feet, and from Red Bluff to Lake Waccamaw (river mile 140), the width gradually decreases to 35 feet. Tidal influence is detectable as far upstream as Bellamy's Landing (river mile 83).

Floodplains of the Waccamaw River and its tributaries are generally broad, flat, swampy, and subject to frequent and prolonged overflow. The topography and hydrology of the Waccamaw River sets conditions for a high concentration of dissolved organic material and dark color, common of rivers known as "*blackwater*" rivers. The flat gradient and backwater effects from the Great Pee Dee and Little Pee Dee rivers, which contribute to the extremely slow downstream movement of floodwaters and urban flooding. When extreme weather events occur, flooding along the Waccamaw floodplain typically lasts a few days, but can last up to four to five weeks depending upon antecedent moisture conditions and rainfall intensity and duration. Several tributaries to the Waccamaw are affected by its backwater, particularly when local rainfall events affect the hydrology of tributaries prior to the Waccamaw.

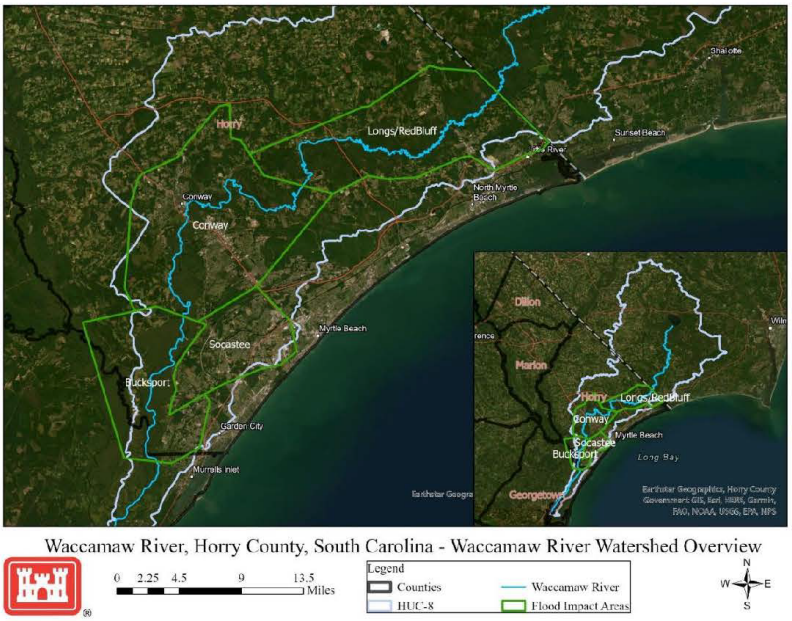

Figure A: Waccamaw River, Horry County, South Carolina project Waccamaw River Watershed overview

Protected Lands

The Waccamaw National Wildlife Refuge (NWR) consists of 23,000 acres of permanently protected land in

southwestern Horry County. A land acquisition program is in place as a mechanism to work with willing landowners to purchase additional tracts. The Waccamaw NWR spans across parts of Horry, Georgetown, and Marion Counties and encompasses large portions of the Waccamaw, Great Pee Dee, and Little Pee Dee watersheds. The NWR showcases a diversity of wildlife habitats, including a blackwater river swamp, alluvial river floodplain, forested wetlands, longleaf pine ecosystems, and tidal and managed historic rice fields. These tidal freshwater wetlands are some of the most diverse freshwater wetland systems found in North America. Additionally, refuge wetlands play a critical role in filtering storm water runoff and supplying vital drinking water resources for the greater Grand Strand region.

The Lewis Ocean Bay Heritage Preserve/Wildlife Management Area (LOBHP/WMA) is a 10,427-acre site owned and managed by the South Carolina Department of Natural Resources (SCDNR) that protects the best assemblage of Carolina bays in the state. The property consists of a mosaic of pine savannas and blackwater swamp forests that are home to 37 rare plant species, most of which are fire dependent. Two such species of global conservation importance include the Venus flytrap (*Dionaea muscipula*) and Raven's primrose willow (*Ludwigia ravenii*). Due to fire suppression and land conversion, the abundance and range of the Venus flytrap has been decimated; it is now known from only a few population in the world – two populations in Horry County and in a few coastal counties of North Carolina. The largest population in the state is centered on LOBHP/WMA.

In addition to rare plants, the LOBHP/WMA provides habitat for the federally endangered red-cockaded woodpecker (*Picoides borealis*) and the pine snake (*Pituophis melanoleucas*), both high conservation priority species in the State's Wildlife Action Plan due to loss of fire-maintained open canopy habitat, and black bear (*Ursus americanus*) a moderate conservation priority in the State Wildlife Action Plan. LOBHP/WMA supports habitat for a large stronghold for the coastal black bear population in South Carolina. The coastal bear population used to be one of the State's largest populations but is no longer due to development pressure and loss of habitat. Today's LOBHP/WMA coastal black bears move from the Carolina Forest area to the Waccamaw River to interact with populations of black bears in the Coastal Plain of North Carolina, maintaining genetic diversity for continued success of this population.

The SCDNR owned Waccamaw River Heritage Preserve/Wildlife Management Area (Waccamaw HP/WMA) is an 8,553-acre site established to protect a large, relatively unbroken riverine bottomland hardwood forest ecosystem that borders or surrounds the Waccamaw River. This property contains several rare plants such as Harper's fimbry (*Fimbristylis perpusilla*) and Plymouth gentian (*Sabatia kennedyana*). Waccamaw HP/WMA is also an important travel corridor for the coastal black bear population. The preserve provides a significant riparian buffer corridor along the Waccamaw River enhancing the water quality benefits of the entire watershed ecosystem. The preserve provides residents and visitors several outdoor recreation opportunities and direct access to the Waccamaw River through one of seven boat landings in the area.

In addition to the 41,980 acres protected by the USFWS and the SCDNR, there are approximately 4000 additional acres protected by local governments, municipalities and by private entities who chose to protect their properties with conservation easements.

Economic Growth

According to the United States Census Bureau, Horry County has over 350,000 residents as of 2019, with the median home value of $172,500 from the period between 2014 – 2018. The area is regionally and nationally significant due to the tourism draw and economic contributions of the Myrtle Beach Grand Strand region. Historical population data for Horry County showed a growth rate of 37% from 2000-2010, with

urban localities like Conway East seeing growth of up to 107% during the same period (US Census Bureau, Waccamaw Regional Council of Governments, SC Budget and Control Board). Projected growth from 2010-2030 was estimated to also be around 36.5%, with some localities like Little River and Myrtle Beach projected to continue growing by over 50% (GSATS 2035 Long Range Transportation Plan, US Census Bureau, Waccamaw Regional Council of Governments, SC Budget and Control Board). As a result of tremendous population increases and subsequent urban development patterns, the natural hydrology of the Waccamaw region has been altered significantly over the past several decades. One of the major physical changes associated with urban development is the increase in impervious surface area that covers the landscape.

Existing Projects in Study Area

There are several other USACE projects that are authorized under the Rivers and Harbors Act of 1880 and 1930 within the project area. Within the Waccamaw River, the USACE maintains a navigation channel 12 feet deep at mean low water (MLW), with an 80-foot bottom width from the mouth of the river into Winyah Bay upstream to Conway. This federal navigation channel was initially constructed in 1923 (41.5 miles). Upstream, the USACE also maintains a navigation channel 4 feet deep at MLW and 50 feet wide from Conway to Red Bluff (25.5 miles) which was initially constructed in 1931, and a cleared channel from Red Bluff to Lake Waccamaw, NC. The USACE also manages operations and maintenance along the Atlantic Intercoastal Waterway (AIWW), which spans the extent of coastal Horry County.

Horry County and Conway are actively advancing several projects independently which are designed to address flooding concerns in the study area. These projects are described in detail in the draft IFREA.

Future Condition of Resources

Overview

If current trends in land use and climate change continue, aquatic resources in the Coastal Plain of South Carolina will continue to be affected. Over the past several decades, habitats within South Carolina have become increasingly fragmented. Habitat decline, increases in invasive species, shifting climate regimes and salinity profiles, increasing development, and rising sea levels represent constraints and barriers to dispersal and migration of fish, wildlife, and plant species.

Land Use

In their IMAGINE 2040 Comprehensive Plan (Horry County Council 2019), Horry County identified approximately 40.66% of land use in the county as "*vacant land,*" which they define as "*land area not developed for a specific use or assigned a land use classification*". Another 20.9% is considered agricultural and forestland and 8.6% is conservation/preservation. Future land use, as envisioned in the plan, is anticipated to become 38.9% scenic and conservation areas and 35.2% rural, collectively making up about 74% of land use. Based on the similarities in how the County defines each of these land use types, it is likely that agricultural and forestland (equivalent to rural) will increase by up to roughly 15%. The conservation/preservation land will increase roughly 30% by 2040, while vacant land will no longer be considered "*vacant*". Given these assumptions alongside previous 20-year trends in changes in forested and wetland cover from 1996 to 2016, which saw roughly 10% decline in total area of these cover types, forested and wetland cover may continue to decline with expanding development.

In Horry County from 1996 to 2016, total net developed land cover increased from 8.43% to 12.7% (50.59%

increase) and impervious surfaces increased from 2.43% to 3.76% (54.37% increase). This is reflected in total net wetland cover decline of 5.32% (from 41.63% of total area to 39.42%) with associated conversion to developed land cover and a total net forested cover decline of 15.53% (from 51.6% of total area to 43.59%). However, forested cover changes are reflected in increases in both developed land covers and scrub/shrub. Similar changes occurred in the Waccamaw River Watershed over the same period (NOAA Coastal Services Center C-CAP Landcover Atlas 2024). A similar trend is expected to continue, particularly extending from current urban centers including Conway, Socastee, and the Grand Strand area.

Increases in impervious surfaces associated with continued development within coastal and inland watersheds leads to altered hydrological regimes, increased nutrient loading, bacteria and pathogens, and contaminants in waterways that reduce biological productivity and alter the food web. Tributaries and creeks are especially sensitive to these changes in land use. When watersheds are characterized by 20-30% impervious surface, ecological processes are impaired (Sanger et al. 2015). Development planning that occurs without wildlife resources in mind generally also leads to increased habitat fragmentation, conversion, and degradation, thereby affecting habitat connectivity, quality, and viability.

Climate Change

Rivers and estuaries and the species they support are at risk from climate change impacts such as changes in rainfall, temperature, sea levels, and salinity. Each of these factors are considered below.

Rainfall

Although not spatially or temporally homogenous, global-climate model simulations detect that global average precipitation will increase by about 1-3% per degree of warming (Allen and Ingram 2002; Hawkins and Sutton 2011; Richter and Xie 2008; Tabari et al. 2019). Furthermore, models have shown that in every year from 2015 - 2020, daily rainfall has deviated from natural variability more than 50% of the time as a result of rising temperatures. This shows how daily precipitation events are predictors of planetary warming (Ham et al. 2023).In the study area, more recent historical trends in rainfall have yielded little to no significant (SCOR 2023), however, this is anticipated to change in the coming years. Projections are analyzed in greater detail in the draft IFREA, but those for the Waccamaw Watershed indicate that the cumulative amount and max amounts of precipitation will significantly increase over the period of the study as well as the max number of dry days.

Increases in heavy precipitation events are key factors that affect the risk of floods. “Heavy precipitation” are instances in which the amount of rain or snow experienced in a location exceeds what is normal, whether that is total amount of precipitation, intensity, or frequency (EPA 2024). Precipitation extremes potentially pose the greatest social risk to South Carolina, rather than changes in monthly, seasonal, or annual averages. Moisture from the Gulf of Mexico and Atlantic fuels heavy precipitation events in South Carolina. In Conway, SC, a station found a statistically significant increase in heavy precipitation. One model predicted a 5-inch rainfall event has a one-in-ten chance of occurring in any given year when using 1930-1979 precipitation data, but a one-in-five chance of occurring using 1970-2019 data (SCOR 2023).

USACE (2023) modeled the Waccamaw River basin to help evaluate existing flood risk and as a tool to gauge the effectiveness of potential flood risk reduction projects. Findings included an increase in rainfall at the study location from approximately 12.68 inches to 14.53 inches for the 100-year average recurrence interval. This is an increase of approximately 14.6%. The results of the simulation indicate that climate non-stationarity could have a significant impact on future water surface elevations and flooding conditions within the Pee Dee and Waccamaw River basins. A 14.6% increase in total rainfall for a 96-hour event

produced a rise in water surface elevation of more than two feet for the Waccamaw River at Conway, SC.

Temperature

Current climate models predict continued warming across the southeast United States, with South Carolina projected to increase by 3°F (lower emissions model) to 10°F (higher emissions model) by the year 2100, depending on future greenhouse gas emissions. In the lower emissions scenario, the ensemble average of all models projects an additional increase of 4°F from the 1991-2020 average by 2100; it ranges from an increase of approximately 3°F in a cooler model to 5°F in a warmer model. It is important to note that this lower emissions scenario assumes decreasing greenhouse gas emissions in the next decade and leveling CO2 concentrations below 450 ppm by the end of the century. By contrast, the high emissions scenario leads to a much greater temperature increase – projected at 6°F, 8°F, and 10°F during the 21st century for the cooler model, ensemble average, and warmer model respectively. Projected changes in temperature extremes also vary by emissions scenario and individual model. By the end of the century, the number of days in which state averaged maximum temperature would exceed 95°F doubles in the lower emissions scenario, using output from a cooler model. In the higher emissions scenario with a warmer model, the number increases five-fold. Projections from a model ensemble average show changes in hot days across space and contrasts between emissions scenarios (SCOR 2023).

Higher temperatures create a higher risk of drought as rates of evapotranspiration increase, leading to increased frequency, duration, and intensity of drought in the coming years. Warmer ocean temperatures may provide more energy to hurricanes creating conditions for more intense storms adding to flooding concerns.

Temperature change is expected to shift species and their habitats in both time and space affecting species diversity and interactions at all trophic levels. Temperature has a direct effect on the physiology, maturation, and survivability of aquatic species whose metabolic rates fluctuate with environmental temperature. Temperature changes will likely affect the rate of energy transfer between the trophic levels as well. The timing and extent of species distributions and migration could also be affected by warming waters (SCDNR 2021).

Sea Level Rise

Recent research in the study area have indicated that rates of sea level rise (SLR) have averaged around one inch per year (Williams and O'Halloran 2023) and that water levels in the Waccamaw Watershed may outpace long-term projections. Analyses of water levels along the Waccamaw River have shown that although rapid changes in tidal range are not expected with current levels of SLR, mean low water is rising significantly faster than daily mean or high tide (Williams and O'Halloran 2023). The implication of these findings is likely to be increased periods of inundation in the tidal wetlands along the estuary and tidal river. As indicated by SCDNR (2021), despite uncertainty, most models project a rise of about two feet in South Carolina over the next century. Sea levels have already risen by approximately one foot in South Carolina and will most likely hit two feet by 2050. Projections for sea level rise by 2150 range from 2 to 16 feet (SCOR 2023).

The rise of two feet is expected to represent landward intrusion of 39-197 feet, affecting the boundaries between estuarine waters and tidal freshwater river and their associated habitats (e.g., tidal salt marsh) and wildlife. This estimate may, however, be an underestimation of SLR and intrusion into the watershed (Williams and O'Halloran 2023).

Salinity

Estuarine systems are at risk to impacts of climate change because of changes in sea level and variation in rainfall that may shift salinity profiles and changes in biotic composition. Rainfall and streamflow are tied directly to seasonal climatic conditions and shifts in salinity profiles in the estuarine system depend entirely upon freshwater input and rainfall. Changes in the location of the saltwater/freshwater interface will affect many freshwater and diadromous fish species. Saltwater will move further up the river systems as sea level rises. The success of species with low salt tolerances and diadromous fish will be limited by their ability to move upstream into better quality habitat due to habitat fragmentation (SCDNR 2021).Salinity profiles in estuaries are expected to change because of both sea level rise and changes in precipitation patterns. Sea level rise accompanied by drought will push salinity regimes up estuaries and landward compressing the available habitat. Drought has periodically affected all parts of the state. The historical record reveals considerable interannual and interdecadal variability, but no statistical trend. Rising temperatures in the 21st century will likely exacerbate agricultural and hydrologic drought (SCOR 2023). Coastal development will add to habitat compression resulting in reduction of saltmarsh habitat in the optimal salinity ranges. Estuarine species can tolerate salinity shifts over a tidal cycle, but they have optimal ranges and move in accordance with prevailing conditions. Sea level rise accompanied by drought would also lead to a reduction in abundance and reproduction of estuarine species that could affect all trophic levels.

Extended drought leads to drying out and dieback of coastal marshes as a result of acidification of the estuary. Salt marsh dieback will reduce primary productivity and increase vulnerability to predators of juvenile fishes and invertebrates due to reduction in cover (SCDNR 2021).

STUDY TIMELINE

Scope of CAR

Scoping for this study began in October 2022, when USACE solicited agency comments via a letter that described the study purpose and authorities. An Interagency Coordination Team (ICT) was formed and met in November 2022. The ICT consisted of state, federal, local, and regional stakeholders to review problems, objectives, constraints, and opportunities. The ICT met several times, including in March 2023, September 2023, and February 2024, to evaluate alternatives. Throughout this scoping phase, funds were allocated for development of a CAR to evaluate the potential impacts of study measures being considered on wildlife resources. Development of a draft report coincided with the selection of a tentatively selected plan and development of a draft Integrated Feasibility Report and Environmental Assessment (IFREA).

USACE and the Services agreed to build upon the existing study objectives and alternatives. The primary focus of the CAR is to further discovery of impacts to fish and wildlife resources from the proposed measures, as well as potential strategies for minimization and mitigation. The CAR will include potential permanent impacts to aquatic and benthic resources, while temporary impacts will be addressed in the IFREA. The temporary impacts are expected to be minor with implementation of standard best management practices. The descriptions of upland habitats and terrestrial resources in the study area and potential effects on these resources will also be included in the IFREA.

Following completion of the Draft IFREA, USACE will complete a period of "*optimization*," to refine the alternative plans by reducing costs and impacts to the environment. This will result in considerable and feasible adjustments to avoid impacts to natural resources.

Planning Efforts

A list of possible structural and nonstructural measures and natural or nature-based features was generated. An initial array of conceptual alternatives was formulated from the meetings. Several of the alternatives were then screened for their effectiveness in meeting study objectives, feasibility, cost, and other factors. The final array of alternatives included a no action alternative (or a Future Without Project alternative) and several action alternatives for each flood impact area. A draft IFREA is being prepared concurrently with this report and is meant to describe the initial array of conceptual alternatives and the final array in detail. Initial costs, engineering, and the potential for adverse environmental impacts of the final array of alternatives will also be evaluated as part of the Draft IFR/EA, which is intended to be released with a Draft Finding of No Significant Impact to the public and agencies for review in July 2024.

PROPOSED POTENTIAL ACTIONS

Overview

In the study area, the proposed structural measures include floodwalls/levees, a detention pond impounded by levees/flood barriers, removal of weirs, road elevation, floodgate, benching, and relief bridges. The proposed non-structural measures include buyouts/acquisition, elevating structures, and implementing flood water systems. Water farming is the proposed nature-based measure.

FISH AND WILDLIFE RESOURCES

Current Resources

Fish and wildlife resources in the aquatic environment of the ROI may include benthic and pelagic assemblages of aquatic and semi-aquatic invertebrates across various life stages; diadromous fish and fish of commercial and recreational value; semi-aquatic and aquatic herpetofauna; semi-aquatic and marine mammals; and a variety of waterbirds. Nearby terrestrial assemblages of invertebrates, herpetofauna, birds and mammals can also be found in the ROI.

Many of the known species in the ROI are documented within the Waccamaw River National Wildlife Refuge (NWR), and thus, many of the species inventoried herein are in reference to their known occurrence in the refuge. Some of these resources are listed as threatened or endangered species under the Endangered Species Act of 1973, as amended (16 USC §1531), for which the Services have jurisdiction. Table 1 shows the federally listed species that have the potential be found in the ROI due to their geographic ranges. This table was generated by the USFWS program called, "*Information for Planning & Consultation*" (IPAC). Although these species have the potential to be in the ROI due to their ranges, not all have suitable habitat in the area.

Table 1: Federally listed species under jurisdiction of the Services in the ROI

Common Name	Scientific Name	Status
American chaffseed	*Schwalbea americana*	E
Atlantic sturgeon	*Acipenser oxyrinchus*	E, CH*
Eastern black rail	*Laterallus jamaicensis jamaicensis*	T
Green Sea Turtle	*Chelonia mydas*	T, PCH
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E, PCH
Leatherback Sea Turtle	*Dermochelys coriacea*	E, CH
Loggerhead Sea Turtle	*Caretta caretta*	E, CH
Monarch butterfly	*Danaus plexippus*	C
Northern long-eared bat	*Myotis septentrionalis*	E
Piping Plover	*Charadrius melodus*	T, CH
Pondberry	*Lindera melissifolia*	E
Red-cockaded woodpecker	*Picoides borealis*	E
Rufa Red Knot	*Calidris canutus rufa*	T, PCH
Shortnose sturgeon	*Acipenser brevirostrum*	E
Tricolored bat	*Perimyotis subflavus*	PE
West Indian manatee	*Trichechus manatus*	T, CH
Wood stork	*Mycteria americana*	T

Key: E - Endangered PE - Proposed Endangered T - Threatened C - Candidate CH - Critical Habitat PCH - Proposed Critical Habitat
*This is the sole critical habitat found within the ROI

The Waccamaw River is vital to supporting a multitude of species, plant and animal, as it winds from the North Carolina state line to its terminus at Winyah Bay. The South Carolina Wildlife Action Plan (SWAP) was originally created in the Wildlife Conservation and Recreation Program created under the federal Appropriations Act of 2001 with a purpose to develop a wildlife conservation planning and restoration strategy for rare and sensitive species. Species are listed in the SWAP because they are rare or designated as at-risk due to knowledge deficiencies; species common in South Carolina but listed rare or declining elsewhere; or species that serve as indicators of detrimental environmental conditions. The 2015 SC SWAP states that the upper Waccamaw River in Horry County is one area of primary conservation concern due to the habitat located there for the following SWAP conservation priority species – the Carolina Pygmy Sunfish (*Elassoma boehlkei*), the Broadtail Madtom (*Noturus* sp. c.f. *leptacanthus*), and the Waccamaw spike (*Elliptio waccamawensis*).

Tables 2 and 3 include a list of all the SWAP conservation priority species, state protected species and federally protected species that are located within the ROI and need to be considered when developing flood risk management solutions in and around the Waccamaw River. Please note that the take of state threatened, and endangered species is prohibited under S.C. Code of Laws §50-15-20 and §50-15-30 respectively. Additionally, S.C. Code of Laws §16-11-590 provides additional protections for the Venus flytrap (*Dionaea muscipula*), a federal at-risk species and SWAP species of high conservation priority, that is now known from only a few populations in the world – two populations in Horry County, SC and in a few coastal counties of NC. This statute requires landowner consent for the cutting, collection, breaking or other destruction to this globally rare plant species. The SCDNR will work with landowners where Venus flytrap may be impacted to remove and relocate these rare plants where minimization and avoidance of destruction of these species cannot occur.

Table 2: Animal Species for consideration during study development.

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
INSECT				
Bombus pensylvanicus	American Bumble Bee	At-Risk Species	Not Applicable	Not Applicable
Danaus plexippus	Monarch Butterfly	Candidate for listing	Not Applicable	Highest
FRESHWATER MUSSEL				
Elliptio complanata	Eastern Elliptio	Not Applicable	Not Applicable	Moderate
Elliptio congaraea	Carolina Slabshell	Not Applicable	Not Applicable	Moderate
Elliptio folliculata	Pod Lance	Not Applicable	Not Applicable	High
Elliptio producta	Atlantic Spike	Not Applicable	Not Applicable	High
Lampsilis cariosa	Yellow Lampmussel	Not Applicable	Not Applicable	Highest
Lampsilis splendida	Rayed Pink Fatmucket	Not Applicable	Not Applicable	High
Toxolasma pullus	Savannah Lilliput	Not Applicable	Not Applicable	Highest
Villosa delumbis	Eastern Creekshell	Not Applicable	Not Applicable	Moderate
CRAYFISH				
Procambarus ancylus	Coastal Plain Crayfish	Not Applicable	Not Applicable	Moderate
Procambarus blandingii	Santee Crayfish	Not Applicable	Not Applicable	Moderate
Procambarus braswelli	Waccamaw Crayfish	Not Applicable	Not Applicable	High
Procambarus chacei	Cedar Creek Crayfish	Not Applicable	Not Applicable	Moderate
Procambarus pearsei	Carolina Sandhills Crayfish	Not Applicable	Not Applicable	Moderate
FISH				
Acipenser brevirostrum	Shortnose Sturgeon	Federally Endangered	State Endangered	Highest
Acipenser oxyrinchus	Atlantic Sturgeon	Federally Endangered	Not Applicable	Highest
Alosa aestivalis	Blueback Herring	Not Applicable	Not Applicable	Highest
Scientific Name	**Common Name**	**Federal Status**	**State Status**	**SWAP Priority**
Alosa mediocris	Hickory Shad	Not Applicable	Not Applicable	Highest
Alosa sapidissima	American Shad	Not Applicable	Not Applicable	Highest
Ameiurus brunneus	Snail Bullhead	Not Applicable	Not Applicable	Moderate
Ameiurus catus	White Catfish	Not Applicable	Not Applicable	Moderate

Ameiurus platycephalus	Flat Bullhead	Not Applicable	Not Applicable	Moderate
Anguilla rostrata	American Eel	Not Applicable	Not Applicable	Highest
Chologaster cornuta	Swampfish	Not Applicable	Not Applicable	Moderate
Elassoma boehlkei	Carolina Pygmy Sunfish	Not Applicable	State Threatened	Highest
Enneacanthus obesus	Banded Sunfish	Not Applicable	Not Applicable	Moderate
Etheostoma serrifer	Sawcheek Darter	Not Applicable	Not Applicable	Moderate
Fundulus diaphanus	Banded Killifish	Not Applicable	Not Applicable	Moderate
Notropis chalybaeus	Ironcolor Shiner	Not Applicable	Not Applicable	Moderate
REPTILE				
Chelydra serpentina	Snapping Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Clemmys guttata	Spotted Turtle	At-Risk Species	State Threatened	High
Deirochelys reticularia	Chicken Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Heterodon simus	Southern Hog-nosed Snake	Not Applicable	State Threatened	Highest
Kinosternon baurii	Striped Mud Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Ophisaurus attenuatus	Slender Glass Lizard	Not Applicable	Not Applicable	Moderate
Pituophis melanoleucus	Pinesnake	Not Applicable	Not Applicable	Highest
Terrapene carolina	Eastern Box Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
BIRD				
Anhinga anhinga	Anhinga	Migratory Bird Treaty Act	Not Applicable	Moderate
Ardea alba	Great Egret	Migratory Bird Treaty Act	Not Applicable	Not Applicable
Ardea herodias	Great Blue Heron	Migratory Bird Treaty Act	Not Applicable	Moderate
Scientific Name	**Common Name**	**Federal Status**	**State Status**	**SWAP Priority**
Butorides virescens	Green Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Dryobates borealis	Red-cockaded Woodpecker	Federally Endangered	State Endangered	Highest
Egretta caerulea	Little Blue Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Egretta thula	Snowy Egret	Migratory Bird Treaty Act	Not Applicable	Moderate
Elanoides forficatus	Swallow-tailed Kite	Migratory Bird Treaty Act	State Endangered	Highest

Haliaeetus leucocephalus	Bald Eagle	Bald & Golden Eagle Protection Act	State Threatened	High
Icterus galbula	Baltimore Oriole	Migratory Bird Treaty Act	Not Applicable	High
Mycteria americana	Wood Stork	Federally Threatened	State Endangered	Highest
Nyctanassa violacea	Yellow-crowned Night-Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Nycticorax nycticorax	Black-crowned Night-Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Sternula antillarum	Least Tern	Migratory Bird Treaty Act	State Threatened	Highest
MAMMAL				
Corynorhinus rafinesquii	Rafinesque's Big-eared Bat	Not Applicable	State Endangered	Highest
Eptesicus fuscus	Big Brown Bat	Not Applicable	Not Applicable	Highest
Lasiurus borealis	Eastern Red Bat	Not Applicable	Not Applicable	Highest
Lasiurus cinereus	Hoary Bat	Not Applicable	Not Applicable	Highest
Lasiurus seminolus	Seminole Bat	Not Applicable	Not Applicable	Highest
Myotis austroriparius	Southeastern Bat	Not Applicable	Not Applicable	Highest
Sciurus niger	Eastern Fox Squirrel	Not Applicable	Not Applicable	Moderate
Trichechus manatus	Florida Manatee	LT: Federally Threatened	State Endangered	Highest
Ursus americanus	American Black Bear	Not Applicable	Not Applicable	Moderate

Table 3: Plant Species for consideration during study development.

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
Agalinis aphylla	Scale-leaf Agalinis	Not Applicable	Not Applicable	Moderate
Calamovilfa brevipilis	Pinebarren Sandreed	Not Applicable	Not Applicable	Moderate
Carex decomposita	Cypress-knee Sedge, Epiphytic Sedge	Not Applicable	Not Applicable	High
Carex elliottii	Elliott's Sedge	Not Applicable	Not Applicable	Moderate
Ceratiola ericoides	Rosemary, Florida Rosemary, Sandhill Rosemary, Sand Heath	Not Applicable	Not Applicable	Moderate
Scientific Name	**Common Name**	**Federal Status**	**State Status**	**SWAP Priority**
Cladium mariscoides	Twig-rush, Fen-sedge, Smooth Sawgrass	Not Applicable	Not Applicable	Moderate
Coreopsis rosea	Rose Coreopsis	Not Applicable	Not Applicable	High
Dionaea muscipula	Venus Flytrap, Meadow Clam, Tippitiwitchet	At-Risk Species	Not Applicable	High

Eleocharis vivipara	Viviparous Spikerush	Not Applicable	Not Applicable	Moderate
Eupatorium recurvans	Recurved Eupatorium	Not Applicable	Not Applicable	Moderate
Fimbristylis perpusilla	Harper's Fimbry	At-Risk Species	Not Applicable	High
Gentiana autumnalis	Pinebarren Gentian	Not Applicable	Not Applicable	High
Lachnocaulon minus	Brown Bogbutton	Not Applicable	Not Applicable	Moderate
Lechea torreyi var. congesta	Sandhill Pinweed	Not Applicable	Not Applicable	Not Applicable
Lilaeopsis carolinensis	Carolina Lilaeopsis	Not Applicable	Not Applicable	Moderate
Lioplax subcarinata	Ridged Lioplax	Not Applicable	Not Applicable	High
Litsea aestivalis	Pondspice	Not Applicable	Not Applicable	High
Ludwigia brevipes	Long Beach Seedbox, Coastal Plain Water-purslane	Not Applicable	Not Applicable	High
Ludwigia lanceolata	Lanceleaf Seedbox	Not Applicable	Not Applicable	High
Ludwigia ravenii	Raven's Seedbox	At-Risk Species	Not Applicable	Not Applicable
Macbridea caroliniana	Carolina Birds-in-a-nest, Carolina Macbridea	Not Applicable	Not Applicable	High
Orthochilus ecristatus	Spiked Medusa, Smooth-lipped Eulophia	Not Applicable	Not Applicable	High
Oxypolis ternata	Savanna Cowbane	Not Applicable	Not Applicable	High
Parnassia caroliniana	Carolina Grass-of-Parnassus, Savanna Parnassia, Eyebright	Not Applicable	Not Applicable	High
Peltandra sagittifolia	Spoonflower, White Arrow-arum	Not Applicable	Not Applicable	Moderate
Plantago sparsiflora	Pineland Plantain	Not Applicable	Not Applicable	High
Rhexia aristosa	Awned Meadow-beauty, Bristly Meadow-beauty	Not Applicable	Not Applicable	High
Rhynchospora pallida	Pale Beaksedge	Not Applicable	Not Applicable	High
Sabatia decandra	Bartram's Rose-gentian	Not Applicable	Not Applicable	Moderate
Sabatia kennedyana	Plymouth Gentian	Not Applicable	Not Applicable	High
Sagittaria weatherbiana	Weatherby's Arrowhead	Not Applicable	Not Applicable	Moderate
Schwalbea americana	Chaffseed	Federally Endangered	Not Applicable	Highest
Solidago pulchra	Beautiful Goldenrod, Carolina Goldenrod	Not Applicable	Not Applicable	High
Scientific Name	**Common Name**	**Federal Status**	**State Status**	**SWAP Priority**
Spiranthes laciniata	Lace-lip Ladies'-tresses	Not Applicable	Not Applicable	Moderate
Sporobolus teretifolius	Wireleaf Dropseed	At-Risk Species	Not Applicable	High
Xyris brevifolia	Shortleaf Yellow-eyed-grass	Not Applicable	Not Applicable	Moderate
Xyris flabelliformis	Savanna Yellow-eyed-grass	Not Applicable	Not Applicable	Moderate

Invertebrates

Within the Waccamaw River basin are several insects, mollusks, and crustaceans that are of conservation concern. Throughout the Waccamaw River NWR, several mollusk species are known to inhabit open waters, including several freshwater mussels ranging from moderate to highest SWAP priority as identified by SCDNR (Table 2). These include Eastern elliptio, Carolina slabshell, pod lance, Atlantic spike, yellow lampmussel, rayed pink fatmucket, Savannah lilliput, and Eastern creekshell. Among the ROI, SCDNR (2023) has also documented mussels and variable spike and freshwater snails, such as the Eastern pondhorn (*Uniomerus carolinanus*) and ridged lioplax.

Among the crustaceans, several crayfish are designated as species of moderate to high conservation priority in the SWAP as decided by taxa groups that are coordinated by SCDNR with input from taxonomic experts. These include Coastal Plain crayfish, Santee crayfish, Waccamaw crayfish, Cedar Creek crayfish, and Carolina Sandhills crayfish. Among the broader study area, SCDNR (2023) has also documented the digger crayfish (*Creaserinus fodiens*). Further downstream near Winyah Bay, the Chesapeake blue crab (*Callinectes sapidus*) is a common crustacean in the estuary (SCDNR 2023). From the mouth of Winyah Bay at the Atlantic Ocean to just north of Butler Island in the Waccamaw River is designated by NOAA Fisheries as Essential Fish Habitat (EFH) Habitat of Particular Concern (HAPC) for penaeid shrimp.

There are also a few insects that are of conservation concern, such as the at-risk American bumble bee, the Palatka skipper (*Euphyes pilatka*) and the Monarch Butterfly, a candidate species for federal listing.

Monarch Butterflies

The Monarch Butterfly is a candidate for listing under the Endangered Species Act (ESA) and was considered a species of highest conservation priority in the 2015 SWAP (SCDNR 2015). Monarch Butterfly in inhabit a variety of habitats where they feed on nectar; however, the species is dependent upon milkweed species for reproduction as that is the sole food source for larvae (USFWS(*b*) n.d.).

Fish

Around 70 species of fish are known to occur within the boundaries of the Waccamaw River NWR, including freshwater, anadromous, catadromous, estuarine-dependent, and marine fish (USFWS(*a*) 2008). Among these, 23 species are listed in the SWAP as species of greatest conservation need (SGCN). Anadromous fish include the striped bass, American shad, hickory shad, blueback herring; catadromous fish species include the American eel; and freshwater fish include largemouth bass, redbreast sunfish, bluegill, redear sunfish, warmouth, pumpkinseed, black crappie, chain pickerel, redfin pickerel, bowfin, snail bullhead, white catfish, swampfish, Carolina pygmy sunfish (state threatened), banded sunfish, sawcheek darter, banded killifish, and ironcolor shiner. Both shortnose and Atlantic sturgeon, federally endangered species, are also documented in the Waccamaw River basin. Shortnose sturgeons are also a state endangered species.

Coastal, estuarine, and riverine waters that include all of Winyah Bay, and the Waccamaw River to the junction with the AIWW are designated as EFH for snapper-grouper and spiny lobster. Cartilaginous fishes, such as sandbar sharks (*Carcharhinus plumbeus*), Atlantic sharpnose sharks (*Rhizoprionodon terraenovae*), finetooth sharks (*Carcharhinus isodon*), blacktip sharks (*Carcharhinus limbatus*), lemon sharks (*Negaprion brevirostris*), spinner sharks (*Carcharhinus brevipinna*), and bull sharks (*Carcharhinus leucas*) can be

found in middle and lower portions of the Winyah Bay (Collatos et al. 2020). Winyah Bay to Georgetown is designated as EFH for neonate, juvenile and adult sand tiger sharks; neonate spinner (*Carcharhinus brevipinna*) and blacktip sharks; and juvenile sandbar sharks. Winyah Bay through the Waccamaw River up to Bull Creek is designated EFH for juvenile and adult tiger and blacktip sharks. Many species of shark in the bay become increasingly limited as salinity levels decline in the middle portions of the bay (around 25 ppt: Collatos et al. 2020), particularly during low tides (around 15 ppt: Collatos et al. 2020). Nevertheless, the bay may serve as secondary nursery grounds (Collatos et al. 2020) where juveniles mature and contribute to population growth.

Sturgeon

Carolina Unit 5 is designated as critical habitat for the Carolina and South Atlantic DPS of Atlantic sturgeon. However, the Waccamaw River is believed to not support spawning and juvenile recruitment or to contain suitable habitat features to support spawning above its confluence with Bull Creek which links it to the Pee Dee River. Post and Waldrop (2020 and 2022) have documented Atlantic Sturgeon ascending further up the Waccamaw River than in previous years. Two adults were detected at the receiver [river kilometer (RKM) 61] near Toddville in the spring of 2020. Additionally, six fish tagged in 2022 in the Waccamaw River remained in the river that year, travelling between RKM 25.7 and 49.1. The receiver at RKM 61 is the uppermost receiver in the river, so sturgeon may have potentially traveled even further upstream. This reflects the presence of sturgeon but does not indicate any spawning.

Marine Mammals

Marine mammals known in the ROI include bottlenose dolphin and West Indian manatee. Both are afforded Federal protection under the Marine Mammal Protection Act (MMPA), though the West Indian manatee is also a federally listed threatened species under the ESA and state endangered under state statute and regulations (SC Ann. 50-13; Code of Regulations 123-150).

While common bottlenose dolphins (*Tursiops truncatus*) can be found in nearshore coastal waters and estuaries of the Atlantic Coast from New York to Florida, bottlenose dolphin have been documented in numbers in Winyah Bay (Brusa 2012; Silva et al. 2019). Anecdotes in media stories have also provided some evidence of bottlenose dolphins in the Waccamaw River as far upstream as Conway, but often these stories involve rescue or mortality that follow these sightings. These individuals of the Northern South Carolina Estuarine System Stock (NSCESS) are described as dolphins that inhabit estuarine and coastal waters within 1 km of the shoreline form Murrells Inlet to Price Inlet (NOAA 2022).

Manatees

Manatees can inhabit both salt- and fresh-waters and are found at shallow depths (5-20'). In the waters of the continental U.S., they are most abundant in the warm waters of peninsular Florida. During the summer months, manatees on the eastern coast of Florida have been reported to travel as far north as Cape Cod, Massachusetts (BOEM 2022). Manatees that inhabit and travel through South Carolina waters during the warmer months will feed on saltmarsh grasses at high tide and submerged algae beds at low tide. Manatees have been sighted over the past five to eight years between Winyah Bay and the Waccamaw River up to about Conway (J. Lemeris, SCDNR, pers. comm. 2023), as well as throughout the AIWW.

Mammals

Within the Waccamaw River NWR, bottomland hardwood forests provide habitat for about 40 species of mammals. This includes black bear, bats, deer, bobcat, raccoon, beaver, mink, river otter, marsh rabbit, and squirrels. Among these, SGCN include eight species of bat, mink, Eastern woodrat, meadow vole, and black bear. Additionally, multiple species of bats have ranges in the study area and South Carolina is home to 15 different bat species. Species include Rafinesque's Big-eared (state endangered), Big Brown, Eastern Red, Hoary, Seminole and Southeastern bat species as well as federally protected bats such as the Northern Long-eared Bat (NLEB) and the proposed for listing, Tricolored Bat (TCB).

Bats

The NLEB is federally protected and listed as endangered. The TCB is proposed as endangered. In the spring, summer, and fall, NLEB and TCB occur in a wide variety of forested or wooded habitats where they roost and forage. NLEB roost under bark, and in cracks, crevices and cavities of live or dead trees, while TCB roost in clusters of leaves in live and dead deciduous trees, Spanish moss (*Tillandsia usneoides*), and clusters of dead pine needles. NLEB and TCB often overwinter in subterranean features (e.g., caves and abandoned mines) or other cave-like structures, but in the southern portions of their ranges, where caves and mines are sparse, NLEB and TCB also roost in trees, road-associated culverts, and bridges and remain active and feed during the winter (USFWS(*a*) 2024).

The Rafinesque's Big-eared Bat is state endangered. It inhabits black gum (*Nyssa sylvatica*) and water tupelo (*Nyssa aquatic*) stands, bald cypress (*Taxodium distichum*) swamp forests, maritime forests, and hardwood or mixed mature forested bottomlands (Cochran 1999, Hofmann et al. 1999, Lance et al. 2001, Gooding and Langford 2004, Trousdale and Beckett 2005). Trees standing 59 to 82 feet tall with large cavities, defined as 3.6 feet tall by 1.2 feet wide, should be surveyed to determine maternity roost occupancy May 1st to July 31st (Mirowsky 1998, Gooding and Langford 2004, Trousdale and Beckett 2005, Carver and Ashley 2008).

Amphibians and Reptiles

Within the Waccamaw River basin, over 100 species of amphibians and reptiles are likely to occur. Documented within the Waccamaw River NWR, aquatic salamanders include the greater siren (*Siren lacertina*), Eastern lesser siren (*Siren intermedia*), two-toed amphiuma (*Amphiuma means*), dwarf water dog (*Necturus punctatus*), and broken-striped newt (*Notophthalmus viridescens*). Common terrestrial salamanders within the NWR are the marbled salamander (*Ambystoma opacum*) and South Carolina slimy salamander (*Plethodon variolatus*). Among frogs, the most encountered are the American bull frog (*Lithobates catesbeianus*), Southern leopard frog *(Lithobates sphenocephalus*), and green treefrog (*Hyla cinerea*). Among snakes, the most widespread species are the brown water snake *(Nerodia taxispilota*) and Eastern cottonmouth (*Agkistrodon piscivorus*). Lastly, among turtles, the most common are the Florida cooter (*Pseudemys floridana*) and yellowbelly sliders (*Trachemys scripta scripta*). Over 20 SGCN are known to occur within the ROI including American alligator (*Alligator mississippiensis*), common snapping turtle (*Chelydra serpentina*), spotted turtle (*Clemmys guttata*) (state threatened), diamondback terrapin (*Malaclemys terrapin*), Southern hognose snake (*Heterodon simus*) (state threatened), chicken turtle (*Deirochelys reticularia*), striped mud turtle (*Kinosternon baurii*), slender glass lizard (*Ophisaurus attenuates*), pinesnake (*Pituophis melanoleucus*), and Eastern box turtle.

Sea Turtles

There are four species of sea turtles known to occur in or near waters of Winyah Bay, all of which are federally listed as threatened or endangered species: Kemp's ridley, leatherback, loggerhead and green.

Leatherback sea turtles, found in offshore waters, and Kemp's ridley sea turtles, found in nearshore waters, are not expected to be in the ROI. Loggerhead and green sea turtles are the most common species in South Carolina waters, and their distribution at different life stages varies including offshore waters, bays, inlets, river mouths, salt marshes, creeks, ship channels, and sandy beaches for nesting. Subadult and adult loggerheads move into coastal waters, such as Winyah Bay, to prey on mollusks, crustaceans, and fish. Although loggerheads and greens could be found in Winyah Bay, they are unlikely to wander into the shallow, altered tidal creeks upstream the Waccamaw River.

Threats to sea turtles include vessel strikes, dredging, fishing by-catch and entanglement, degradation of foraging habitat, pollution, and disease. Beyond the ROI, near Georgetown, critical habitat for nesting loggerhead sea turtles is federally designated extending in both directions from the mouth of Winyah Bay to North Inlet along North Island (LOGG-T-SC-01) and to North Santee Inlet along South Island (LOGG-T-SC-02 & LOGG-T-SC-03). Additionally, nearshore critical habitat is designated from North Inlet to Five Fathom Creek Inlet (crossing Winyah Bay and North Santee Inlet) from mean high water line seaward 1.6 kilometers (LOGG-N-6).

Birds

Within the Waccamaw River NWR, approximately 200 species of bird have been recorded (USFWS(*a*) 2008), of which 100 or more are listed in the SCDNR SWAP as SGCN (SCNDR 2014).

Contiguous forested wetland ecosystems within the Waccamaw watershed serve as important habitat for transient neotropical migratory species, as well as feeding, foraging, and nesting habitat for other temperate migratory and resident species (USWFS 2008). There are several bottomland hardwood birds that are SGCN within the ROI including barred owl (*Strix varia*), red-shouldered hawk (*Buteo lineatus*), wood duck (*Aix sponsa*), yellow-crowned night heron, great blue heron, green heron, little blue heron, snowy egret, black-crowned night heron, wood stork (state endangered and federally threatened), swallow-tailed kite (state endangered), bald eagle (state threatened and protected under the Bald & Golden Eagle Protection Act), yellow-billed cuckoo (*Coccyzus americanus*), Acadian flycatcher (*Empidonax virescens*), prothonotary warbler (*Protonotaria citrea*), Swainson's warbler (*Limnothlypis swainsonii*) and Northern parula (*Setophaga americana*). Swallow-tailed kites have their highest nesting density in South Carolina (2001-2004) within the NWR and represents among the northernmost nests known to the species.

Also, within the NWR are southern pine forests, which are valued by vulnerable species like Northern bobwhite (*Colinus virginianus*), Bachman's sparrow (*Peucaea aestivalis*), wintering Henslow's sparrow (*Ammodramus henslowii*), southeastern American kestrel (*Falco sparverius paulus*), brown-headed nuthatch (*Sitta pusilla*), Baltimore oriole, red-cockaded woodpecker (state and federally endangered), and prairie warbler (*Setophaga discolor*).

Coastal wetlands near the Winyah Bay drainage area, serve as wintering and staging areas for migratory waterfowl. The area also serves as wintering habitat for more ducks than any comparable habitat in South Carolina, and the river system provides a flight corridor for birds migrating between coastal wetlands. Forested floodplains also provide resting and feeding areas for waterfowl during stopovers. These include SGCN such as American green-winged teal (*Anas carolinensis*), mallards (*Anas platyrhynchos*), and

Northern pintails (*Anas acuta*). Wood ducks also nest and produce offspring year-round in the NWR.

In the southern reaches of the ROI, a highly vulnerable group of birds—marsh and wading birds—occupy tidal marsh. These include many SGCN such as American bittern (*Botaurus lentiginosus*), pied-billed grebe (*Podilymbusp Podiceps*), American coot (*Fulica americana*), king rail (*Rallus elegans*), least bittern (*Ixobrychus exilis*), and American purple gallinule (*Porphyrio martinicus*). Others include Great egrets, green herons, little blue herons, snowy egrets, yellow-crowned night herons, and black-crowned night herons. Nearby, shorebird habitats along the coastal plain may provide for more SGCN such as greater and lesser yellowlegs (*Tringa melanoleuca*; *Tri. flavipes),* spotted sandpiper (*Actitis macularius*), and American woodcock (*Scolopax minor*).

ESA Listed Birds

The endangered red-cockaded woodpecker (RCW) is known to nest within the NWR in mature pine forest of Sandy Island. Wood stork, a federally threatened and state endangered species, have also had rookeries documented in the ROI. Additionally, the federally protected, eastern black rail range is partially in the study area, but unlikely present due to unsuitable habitat. Finally, piping plovers and Rufa red knots are two federally protected shorebird species that are found along the SC coast.

The wide range of bald eagles span across coastal South Carolina and the study area. Bald eagles build their nests along coasts, riverbanks, and lakes. Usually in SC, nests are found in tall, live pines and are within one mile to large bodies of water. Bald eagles are federally protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

Plants

SCDNR has identified numerous species of interest in the ROI including several at-risk species like Harper's fimbry, Venus flytrap, and wireleaf dropseed (Table 2, *Appendix A*). These more sensitive species of plants are most often found in habitats that have highly refined disturbance regimens and are often anthropogenically altered. Each of these at-risk species is addressed individually herein. However, more common plant species are mentioned or inferred based on their supporting habitats that are common throughout the study area and are referred to below.

Harper's fimbry is an annual sedge that occurs in the eastern U.S. on the Lower Coastal Plain, with highly variable year-to-year abundance at a site. The plants are restricted to areas in ponds and rivers that are exposed, but not desiccated, during seasonal low-water periods. Both alteration to site hydrology from drainage or excessive flooding impact the species and habitat negatively (NatureServe Explorer 2024*a*). Several observations of the species have been made by SCDNR (2023) since as recently as 2019 in the Longs/Red Bluff flood impact area of the ROI.

The Venus flytrap is a narrow endemic of the coastal plain of North and South Carolina, occurring in scattered pine savannas and flatwoods. The species has very narrow habitat needs which include frequent natural fire, open understory and low nutrient soils. This more often is in areas between pine savannas or wet pine flatwoods and pocosins, with predominately wet or moist soils (NatureServe Explorer 2024*b*). An observation of this species was made by SCDNR (2023) as recently as 2021 at a timber lot close to the floodplain of the Conway flood impact area.

Wireleaf dropseed is a perennial graminoid endemic to the Coastal Plain that grows in permanently moist to wet pine savannas. Often, the species is found in habitats like ponds and longleaf pine dominated landscapes

with interspersed patches of shrubs, but also is found in interhabitat areas of pine/oak/wiregrass uplands and red maple-sweet gum-swamp tupelo drainages, as well as pitcher plant bogs and broad seepage slopes of small streams (NatureServe Explorer 2024*c*). An observation of this species was made by SCDNR (2023) as recently as 2023 in a disturbed patch of woody wetland in a broader landscape including patches of developed land and evergreen forest in the Socastee flood impact area (See *Appendix A* for a full list of SGCN and non-SGCN plant species in the ROI) (SCDNR 2023).

ESA Listed Plants

Within the ROI, there are several plant species that are federally protected, such as American Chaffseed, and Pondberry. American chaffseed occurs in fire-maintained longleaf pine flatwoods and savannas. Chaffseed is dependent on factors like fire, mowing, or fluctuating water tables to maintain the open to partly-open conditions that it requires (USFWS(*a*) n.d.). Pondberry, for the most part, is associated with wetland habitats such as bottomland and hardwoods in the interior areas, and the margins of sinks, ponds and other depressions in the more coastal sites. The plants generally grow in shaded areas but may also be found in full sun (USFWS(*c*) n.d.).

IMPACTS OF THE PROPOSED ACTIONS ON FISH AND WILDLIFE RESOURCES

The goals of flood risk management projects are to improve life safety and reduce property damages resulting from flooding. Historically, flood risk management has involved the construction of floodwalls and levees, modification of channels, use of culverts and bridges, and construction of floodgates among other things. The impacts of implementing these measures have been studied over time and their impacts on fish and wildlife resources are generally understood.

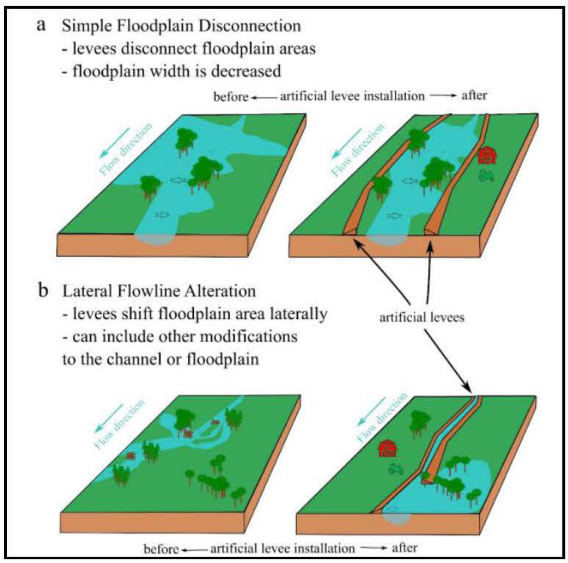

Figure B: Simple Floodplain Disconnection (a) and Lateral Flowline alteration (b) (Knox et al. 2022a).

Structural Measures

Levees/Flood Walls

In the Longs/Red Bluff region near the North Carolina border, along the basin tributary Buck Creek, a floodwall or levee is being considered as a measure to insure homes in Aberdeen and homes on Cox Lane. The measure would involve construction of a 7-foot high wall above existing grade to provide 1% annual exceedance probability (AEP) flood protection along approximately 1.3 miles of floodplain west of Buck Creek. In the Socastee region, upstream of where the Waccamaw River meets the AIWW is Socastee Swamp. An approximately 1.35-mile sheet pile floodwall is being considered for construction on the western outer bend of Socastee Creek to protect the Forestbrook neighborhood. An additional 2.06-mile portion would also be constructed on the eastern outer bend of Socastee Creek to protect McCormick and Burcale Road. The floodwall would be about 7-feet with extensive footing/foundation. The floodwalls being considered would also require drainage to prevent water build up behind the walls and would be accomplished by gates and/or pumps. The construction of levees/flood walls and their associated gates/pumps can lead to direct and indirect ecological impacts, such as floodplain disconnection, flowline alteration, hydrological changes, habitat modifications, and vegetation clearing. There may also be additional noise, vibration, and lighting from the construction activities.

Levees and floodwalls innately disconnect floodplains from waterways and result in simple floodplain disconnection, lateral flowline alteration, or both (Figure B) (Knox et al. 2022*a*). Floodplain disconnection directly reduces the area of active floodplain and lateral flowline alteration describes adjustment of the direction of flood waters and shifting of the locations of flooding.

Floodplain disconnection is an inevitable outcome of the proposed floodwall in Socastee, whereby floodwall structures would be constructed on both sides of Socastee Creek. This proposed structure runs parallel on both sides of the creek for about 1.35 miles prior to termination of the wall on the right side of the creek, and continuation of the floodwall on the left side the remaining 0.71 miles. Lateral flowline alteration is expected on the right side of the creek where the floodwall originates and terminates, likely resulting in a broader floodplain radiating from these points. At the Socastee Creek site, having some bends in the channel morphology, channel scouring is anticipated alongside changes to the floodplain mentioned above (i.e., floodplain disconnection and lateral flowline alteration) following heavy precipitation and flooding events.

Along Buck Creek, lateral flowline alteration is similarly anticipated at the origin and termination of the proposed floodwall. However, the intensity of this impact is expected to be offset to some degree by broadening of the floodplain on the left side of the creek. On the right side of the creek, lateral flowline alteration is likely to result in a broader floodplain and greater depths of inundation following heavy precipitation and flooding events. This can be attributed to the canalized waterway and lack of notable sinuosity.

In lotic ecosystems, hydrological connectivity involves four dimensions (longitudional, lateral, vertical, and temporal). Lateral hydrological connectivity (LHC) or lateral connectivity refers to the connection between the main channel and adjacent floodplain water bodies. Lateral connectivity is essential for ecosystem functioning, supporting high biodiversity, and providing ecosystem goods and services (Shen and Liu 2021).

Artificial levees lead to limiting lateral connectivity and the exchange of nutrient exchange, sediment, and organisms between floodplains and rivers (Knox et al. 2022*a*). This disconnection can completely change hydrology, impacting biogeochemical reactions and food webs. Impacting biogeochemical reactions and food webs may lead to ripple effects, eventually lowering overall function of the floodplain, resilience, and ecosystem diversity, and species composition and diversity (Knox et al. 2022*b*; Leyer 2005). Allochthonous

and autochthonous carbon sources are vital for floodplain food webs. Within hydrologically connected floodplains, there is greater habitat abundance and diversity. Past studies have found other potential impacts of levees on floodplain vegetation, including drier soil and loss of coastal wetland habitat (Morrison et al. 2018).

The implications for biological resources from the changes discussed above are a net loss of the relatively high biomass and biodiversity of floodplains. Organic matter productivity, being partly dependent on floodplain connectivity, enables the system to support a high biodiversity of fish, invertebrates, microbes and more. Hydrological or habitat connectivity between the different waterways and floodplain is important for dispersal of fish species and life-stages. Dispersal affects how fish access different recourses. Spatial extent of movement between habitats can be species-specific. It is likely that the loss of lateral habitat connectivity is a dominant driver of reduced persistence and productivity of fishes (Stoffels et al. 2022).

Additionally, many aquatic species in riverine systems undergo life history stages which require specific nursery habitat that are spatially and temporally variable, predominately in the form of branching shallow water habitats from a connected. Dead biomass in the form of large wood, can come from overbank flows and creates physical and ecological functions on floodplains (Knox et al. 2022*b*).

The aquatic and semi-aquatic species that utilize the rivers and creeks may be directly or indirectly impacted by the proposed activities. These species could include fish, aquatic salamanders, frogs, terrapins, turtles, alligators, mollusks, crustaceans, and others. As mentioned, the levees can alter habitat, including dead biomass, carbon sources, soil, sediments, and nutrients. This can upset the food webs, diversity, and composition of those species. Plant composition and diversity can be altered and therefore, wildlife that utilize specific plants can also be impacted. Additionally, the levees can serve as a barrier for the migration and movement of species, such as crayfish.

Detention

This measure would involve construction of a diversion channel from Socastee Creek to an approximately 55-acre area of existing woody wetlands and evergreen forest which would be converted to a detention pond for stormwater. An existing tributary will be channelized to act as a diversion channel for a passively controlled release into Socastee Creek. Depth of the detention pond is unknown currently. Given the existing stream and lower topography, this plan may include pumps and or gates features to prevent backwater spillage. This area is land locked by Edward E Burrough Hwy, private, and commercial property. Construction and maintenance access may require easements and acquisition. Currently assuming an active system for water retention and releases.

Construction activities associated with excavation such as site clearing, fill removal/placement, and restoration are required. Suitable fill material may be repurposed for pond impoundment (requires soil sampling). The creation of the detention pond can lead to direct and indirect ecological impacts, such as converting habitat, altering hydrology, disconnecting nutrients, and sediments, affecting species composition, and creating a concentration of pollutants in the pond. There may also be additional noise, vibration, and lighting from the specific construction activities.

The area of the proposed detention pond is currently a roughly even mix of woody wetlands and evergreen forest. The area of woody wetlands is at least periodically flooded during heavy precipitation events. This measure would involve conversion of existing habitats to open water and developed open area, with some areas of potentially intact habitat remaining, albeit with altered hydrology. In the unaffected areas surrounding the constructed detention pond, altered hydrology would have similar impacts to biomass and

biodiversity as are anticipated with floodwalls discussed above resulting from disconnection of nutrient cycling, sediment transport, and hydric conditions. Similarly, plant communities and composition shifts are expected. This can affect food webs, species interactions and composition, as mentioned above.

Creation of a detention pond can result in new wildlife habitat, including wildlife such as aquatic plants, fish, amphibians, and waterfowl. The ponds receive inputs of suspended particulate matter and nutrients. This can lead to sediment accumulation, less water volume, and biogeochemical activity, such as C sequestration. Depending on the design of the detention pond and usage of best management practices (BMPs) can influence the number of impervious surfaces, which can have significant influencers on the storage or discharge of stormwater (Schroer et al. 2018). For instance, the use of pumps, gates, channelization and substantial increases in impervious surfaces can have significant influences on the storage or discharge of stormwater and determine whether the resulting detention pond is "*wet*" (i.e., a permanent pool) or "*dry*." "*Wet*" detention ponds are the most common type across coastal South Carolina (Scaroni et al. 2021).

Wet detention ponds are storm water control structures providing both retention and treatment of contaminated storm water runoff. A typical wet detention pond design is shown in Figure 1. The pond consists of a permanent pool of water into which storm water runoff is directed. Runoff from each rain event is detained and treated in the pond until it is displaced by runoff from the next storm. By capturing and retaining runoff during storm events, wet detention ponds control both storm water quantity and quality. The pond's natural physical, biological, and chemical processes then work to remove pollutants (EPA 1999).

If not properly maintained, ponds can accumulate sediment and debris and have slope and/or outlet failures, resulting in high sediment and pollutant loadings to receiving waters. When sediment is removed from ponds as part of routine maintenance, contaminated sediments could require disposal at certified landfills. Stormwater pond surface waters are documented to have poor water quality indicators and other unintended, negative consequences. These ponds can accumulate large masses of algae, including some harmful algal species. They can be the sites of fish kills, accumulate debris and trash, and exhibit high concentrations of nutrients, chlorophyll a, chemicals, pesticides, fecal coliform bacteria (FCB), and have low dissolved oxygen (DO) concentrations. These conditions are not necessarily problematic, especially when a pond is considered a water treatment facility rather than an amenity. However, an opportunity may exist to improve pond water quality through changes in design and maintenance of ponds. Furthermore, regardless of their intended use, ponds attract humans and wildlife, as well as serving as a source of freshwater to estuarine systems (SCDHEC 2007). This may increase the exposure and risk of wildlife to high concentrations of pollutants and toxins. Furthermore, design of stormwater storage or discharge can influence the flow of total suspended solids and other associated contaminants into nearby Socastee Creek (Nix 1985; Stanley 1996). Control of the flow of total suspended solids (TSS) and pollutants downstream serves in limiting reduced dissolved oxygen concentrations and further deterioration of aquatic ecosystems (Bilotta and Brazier 2008).

Barrier Removal

Removal of the weirs along Socastee Creek would decrease the water depths affecting the upstream homes from the existing weirs. Other anticipated effects immediately proximal to weir removal include induced erosion and sedimentation of finer particles (Thomas et al. 2015) upstream and downstream and an increase in flow velocity upstream (Im et al. 2011). Impacts are expected from initial redistribution of fine sediment downstream of weir removal; however, rapid evacuation of fine sediments is likely to result in impacts being temporary and a general coarsening of the area would occur over longer periods. Weir removal research has shown several instream changes may occur which improve habitat heterogeneity as the channelizing effect of weirs is remediated and bed zones reflect changes in water level, velocity ranges, and

sediment distribution (Im et al. 2011; Thomas et al. 2015; Kim and Choi 2019).

Weirs are typically designed to facilitate fish passage, but can be barriers for nontarget weak-swimming or crawling species. They can disrupt streambed continuity and may limit movement of benthic organisms and aquatic and riparian-dependent species that require dry or shallowly-submerged surfaces for movement (USFS 2008).

Weir removal may improve upstream conditions without significantly affecting physical habitat downstream, increasing habitat suitability for a broader diversity of native lotic fish and invertebrate species (Im et al. 2011). Macroinvertebrates characterized as swimmers, clingers, and sprawlers benefit the most from weir removal, while reduced habitat for burrowers reflects a drop in species dominance (Kim and Choi 2019). Effects to fish community structure are dependent upon existing guilds and may exhibit modest changes in diversity and dominance of fish species generally (Im et al. 2019). However, greater continuity between upstream and downstream reaches is expected and there is some evidence for increased fish abundance following weir removal (Im et al. 2019). Furthermore, barrier removal improves capacity for movement of aquatic organisms in feeding and spawning and potentiates increases in their populations (Birnie-Gauvin et al. 2018). Potential improvements in habitat connectivity, lower trophic level biodiversity and increased populations provides for conditions of higher ecosystem function (Lefcheck et al. 2015; Thompson et al. 2017).

Road Elevation

Road elevation in the Bucksport flood impact area is proposed to include elevating approximately 7 miles of the Pee Dee Hwy, starting at US 701 Hwy and terminating at Pauley Swamp Road. This measure is being pursued to reduce flood risk for a 1% AEP event the Pee Dee Hwy would need to be raised by 3-7 feet (existing road elevation varies). Auxiliary drainage features to minimize pooling east of the roadway may be required. Raising the Pee Dee Highway and extending the roadside embankment laterally will result in the clearing of trees and the permanent loss of wetlands. This would also result in the loss of lateral connectivity of floodplains, which currently flow over the highway during high water events. As mentioned earlier, lateral disconnection can result in impacts to aquatic wildlife by changing food webs, vegetation, and species composition. However, impacts can be minimized through adequate maintenance of waterways through the addition of centralized culverts with floodplain culverts and bridges.The loss of wetlands can be detrimental to the wildlife that inhabit those lands and depend on that habitat. Wetlands are extremely productive ecosystems with a diversity of wildlife including songbirds, mammals, reptiles, and amphibians. Fish utilize wetlands for breeding sites and protection (Yarrow 2009). Depending on the size, material, and design of culverts, they can be harmful or beneficial for different species, , including the threatened West Indian manatee, endangered Northern long-eared bat, and the proposed endangered tricolored bat.. TCBs are opportunistic when it comes to their roosts. Newly installed culvert pipes can incidentally serve as an excellent roost. Culverts account for the majority of hibernacula documented in Mississippi, Georgia, and Louisiana (Limon et al. 2018, North American Bat Monitoring Program 2021). In road-associated culverts in the southern U.S., TCB move within and between culverts throughout the winter (Anderson et al. 2019).

There are a variety of ways in which culverts are detrimental and can prevent the movement of animals. Culverts can create barriers through elevation drops, becoming clogged with debris, excessive water velocities, the absence of bank-edge areas, excessive turbulence, insufficient water depth, and the discontinuity of channel substrate (USFS 2008).

Riparian wildlife may choose to cross over the road surface rather than pass through a crossing structure that does not have banks or other dry passage. However, if physical barriers, such as fencing or Jersey barriers

are present, passage across the roadway may be blocked. Even where passage over the road is not blocked physically, if the road supports hightraffic volumes, individual animals are likely to be killed trying to cross. For some long-lived species with low reproductive rates, such as turtles, roadkill can undermine the viability of populations significantly. Streamsimulation structures generally offer dry passage opportunities for ripariandependent species, since the structures are wide enough that the channel edges are dry much of the year (USFS 2008). Roadways have been documented to have significant effects on herpetofauna populations with high rates of direct mortalities on the roads as well as habitat fragmentation and reduction in gene flow and habitat utilization (Andrews et al. 2007). Research has shown that amphibians and reptiles can utilize culverts as wildlife crossings with roadways. The most successful structures for herpetofauna are a combined system of guide fences and underpasses to funnel organisms beneath roadways (Dodd et al. 2004; Aresco 2005; Andrew et al. 2007; Patrick 2010).

Crossing structures may be complete barriers—essentially blocking passage for all aquatic species—or they selectively may pass some species or lifestages while blocking others. Even for a particular species a partial barrier may allow passage for only the strongest swimming individuals in a population. Partial barriers are sometimes referred to as "filters" because of their selective nature in facilitating passage. Other structures may be barriers at certain times of the year (high-flow or low-flow conditions) but not others. For some species, the timing of movement is critical and temporary or seasonal barriers might seriously impact survival or reproduction within a population (USFS 2008).

Floodgate

The floodgate is expected to slow backwater in the Great Pee Dee River by restricting backflow through Cowford Swamp. Its function would permit flow below the 2-yr or 5-yr floodplain level from Cowford Swamp to the Great Pee Dee River; but provide actively controlled protection above these levels to provide a barrier for waters associated with 25-yr and 100-yr flood water. Situated between 701 HWY and Big Bull Landing on Marine Park Road, this structure is estimated to be 0.6 miles in length. The exact location and footprint remain undefined. From the center line of the gate/wall on each side, a perpetual 25-foot-wide easement is required for maintenance, plus a 10-foot-wide temporary easement during construction, totaling 70 feet. This structural measure would provide protection for communities on or near Frazier Road, Bucksport Road, and Railroad Drive. The structure would require supplemental drainage facilities such as additional gates and pumps to prevent water build up behind the gate.

Inherent to the additional surface area of impervious structure to be constructed for this measure are changes to water velocity and depth, scouring of sediment upstream and downstream, and the potential for debris to further impact flow and act as a physical barrier to the movement of aquatic organisms. These effects are of more concern when high water levels or flow rates increase output demands through the obstruction created by a floodgate of the nature proposed here.

Similar to an undershot sluice, flood events may inhibit the exchange of aquatic organisms between Cowford Swamp and Bull Creek where the increased velocity passing under the floodgate exceeds the 'burst' speed capacity of a fish or other aquatic organism (Beach 1984) (Figure C). Sluices which employ an undershot flow of water have been shown to negatively affect fish species assemblages and stock values by reducing the accessibility of waterways to migrant fish (Halls et al. 1998) as well as contributing to increased larval mortality (Marttin and de Graaf 2002). Large differences in head pressures on either side of the floodgate could expose fish and other aquatic organisms to elevated shear stresses and decompression levels, damaging early life stages and small-bodied fish (Pflugrath et al. 2019).

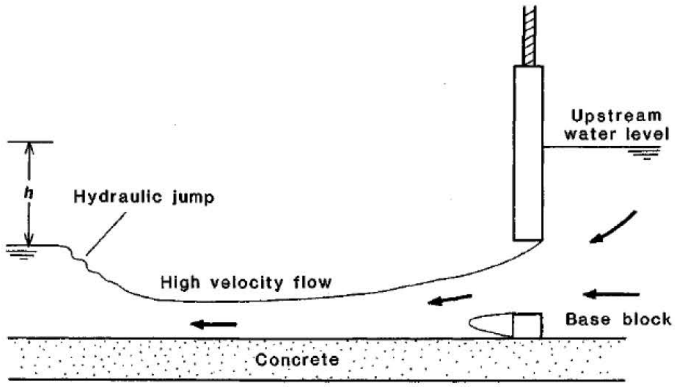

Figure 3 This form of undershot sluice makes fish passage very difficult, requiring both high speeds and long endurance times. The concrete base block enables a water jet to form, and the flat base allows the high velocity flow to persist over a considerable distance.

Figure C: Visual representation of potential physical effects and barriers to fish migration from floodgate construction (Beach 1984).

There is the potential for significant direct and indirect impacts to tidal habitats, water quality and aquatic resources by restricting tidal flow. Floodgate structures can result in impacts to natural resources through altering biological, chemical, and physical processes. The blocking of tidal flows can restrict access for fish and invertebrates to and from habitats that are necessary for feeding, spawning, migration, and predator avoidance as well as altering environmental conditions such as salinity, temperature and dissolved oxygen which directly affect an organism's fitness. Floodgates may also affect hydrology and hydrodynamics in creek systems which can cause alterations to physical and chemical dynamics such as sediment and nutrient flux which are critical factors in marsh building processes[1].

Benching/Terracing

This measure is anticipated to increase conveyance in this waterway and reduce flood elevations around the adjacent damage areas that include residential homes.

Floodplain benching is anticipated to increase channel capacity for conveyance during flood events but decrease water velocity and height during periodic high water in the creek by expanding above the bankfull width. An immediate impact of construction is that it would require excavation of the channel bank and some clearing of existing vegetation. Increasing conveyance of the waterway would also decrease durations of floodplain inundation, disrupting the disturbance regime to local floodplain forest. Potential impacts may include encroachment of more flood-intolerant plant species and reduced exchange of sediment and

[1] Giannico GR, Souder JA. 2005. The effects of tide gates on estuarine habitats and migratory fish. Oregon Sea Grant. ORESU-G-04-002.

nutrients between the channel and floodplain forest. This could result in impacts like those on reduced floodplain connectivity discussed for floodwalls and levees above.

Benching along the creek would disrupt durations of lateral connectivity to the floodplain and affect existing disturbance regimes as they relate to discharge rates from the channel but allow for formation of new ecological niches in depositional formations which may occur naturally outside channels. These may include a continuum of forms from smaller structures such as bars up to extensions of the floodplain (Vietz et al. 2004). This may mirror natural changes which occur in meandering channels whereby influence of local scale hydraulics, variability in channel width, and sedimentation patterns lead to formation and dissemination of in-stream benches (Vietz et al. 2004). This may benefit some aquatic assemblages, particularly fish yields and production, as they are known to be strongly correlated with the extent of accessible floodplain (Junk et al. 1989), and benching can increase the extent and duration of periodically inundated surfaces along banks of the waterway. Likewise, the added variation in the topographic gradient may support new, rich floral and faunal communities, as elevation has been correlated with plant species distribution in blackwater rivers in the southeast (Burke et al. 2003). Waterways with intermediate flood disturbance frequencies and intermediate levels of productivity have been shown to high species richness (Pollock et al. 1998). Though soil characteristics, nutrient availability, recruitment of large woody debris and other dynamic characteristics are also important for plant community structure in floodplains (Malanson and Butler 1990; Burke et al. 2003)

Relief Bridges

In Longs/Red Bluff, the measure would include adding culverts to the bridge on Highway 905 at the intersection of Simpson Creek and Todd Swamp. This measure may also include some clearing of debris and obstructions in the stream under the bridge. This measure is anticipated to alleviate flooding damage and backwater effects that occurs in high flood events in nearby neighborhoods at Parker Drive and McNeil Chapel Rd. This measure may also benefit Jefferson Rd and Mountain Drive. In Conway, the measure would include adding relief bridges or culverts along stretches of Highways 501 Bypass and 501 Business, as well as Hwy 905. Exact location and length of the bridges along these roadways is still being determined and will depend on the amount of additional flow needed.

Relief bridges and culverts both functionally have similar impacts on riverine systems, though impacts are generally more severe the narrower a waterway is constrained by such hardened structures. Culverts are known for reducing the movement of fish and other aquatic organisms through the creation of high velocity flows (Mahlum et al. 2014), high hanging heights (Burford et al. 2009), and when culverts are obstructed by built-up debris and sediment (Wellman et al. 2000). Culverts can also create novel habitats at a local scale when pools form downstream of the structures with scouring created by the displacement of flows (Wellman et al. 2000). The accumulation of fine sediments within and downstream of culverts can also occur, creating changes to benthic habitat for fish and invertebrates (Quigley and Harper 2000). All of these factors can contribute to changes in the biodiversity and community compositions of streams intersected by culverts and relief bridges.

Non-structural Measures

Nonstructural measures of elevating and acquisition of existing structures do not typically result in direct impacts to aquatic resources as they do not take place in the aquatic environment. There could be the potential for indirect impacts to aquatic resources if pollutants or soil particles from ground disturbance are released during construction of the nonstructural measures and become concentrated in runoff that reaches local waterways. This could temporarily alter water quality conditions that aquatic resources depend on.

Buyouts/Acquisition

Buyout/acquistion structures include those subject to more frequent flooding (2- to 50-yr events), lacking structural suitability for elevation, or experiencing greater than 4 feet of flooding during a 100-yr event. Although this measure would not have any direct consequences for wildlife resources, there may be some levels of disturbance or potential for pollution through runoff resulting from any construction activities that may be pursued when repurposing acquired properties. This, however, would be expected to be of low impact and repurposing of properties could potentially involve reincorporation into the natural floodplain landscape. This could potentially benefit wildlife resources.

Elevation

Structures and utilities within the 2- to 50-yr floodplain subject to 1-3 feet of structural damage are eligible for elevation. Structures would be elevated above the 100-yr base flood elevation including 2 feet of additional freeboard. This plan excludes communities subject to flood risk reduction through structural means. This measure is not anticipated to have impacts to wildlife resources unless construction-related activities result in disturbances and pollution from runoff.

Flood Warning Systems

A flood warning system is expected to have few consequences for wildlife resources outside of any construction-related impacts and those associated with noise temporarily during use. Given the infrequency of noise emitted by these systems, impacts are expected to be minor.

Nature-based Measures

Water Farming

Overall, water farming is expected to have minimal environmental consequences, though site-specific considerations are relevant. Unless active measures were pursued by landowners to counter natural flooding regimes on the property, very little change is expected to result from this measure. Potential benefits may be realized from this measure for floodplain conservation as it prevents the potential for private development of the land.

The Bucksport measure for water farming overlaps or is nearby a developed area for sod farming, property in the Safe Harbor Program for red-cockaded woodpecker, and wastewater treatment facilities. Nearby sod farms are inadvertently a beneficial habitat for some shorebirds and migratory species, which obtain food resources when sod farms are inundated, and sod harvesting is occurring (Taylor and Galbraith 2007; Lehnen and Krementz 2013). This may include ESA species like the red knot (Sullivan et al. 2009). However, the areal extent currently proposed would likely have little impacts to these features and may in fact increase period of inundation and allow for more foraging opportunities for these species. Where this measure overlaps with properties in the Safe Harbor Program, there is potential for conflicting interests and may or may not be executable. Lastly, where there is potential for any interaction with wastewater facilities this measure should be avoided as to limit any potential for leaching of pollutants and propagules.

The Longs/Red Bluff measure for water farming predominately overlaps with the Waccamaw River Heritage Preserve and a Clean Water Act Mitigation Bank and therefore may preclude potential realization of this measure.

Summary and Potential for Cumulative Effects

In summary, hardened structures in floodplain networks can result in direct and indirect impacts to aquatic resources. If multiple adverse effects result in a location, there is the potential for them to have a compound or additive effect on fish and wildlife in that network. If multiple floodplain networks are significantly affected, then there is the potential for the effects to be cumulative.

Traditional flood risk structures can limit access to habitat and lead to loss of habitat in addition to altering habitat and food webs. Similar impacts could occur from measures such as floodwalls and floodgates constructed in floodplain networks. Flood control structures with gates and walls in a floodplain will influence exchange and inundation of vegetation, soils, and organisms on both sides of structures. Severity of effects on water quality, community composition and structure, and species richness depend on the degree of lost connectivity, with the greatest impacts expected where connectivity is completely severed. Complete disconnection of the floodplain is most similar to what could be expected from the floodwalls.

Use of hydraulic pumps along floodwalls the floodgate during storm surge events could impact aquatic resources depending on the duration and frequency of closure, changing water quality parameters critical in supporting aquatic life. Temporary construction activities could impact aquatic and terrestrial resources. Runoff from constructing structural and nonstructural measures could also result in impacts, if standard best management practices are not implemented.

Potential Conservation Measures for Fish and Wildlife Resources

While not all conservation measures may be applicable to the environmental conditions of the study area nor to the specific measure proposed in the tentatively selected plan, several studies provide ideas for avoiding or minimizing impacts to aquatic resources from building traditional flood risk structures in riparian environments.

Measures to Avoid Impacts

Direct impacts to aquatic resources can be avoided by not building flood risk structures in the riparian environment. However, even land-based structures can have indirect impacts by changing the physical landscape that contributes to floodplain connectivity. Impacts from upland construction of flood risk structures could also have indirect impacts. So, while most direct impacts could be avoided, minimization measures are likely needed to reduce indirect impacts. Some impacts to aquatic resources could be avoided by considering non-structural measures to achieve flood risk management if they don't involve construction, such as policy changes or outreach and education.

Measures to Minimize Impacts

Structural Measures

Impacts to environmental resources in the ROI can be minimized through designs that consider their effects and the implementation of Best Management Practices (BMPs). Examples of BMPs include using buffer strips along waterways and employing on-site sediment control structures.

In areas where structural measures are proposed, care should be taken to prevent the establishment of invasive species in disturbed habitats. Practices to limit invasion may include thorough inspection and cleaning of all construction equipment before and after use, preserving trees and riparian vegetation where

possible, reseeding with native plant species appropriate for the ecoregion in disturbed soil or fill areas, and implementing monitoring and maintenance plans that include measures to control invasive plants.

Construction extents should be surveyed and consider preserving different habitat, such as old trees, rare species, trees of unusual size or shape, and trees with special wildlife value for food, resting, and nesting. Preservation of a network of trees along structural measures can also provide both structural integrity to soils in the area, but also maintain microhabitat conditions that also preserve conditions for other species. For instance, shade trees may prevent soils from drying and hardening, retain soil structure and prevent erosion, and facilitate persistence of important geochemical processes.

Construction operations can also cause disturbance or destruction of important features during sensitive and critical periods. For instance, breeding and roosting behaviors displayed by some migratory bird species, like swallow-tailed kite, may be negatively impacted by presence of construction activities and associated noise. Other species, such as the aforementioned bat species, have critical periods for hibernation/torpor and pupping or summer occupancy. When preserving trees is not plausible, avoid removing known and suitable trees during their critical timeframes and conserving known maternity roosts. This includes conserving maternity roosting trees for the state endangered Rafinesque's big-eared bat. Any maternity roost tree identified should then be buffered with a 1000-foot radius and an avoidance for tree clearing implemented May 1st to July 31st. Maternity roost trees are defined as trees standing 59 to 82 feet tall with large, hollow, cavities – 4 feet tall by 1 feet wide external width, with large basal cavities potentially being preferential (Mirowsky 1998, Gooding and Langford 2004, Trousdale and Beckett 2005, Carver and Ashley 2008, Bat Conservation International and Southeastern Bat Diversity Network 2013). Construction can also follow the other minimize measures to minimize impacts to the different species (Found in the Service's "*Minimum Conservation Measures*" Guidelines). For aquatic animals, such as fish, construction operations should be avoided during migrations and spawning periods. The Great Pee Dee River is a spawning area that should be avoided during a spawning period. Depending on the species present in the area and the specific operations, the best time of year for construction activities might differ.

Isolated wetlands provide critical habitat for a variety of reptile and amphibian species. A key aspect of the herp lifecycle includes terrestrial movements and use of uplands habitats adjacent to these wetlands. The placement of a minimum of a 300-foot buffer between development of any hardened structures and adjacent wetlands would be beneficial to encompass and protect terrestrial movements of a variety of important herp species (Semlitsch and Bodie. 2003, Buhlmann et al. 2001, Buhlmann et al. 2009, Litzgus et al. 2004, Veysey Powell and Babbit, 2015). However, Semlitsch and Bodie (2003) recommends to completely protect the core habitats necessary to protect herpetofaua, a 600-meter (approximately 1900 feet) buffer would be needed.

Levees/Flood Walls

During construction, stressors such as pollution, noise, vibration, and lighting can affect fish and wildlife. Various construction techniques, including excavation, hauling, compaction, piling installation, clearing vegetation, and others can lead to these stressors. The equipment itself has the potential to emit fumes or leak gas that can harm the water quality, habitat, and living organisms. If dewatering, burning of debris, waste material processing, or other techniques are used, this can directly impact water quality, water depth, and aquatic organisms. The BMPs should focus on reducing direct and indirect impacts to the surrounding area, such as preventing water degradation, oil leaks, and other potential environmental stressors.

To aid in reducing the potential ecological harm, the floodwall may be setback a distance that allows some of the floodplain to go undisturbed directly by construction. Levee setbacks can help offset the damages

mentioned to geomorphology, hydrology, biogeochemistry, habitat, and biota. A setback may allow for some conservation of floodplain function and vegetation composition inside the floodwall (Gergel et al. 2002). Additionally, native plants and plant communities may be planted as an overall ecosystem restoration goal.

Levee setbacks have the potential to improve hydrologic aspects and can improve the levee's resiliency and risk reduction. This improvement can occur because there is more space for the floodwaters to disperse. However, hydrologic response is site-specific, and models can help estimate the response to a levee setback. Also, geomorphic structures, such as bypass channels, dikes, barbs, or hard points can help stimulate natural processes, such as moving sediment (Dahl et al. 2017). Where a large enough buffer between the floodwall design area and the channel does not exist to limit alteration of hydrology, this may result in a shift in plant communities as patterns of sedimentation and inundation become less varied, contributing ultimately to reducing habitat complexity and biodiversity.

Streamside forest buffers along the proposed diversion channel and detention pond should also be considered in design as buffers ≥30 meters have been shown to protect physical, chemical, and biological integrity of small streams (Sweeney and Newbold 2014). Readily available scientific literature indicates that the ability of vegetated buffers to trap suspended sediments are positively correlated with width and negatively correlated with slope (Wenger 1999). A literature review performed by Castelle et al (1994), found that buffers must be 30 meters (100 ft) wide to maintain the health of the biota in nearby streams, but that this width would need to be increased for steeper slopes. Peterjohn and Correll (1984) found that for a 5% slope, only ninety percent of the suspended sediment was trapped in the first 19 meters (62 ft), and that the entire 60-meter (164 ft) buffer trapped 94% of the sediment. Therefore, adjacent streams and wetlands would be protected by vegetated riparian buffers of at least 150-feet wide, wherever practicable. Any cleared/denuded vegetated buffer areas should be replanted in native woody vegetation in order to better protect adjacent aquatic resources.

During the planning phase, a model describing hydrologic response and different levee designs with differing size buffers would be helpful for understanding the full impacts. Other planning materials could include stormwater pollution prevention approaches, which can help describe erosion, sediment migration, and other potential waste factors of the project. During this phase, the associated construction stressors to wildlife and other organisms should be considered and mapped.

Detention

Detention ponds can serve as valuable habitat for sensitive wildlife like amphibians and reptiles in urban settings. Utilizing informed design and management of detention ponds can be critical in determining whether these anthropogenic counterparts to natural wetlands serve as valuable habitat or have detrimental impacts. Important characteristics that can affect amphibian and reptile biodiversity include water depth, shoreline geomorphology, cover of emergent vegetation, and aquatic connectivity (Hamer et al. 2012). Maintaining or improving the length of hydroperiods can aid in complete development of early life stages which may otherwise be truncated in natural ephemeral wetlands (Brand and Snodgrass 2010). Reducing contamination from pollutants suspended in local water inputs is also important for supporting aquatic wildlife, and can be achieved through inclusion of trash racks, forebays, and littoral shelves in design.

Detention ponds may support a richness of aquatic fauna that serve to enhance the resilience of natural systems in the ROI while simultaneously providing flood management benefits; however, some species such as beaver and waterfowl may require direct management to prevent the detention from having otherwise harmful impacts to waterbodies and the risk of flooding. Although beavers are often a keystone species in

wetland habitats, engineering habitat conditions suitable for a variety of other species, they may also impact flood risk abatement designs by clogging water control structures and affecting retention times. Similarly, detention ponds can serve as habitat for many bird species, but also attract nuisance birds like Canada geese which may impair water quality when abundant. Design parameters may discourage use by these species, such as decreasing pond size, perimeter area, and the ratio of open water to aquatic plant cover (Blackwell et al. 2008).

The West Indian Manatee's range does approach the proposed floodwalls connected to the detention pond. Depending on the hydrology of the affected streams and potential for manatees to enter the proposed areas, manatees may have the ability to enter the detention pond. Manatees have been found to utilize artificial warm water sites, such as power plants. Changing temperatures have caused manatees to stay in these warm water refuges for longer (Sattelberger et al. 2016). Wet detention ponds can increase stormwater temperatures and therefore, raise surface water temperatures (U.S. EPA 2021). It is important to recognize there is a potential for the detention pond to host warm water, which is attractive to manatees. In 2012, four manatees entered a large storm water treatment pond in Florida due to their curious nature. This resulted in an exclusion fence being added to the lake to prevent future access ("*Florida Fish and Wildlife Conservation Commission*" n.d).

The floodwalls leading to the detention pond should be designed to keep manatees from entering (i.e., exclusion fence). Floodgate designs capable of closing passively or without detectability of aquatic organism movements should not be considered for use, given the potential impacts to marine mammals. If construction occurs during the warmer months (i.e., spring and summer) when manatees may be in the study area, protective measures should be implemented to ensure take of manatees or other marine mammals (i.e., bottlenose dolphins) does not occur either directly or indirectly as a result of construction equipment or practices. The appropriate manatee mitigation guidelines created by the Service should be utilized: "*Manatee Protection Measures for South Carolina*" (USFWS 2021).

During the planning phase, a model describing hydrologic response should be created and utilized. By using models, informed design, and BMPs, the detention pond may provide more benefits. As mentioned, a forest buffer greater than 30 meters along the diversion channel and detention pond can be beneficial to protecting the integrity of the stream. In addition to the design parameters mentioned, the associated construction stressors (noise, vibration, light, etc.) to wildlife and other organisms should be considered during project planning.

Road Elevation

For the road elevation construction, the design of the culvert should consider different features for aquatic and terrestrial species. The construction of the culverts can impact aquatic animals directly. This can happen from dewatering erosion, pollution, and other factors, such as the time of the year when construction takes place. During construction, BMPs should be utilized to avoid impacts to aquatic animals.

During the in-water construction, there are risks to manatees, with the potential for injury or death of the animals. Additionally, manatees can become stuck and lost when entering culverts and pipes. The entrapment within culverts can lead to starvation, drowning, and death of the animals. Because of these impacts, there are specific guidelines for culvert construction, such as the usage of exclusion devices within culverts ("*Florida Fish and Wildlife Conservation Commission*" n.d.). Manatee mitigation measures should be used by contractors and subcontractors to avoid impacts to manatees: "*Manatee Protection Measures for South Carolina*" (USFWS 2021).

Culverts can impact aquatic animals indirectly as well. They can affect habitats by means of their effects on stream channels and flood plains. These impacts are not universally adverse, but beneficial effects are less common than detrimental ones. Focusing on the conservation of a single desirable species is not enough. The entire aquatic ecosystem is linked, and all species depend on each other for food and other essential interactions. As survival of a "target species" depends on a healthy and diverse ecosystem, it is essential to focus on habitat quality and continuity for aquatic communities rather than one individual species (USFS 2008).

When designing the culvert, the utilization of the U.S. Forest Service's stream simulation would be beneficial: "*Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings*" (USFS 2008). Stream simulation is a method for designing and building road-stream crossings intended to permit free and unrestricted movements of any aquatic species. Their guide aims to help national forests achieve their goal of maintaining the physical and biological integrity of the stream systems they manage, including existing populations of fish and other wildlife species (see National Forest Management Act, 16 U.S.C. 1600-1616). Habitat fragmentation is an important factor contributing to population declines of many fish, and crossing structures that are barriers are a large part of the problem. Stream simulation provides continuity through crossing structures, allowing all aquatic species present to move freely through them to access habitats, avoid adverse conditions, and seek food and mates. Stream simulation applies to crossing structures on any transportation network, including roads, trails, and railroads (USFS 2008).

However, culverts can be used as roosting areas for bats and therefore, be beneficial. Many species of bats have been documented using anthropogenic roosts, including bridges and culverts. Surveys have shown evidence for bats to prefer concrete bridges and culverts over other metal and wooden structures. This could be due to the thermal and frictional properties, which makes roosting easier (Wetzel and Roby 2023). The design of the culverts should consider including culvert weep holes, which have been found to be an alternative for hibernation. Two adjacent ceiling weep holes per culvert made from roughened concrete or similar material would provide footing locations for the roosting bats. Additionally, the use of roughened concrete on the walls, sides, and ceilings could also be attractive for the bats. However, if the design of the culverts are to discourage bat usage then the diameter of the culvert pipe would need to be 2 feet or less and/or smooth walled piping.

Additionally, culverts with smooth featureless surfaces can increase velocity flows and make it more difficult for fish and/or other aquatic animals to pass through. Culverts with more ridges can aid some wildlife species during their passing and provide them with more resting spots. Culverts can also block passage if there is insufficient water depth or by blocking sunlight. Therefore, shorter culverts can help bring in more sunlight and improve the fish's behavioral response. (Kozarek et al. 2017). The design of the culvert should consider these factors and design-features. Utilizing a model or using a stream simulation (USFS 2008) that describes potential hydrological effects can provide better insight into how fish may respond.

Culvert design should also consider all life stages of the waterway's fish. Until recently, where fish were a serious concern, designing culverts for passage of a target species (the "design fish") during its migration season was considered best practice. This practice, however, often does not achieve the best ecological results. For example, considerable resources have gone into facilitating passage of adult salmon and steelhead migrating to their spawning grounds, only for fishery biologists to find that accommodations made for adults did not even begin to cover the needs of juveniles of the same species. Sustaining a population

demands that all life stages must succeed, and fry, juveniles, and adults have different movement needs and capabilities.

During the design phase, different experts should compare the different design choices and their impacts on the ecosystem. For example, some fish may benefit from shorter culverts to ensure better sunlight, and deep enough water and ridges to allow an easier transition, but other wildlife may not. These structures should also be regularly inspected for maintenance and to ensure debris and obstructions do not impede movement.

The removal of trees can have harmful effects to the multiple species of bats that utilize the area. Bats require different trees for roosting. Here, the NLEB and TCB ranges are considered active year-round. During the planning and construction phase, the specific tree removal guidelines created by the Service should be utilized: "*Northern Long-eared Bat and Tricolored Bat Voluntary Environmental Review Process for Development Projects*" (USFWS(*a*) 2024). The design of the culverts may help offset the removal of the trees for the bats.

Floodgate

Design should consider inclusion of stilling basins extending below the floodgate to allow for diffusion of energy flowing under the gate during high water events and allowing for a rapid reduction of the high-water velocity by forming the hydraulic jump close to the floodgate (Beach 1984).

Numerous direct and indirect impacts to manatees may result during and after construction of a floodgate in the proposed area, given the proximity to Bull Creek—a waterway known to be used by manatees. Documented cases of direct impacts associated with in-water construction have included vessel interactions, entanglement and ingestion and entrainment, while indirect effects may include habitat obstruction, habitat degradation and noise (Hieb et al. 2021). Floodgates and locks are also the second most significant human-induced factor contributing to manatee fatalities, with closing barriers resulting in the slow-moving animal being crushed (Black and Leslie 2018). Floodgate designs capable of closing passively or without detectability of aquatic organism movements should not be considered for use, given the potential impacts to marine mammals. If construction occurs during the warmer months (i.e., spring and summer) when manatees may be in the study area, protective measures should be implemented to ensure take of manatees or other marine mammals (i.e., bottlenose dolphins) does not occur either directly or indirectly as a result of construction equipment or practices. The appropriate manatee mitigation guidelines created by the Service should be utilized ("*Manatee Protection Measures for South Carolina*" 2021).

Disturbance associated with construction of this measure may also have important consequences for the state-listed Swallow-tailed Kite if occurring during the post-breeding/pre-migration season (June to September). This study area overlaps with the northern-most extent of nesting for the species and the area around Cowford Swamp is known for nesting and roosting aggregations of this species (M. Sasser, pers. comm., 2024). The area is important over long periods of time as the species regularly displays high nest and roost site fidelity (Chiavacci et al. 2009; Cely and Meyer 2015). Repeated or intensive disturbance may displace many kites during this critical period of annual cycles (Cely and Meyer 2015). For these reasons, construction-related disturbance may result in loss of critical habitat for this local population and tree clearing should be avoided from March 1st – July 31st.

The use of pumping systems behind the floodgate may have direct and indirect effects on fish and aquatic organisms depending on design and operation. Given the risk of entrainment and indirect effects on fish

movements, pumps should be equipped with fine-mesh screening to lower this risk, and operation of pumps should be limited to nighttime periods of low fish abundance or movement (Norman et al. 2023). Similarly, lowering of floodgates should be conducted prior to diel movements of fish when pump operations are anticipated as to limit potential for fish entrainment (Norman et al. 2023).

Aside from the direct impacts to aquatic organisms at the interface of the floodgate, the intended reduction in flooding also has consequences for floodplain forest ecology at Cowford Swamp. Increasing conveyance of waters in the Great Pee Dee River and reducing the duration of inundation in Cowford Swamp is intended to limit extent and duration of flooding locally. Although this is intended to only limit flooding from events above the 5-year Annual Exceedance Probability (AEP), this will likely have some consequences for plant species assemblages and habitat diversity and complexity, as forest communities may respond to effects of long-term flood events including 50-year and 100-year events (Junk et al. 1989; Burke et al. 2003). For instance, sediment and debris deposition and scour patterns resulting from flood pulses contribute to patchiness within the riparian floodplain creating habitat niches and structural complexity (Stromberg et al. 1993).Furthermore, dampening of flood pulses below more infrequent events (i.e., 10-year AEP) may reduce disturbance rates below a "*geomorphic threshold*", whereby a substantial change in floodplain morphology and vegetation begins to occur (Graf 1983, Stromberg et al. 1993). Therefore, there are potential long-term consequences for species with habitat specializations within the floodplain.

Some herpetofauna depend on isolated wetlands that are fed by bankfull flows and/or other specific hydrological characteristics. Isolated wetlands provide critical habitat for a variety of reptile and amphibian species. A key aspect of the herp lifecycle includes terrestrial movements and use of uplands habitats adjacent to these wetlands. Small ephemeral wetlands are particularly important habitats for herpetofauna adapted to seasonal hydroperiods and the absence of predatory fish (Morin, 1983, Semlitsch et al., 1996). For example, over a 5-year period 16,155 individuals of 42 species of amphibians and reptiles were captured from an ephemeral pond only 0.16 ha in size (Dodd, 1992). Because several endemic and rare species of herpetofauna are associated with isolated wetlands (Dodd, 1995), loss of these habitats may significantly alter regional biodiversity (Dodd, 1992, Semlitsch and Bodie, 1998). Small isolated wetlands are focal points of herpetofaunal richness and abundance in managed coastal plain forests and contribute more to regional biodiversity than is implied by their small size or ephemeral hydrology. By incorporating small wetland values and functions into planning objectives, forest managers can significantly enhance the contribution of extensive young-growth forests to regional conservation of biodiversity (Russell et al. 2002).

Relief Bridges

The construction of the relief bridges and culverts can impact aquatic animals directly. This can happen from dewatering erosion, pollution, and other factors, such as the time of the year when construction takes place. During construction, BMPs should be utilized to avoid impacts to aquatic animals. As mentioned, culverts can negatively impact manatees and the USACE should follow the specific guidelines created by the Service: "*Manatee Protection Measures for South Carolina*" (USFWS 2021).

Culverts can impact aquatic animals indirectly as well. They can affect habitats by means of their effects on stream channels and flood plains and it is essential to focus on habitat quality and continuity for aquatic communities rather than one individual species (USFS 2008).

Culverts and bridges can be beneficial to bats due to their ability to act as a roosting structure. Bridges and culverts can have many characteristics suitable for bat occupation. Many bat species will take advantage of

cracks, crevices, voids, and other openings within structures. These can include cracks and openings caused by structural deterioration (e.g., cracking in concrete, rusted metal, etc.) and typical spaces existing via structural design (e.g., expansion joints). Bats may also roost in the open on rough surfaces or within drain or weep holes, along guardrails, and within jersey barriers or other voids. Additionally, many bridges and culvert designs create artificial "*cave-like*" environments where conditions are generally stable, thus allowing bats to use for extended periods of torpor, particularly in areas where natural cave-like habitats may be limited (USFWS(*b*) 2024).Surveys have shown a preference among bats for concrete bridges and culverts over other materials. In the culverts, weep holes and roughened concrete can be attractive for the bats. For the bridges, bats prefer parallel box beam and prestressed girder type bridges. On bridges, bat boxes, bat condos, or bat roosts can be installed as another management technique (Wetzel and Roby 2023). If plausible, the USACE can consider bat management techniques during the design of these structures.

However, again, there are a variety of ways in which these structures are detrimental and can prevent the movement of animals. Therefore, when designing the relief bridge and/or culvert, the utilization of the U.S. Forest Service's stream simulation method would be beneficial: "*Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings*" (USFS 2008).

Structure design should also consider all life stages of the waterway's fish. Sustaining a population demands that all life stages must succeed, and fry, juveniles, and adults have different movement needs and capabilities. During the design phase, different experts should compare the different design choices and their impacts on the ecosystem. For example, some fish may benefit from shorter culverts to ensure better sunlight, and deep enough water and ridges to allow an easier transition, but other wildlife may not. These structures should also be regularly inspected for maintenance and to ensure debris and obstructions do not impede movement.

Although there is some potential for habitat changes around and immediately downstream, the relief bridge proposed at Simpson Creek would likely improve longitudinal connectivity of the creek by improving conveyance otherwise impeded by the existing bridge infrastructure during high water periods. As mentioned, issues with culverts include sediment build-up, scouring, and increased flow velocity which can all affect stream habitat for fish and invertebrates; however, Simpson Creek is already impacted by an existing bridge and these effects to stream physics are generally the result of narrowing a stream through a hard structure, while this measure would widen the area for water to flow through. For this reason, there are lower impacts relative to construction of culverts where infrastructure does not already exist. There may also be some benefits where these issues common to culverts are relieved by improving conveyance.

Along Highway 905 in Conway would also likely be a net benefit to the environment following construction as it would enhance connectivity of floodplain habitat which is currently intersected by elevated roadways and bridges. Increasing downstream conveyance of floodwaters may reduce some of the areal extent of the floodplain but would allow for more natural movement of floodwaters throughout the system of floodplains. Relief at Highway 905 may also restore floodplain connectivity between the Waccamaw River and Kingston Lake which is currently reduced by the roadway. H&H modeling should inform extent of floodplain reduction.

Non-structural Measures

Repurposing of acquired properties for reincorporation into natural floodplains should be considered to enhance opportunities for wildlife and habitat within the watershed. Collaboration with local stakeholders

and agency partners is encouraged to identify plans and opportunities to manage acquired properties to ensure effective restoration. Examples of local stakeholders and partners could include the SCDNR, the local counties and cities, the Horry County Soil & Water Conservation District, and local organizations, such as The Coastal Conservation League and the Horry Chapter of Wildlife Action, Inc. BMPs for control of sediment and runoff, noise and disturbance, and other construction related impacts should also be implemented during the repurposing of any acquired properties and the implementation of property elevations and installation of flood warning systems. The acquired properties may be revegetated naturally and managed for invasive plants.

Nature-based Measures

Water farming is relatively poorly defined and may involve site-specific considerations for minimization of impacts. Movement of potential pollutants and invasive propagules between areas designated for water farming and waterways upon draining need be considered for protective measures or elimination from boundaries. Land management practices may also be important in areas where current management regimens would be abandoned because of implementation of water farming. For instance, if agricultural fields are abandoned in place of water farming, environmental consequences may be realized if the area is recolonized by invasive plants. Active management to ensure the area transitions to habitat more like that of native floodplains in the ecoregion along the waterway should be pursued.

Measures to Mitigate for Unavoidable Impacts

Construction of floodwalls and floodgates have the greatest potential to affect wetlands in the ROI and create the greatest need for mitigation. Wetland mitigation banking will need to be pursued to offset the loss of wetlands from floodplain disconnection and displacement.

Recommendations and Position of Service

The Service finds that the proposed flood risk management alternatives, while intended as a measure to protect against severe flood damage, is likely to result in the loss of natural resources surrounding the Waccamaw watershed. Natural resource communities in the watershed have been historically eliminated through fill and development as the county continues to grow and expand. The addition of flood risk measures represents a continuation of this expansion. While the project may create or restore ecological integrity under some measures, net negative impacts to woody wetlands and their biota are anticipated.

In preface to Section 7 consultation, the USFWS recommends the following suggestions regarding protected species for USACE use, analysis, and implementation, as undertaking these measures will also afford benefits to fish and wildlife species associated with protected species, and using the same habitats:

- Additional investigations, including hydraulics and hydrology modeling and impacts analysis with relative sea-level rise and cumulative impacts, should be conducted to determine if the construction of the storm walls or levees alter natural periods of inundation and could prove detrimental to their function and longevity (e.g., reduced existing water exchange regarding water depth, delays in water movement, water stacking, and impacts to water quality).

- Given the risk of entrainment and indirect effects on fish movements, pumps should be equipped with fine-mesh screening to lower this risk, and operation of pumps should be limited to nighttime periods of low fish abundance or movement. Similarly, lowering of floodgates should be conducted

prior to diel movements of fish when pump operations are anticipated as to limit potential for fish entrainment (Norman et al. 2023).

- All personnel associated with the project should be instructed about the potential presence of manatees, manatee speed zones, and the need to avoid collisions with and injury to manatees. Should a proposed action directly or indirectly affect the West Indian manatee, further coordination with the Service office will be necessary. More protection measures can be found in "*Manatee Protection Measures for South Carolina*" (USFWS 2021).

- Make all practicable efforts to avoid collisions, disturbances, and risk to the shortnose sturgeon and Atlantic sturgeon.

- Make all practicable efforts to avoid collisions and other disturbances affecting loggerhead, green, leatherback, and Kemp's ridley sea turtles. In the event that a turtle is injured or killed, USACE must contact the SC Marine Turtle Conservation Program stranding hotline at 843-633-1639.

- Avoid removing trees during sensitive timeframes (i.e. winter torpor, summer occupancy, pupping season) to avoid impacts to bats. Tricolored bats have been identified within the study area and NLEB may be present.

- When designing the culverts and relief bridges, planners should utilize the U.S. Forest Service guidelines and stream simulation method to avoid impacts to the entire ecosystem and associated species. The measures can be found in "*Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings*" (USFS 2008).

In addition to the recommendations from USFWS, NMFS has also provided rationalized support or otherwise for several measures to be considered in further refinement of project development.

NMFS fully supports:

- Nonstructural alternatives as its first option (i.e., acquisitions, elevations, and flood warning systems).
- For reasons cited above for each respective measure—barrier (weir) removal, raising of Pee Dee Highway with appropriate-sized bridges or culverts, limited benching, and relief bridges which include appropriately-sized culverts.

NMFS does not support, because of their unavoidable and potentially severe impacts to fish and wildlife resources, the following:

- Floodwalls or levees (and associated gates and pumps), detention ponds and floodgates. Levees are particularly egregious because while they may provide immediate protection to a section of stream bank, stream velocity increases and the downstream erosional impacts are intensified.

Lastly:

- A nature-based solution, water farming, poses a number of unknowns and may not be a viable measure. If the measure served as a deterrent to private development of the land, then it would be expected to provide some benefit."

APPENDIX A

Table A-1: Supporting habitats found throughout the ROI.

Habitat Type	Description
Open Water	Open water includes all unvegetated water bodies. In the ROI, this refers predominately to the Waccamaw River, some of its tributaries, and the mouth of the Waccamaw River at Winyah Bay.
Freshwater Marsh	Freshwater marsh are a type of freshwater wetlands dominated by emergent vegetation. Most of these marshes in the ROI are tidally influenced. Freshwater marshes remain flooded or saturated except during extremely dry weather periods. Most freshwater marshes in the ROI have intersecting abandoned dikes and canals erected for rice cultivation during the 18th and 19th centuries. This habitat type supports a great degree of plant diversity relative to similar habitats in the ROI. Common species of freshwater marsh plants are giant cutgrass, pickerelweed, wild rice, jewelweed, water parsnip, smartweeds, yellow pondlily, water hemlock, arrowhead, rose mallow, soft-stem bulrush, giant cordgrass, cattail, loosestrife, white water lily and alligator weed. Woody vegetation including tag alder, bald cypress, buttonbush, tupelo and black gum also grow on abandoned rice field levees.
Managed Wetlands	Managed wetlands in the ROI are generally former rice field areas impounded by dikes and levees, where hydrology is altered primarily for growth of emergent vegetation attractive to waterfowl. This may include smartweed, panic grass, wild millet, red root, water shield, spikerush, arrow-arrum, white water lily, southern naiad, Asiatic dayflower, soft-stem bulrush, wild rice, and water grass. Cultivated grains may also grown during drawdown periods.
Deciduous Forested Wetlands – Temporarily and Seasonally Flooded Tidal	Deciduous forested wetlands of this type are periodically influenced by tidal fluctuations. Flooding with lunar tides and high river flows often occurs in the winter through late spring. Inundation periods vary from few days to weeks in winter and early spring and as late as into the summer. These habitat types support a high level of diversity, but common trees include red maple, overcup oak, swamp chestnut oak, water oak, laurel oak, water hickory, green ash, sweet gum, river birch, swamp tupelo, bald cypress, and loblolly pine.
Deciduous Forested Wetlands – Semipermanently Flooded Tidal	Deciduous forested wetlands of this type remain flooded or saturated throughout most years but may be susceptible to drought periods. Tidal amplitudes influence water depths in these forests. Dominant plant species include swamp tupelo, bald cypress, green ash, water tupelo, and red maple.
Deciduous Forested and Shrub Wetlands – Regularly Flooded Tidal	Deciduous forested and shrub wetlands of this type remain flooded or saturated throughout most years. Water depths fluctuate regularly with tides. Dominant species of plants often include swamp privet, buttonbush, and tag alder.
Deciduous Forested and Shrub Wetlands – Temporarily Flooded or Saturated	Deciduous forested and shrub wetlands of this type remain flooded or saturated throughout the winter and briefly during spring. Tidal influences are often lacking in these habitats and usually occurs at the higher elevations. Typical plant species include swamp chestnut oak, water oak, cherrybark oak, loblolly pine, several species of hickories, white oak, tulip poplar, ironwood, sycamore, and sweetgum.
Deciduous Forested and Shrub Wetlands – Seasonal and Semipermanently Flooded	Deciduous forested and shrub wetlands of this type have varied periods of flooding, being for extensive periods during the growing season to throughout most of annual cycles. Tidal influence is little to none. Typical species in drier soils include water oak, green ash, American elm, and sweetgum. In wet soils species include overcup oak, water hickory, water tupelo, swamp tupelo, and bald cypress.
Evergreen Forested and Shrub Wetlands	Evergreen forested and shrub wetlands rarely experience inundation from flooding, but periodically retain soil moisture at the surface. This habitat is often at high elevations in the floodplain and results from poorly drained soils or pockets in surface topography. Common species include loblolly pine, spruce pine, live oak, and American holly. Beyond floodplain, habitats matching this definition may include bay swamps, pine savannahs, or wet pine

	flatwoods and are dominated by pond pine, loblolly bay, sweet bay, red bay, titi, fetter-bush, wax myrtle, zenobia, and sweet gallberry.
Upland Forests	Upland forests include any area that does not meet the definition of wetland or deepwater habitat as classified by Cowardin et al. (1979). Upland plant communities are highly diverse and include maritime sandhill community, longleaf pine savannahs, and flatwoods with intermittent inclusions of small evergreen and deciduous depressions, pocosins, freshwater depression meadows, broad-leafed deciduous swamps, and pond pine woodlands.

Table A-2: List of SGCN and non-SGCN plant species identified in the ROI by SCDNR (2023).

Common Name	Scientific Name	SWAP Priority
Scale-leaf Agalinis	*Agalinis aphylla*	Moderate
Pinebarrens Peanut-grass	*Amphicarpum amphicarpon*	N/A
Tawny Bluestem, Bog Bluestem	*Andropogon mohrii*	N/A
Purple Silkyscale	*Anthenantia rufa*	N/A
Big Three-awn	*Aristida condensata*	N/A
Stalked Milkweed, Savanna Milkweed	*Asclepias pedicellata*	N/A
Aquatic Milkweed	*Asclepias perennis*	N/A
Savanna Honeycomb-head, Yellow Balduina	*Balduina uniflora*	N/A
Crowfoot Sedge, Ravenfoot Sedge	*Carex crus-corvi*	N/A
Cypress-knee Sedge, Epiphytic Sedge	*Carex decomposita*	High
Elliott's Sedge	*Carex elliottii*	Moderate
Leatherleaf, Cassandra	*Chamaedaphne calyculata*	N/A
Twig-rush, Fen-sedge, Smooth Sawgrass	*Cladium mariscoides*	Moderate
Swamp Coreopsis	*Coreopsis gladiata*	N/A
Beadle's Coreopsis	*Coreopsis palustris*	N/A
Rose Coreopsis	*Coreopsis rosea*	High
Georgia Sunrose, Georgia Frostweed	*Crocanthemum georgianum*	N/A
Le Conte's Flatsedge	*Cyperus lecontei*	Moderate
Smallflower Halfchaff	*Cyperus subsquarrosus*	N/A
Venus Flytrap, Meadow Clam, Tippitiwitchet	*Dionaea muscipula*	High
Robbins's Spikerush	*Eleocharis robbinsii*	N/A
Viviparous Spikerush	*Eleocharis vivipara*	Moderate
Green-fly Orchid	*Epidendrum conopseum*	N/A
Recurved Eupatorium	*Eupatorium recurvans*	Moderate
Harper's Fimbry	*Fimbristylis perpusilla*	High
Swamp Jessamine	*Gelsemium rankinii*	N/A
Pinebarren Gentian	*Gentiana autumnalis*	High
Mud-babies, Dwarf-burhead	*Helanthium tenellum*	N/A
Pygmy Spiderlily, Waccamaw Spiderlily	*Hymenocallis pygmaea*	N/A
Sarvis Holly	*Ilex amelanchier*	N/A
Brown-fruited Rush	*Juncus pelocarpus*	N/A
Southern Bogbutton	*Lachnocaulon beyrichianum*	N/A
Brown Bogbutton	*Lachnocaulon minus*	Moderate
Carolina Lilaeopsis	*Lilaeopsis carolinensis*	Moderate
Pondspice	*Litsea aestivalis*	High
Long Beach Seedbox, Coastal Plain Water-purslane	*Ludwigia brevipes*	High
Carolina Birds-in-a-nest, Carolina Macbridea	*Macbridea caroliniana*	High

Narrowleaf Pondlily, Bonnets	*Nuphar sagittifolia*	N/A
Riverbank Evening-primrose	*Oenothera riparia*	N/A
Spiked Medusa, Smooth-lipped Eulophia	*Orthochilus ecristatus*	High
Savanna Cowbane	*Oxypolis ternata*	High
Carolina Grass-of-Parnassus, Savanna Parnassia, Eyebright	*Parnassia caroliniana*	High
Tidal Marsh Obedient-plant, Swamp Obedient-plant	*Physostegia leptophylla*	N/A
Sandhill Goldenaster	*Pityopsis pinifolia*	N/A
Pineland Plantain	*Plantago sparsiflora*	High
Swamp-forest Beaksedge	*Rhynchospora decurrens*	N/A
Narrow-fruit Horned Beaksedge	*Rhynchospora inundata*	N/A
Feather-bristled Beaksedge	*Rhynchospora oligantha*	N/A
Plymouth Gentian	*Sabatia kennedyana*	High
Weatherby's Arrowhead	*Sagittaria weatherbiana*	Moderate
Yellow Pitcherplant, Trumpets	*Sarracenia flava*	N/A
Chaffseed	*Schwalbea americana*	Highest
Baldwin's Nutrush	*Scleria baldwinii*	N/A
Beautiful Goldenrod, Carolina Goldenrod	*Solidago pulchra*	High
Wireleaf Dropseed	*Sporobolus teretifolius*	High
Smooth Hedge-nettle	*Stachys tenuifolia*	Moderate
Yellow Hatpins, Bantam-buttons	*Syngonanthus flavidulus*	N/A
Shortleaf Yellow-eyed-grass	*Xyris brevifolia*	Moderate
Elliott's Yellow-eyed-grass	*Xyris elliottii*	N/A
Savanna Yellow-eyed-grass	*Xyris flabelliformis*	Moderate
Florida Atamasco-lily, Red-margined Atamasco-lily	*Zephyranthes simpsonii*	High

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United States Department of the Interior
FISH AND WILDLIFE SERVICE
South Carolina Ecological Services Field Office
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407

August 25, 2025

LTC Todd Mainwaring
District Engineer
U.S. Army Corps of Engineers
69A Hagood Avenue
Charleston, SC 29403

Attn: Niko Brown

Dear Lieutenant Colonel Mainwaring;

This letter transmits the U.S. Fish and Wildlife Service's (Service) and the U.S. Army Corps of Engineers' (USACE) Fish and Wildlife Coordination Act Report (CAR) as required by Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The CAR provides an analysis of impacts of the proposed project and recommendations to reduce adverse impacts to aquatic species and habitats as described in the draft integrated Feasibility Report and Environmental Assessment, dated September 2024. USACE is proposing to construct relief bridges (cross drains) and remove weirs for the proposed Waccamaw River Flood Risk Management project in Horry County, South Carolina.

The purpose of the Waccamaw River Flood Risk Management Feasibility Study is to investigate and recommend potential structural and nonstructural solutions to reduce damages and life/safety impacts from coastal storms. The Recommended Plan consists of the construction of additional relief bridges or culverts at Hwy 501 Business, Hwy 501 Bypass, and Hwy 905 to increase conveyance through these areas where potential bottlenecking is occurring. The plan also consists of the removal of two weirs along Socastee Creek.

This CAR contains a description of existing fish and wildlife resources in the project area, discusses the Recommended Plan, identifies fish and wildlife-related impacts, and provides recommendations to improve the proposed project. The Service coordinated with National Marine Fisheries Service (NMFS) and South Carolina Department of Natural Resources (SCDNR). Their comments have been incorporated into the final report.

We appreciate the cooperation of your staff on this project. Should your staff have any questions regarding the enclosed report, please have them contact Julia Plasynski at Julia_plasynski@fws.gov.

Sincerely,

Christy Johnson-Hughes

Christy Johnson-Hughes
Project Leader

Fish and Wildlife Coordination Act Report
Waccamaw River Flood Risk Management
Horry County, South Carolina

South Carolina Ecological Services Field Office
U.S. Fish & Wildlife Service

Charleston District
U.S. Army Corps of Engineers

Habitat Conservation Division, Southeast Regional Office
NOAA National Marine Fisheries Service

August 2025

State of South Carolina
Department of Natural Resources

P.O. Box 167
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Robert H. Boyles, Jr., *Director*
Lorianne Riggin, *Director, Office of Environmental Programs*

August 7, 2024

Julia Plasynski
SC Ecological Services Field Office
U.S. Fish and Wildlife Service (Region 4)
176 Croghan Spur Rd #100,
Charleston, SC 29407

Niko Brown
Charleston District
U.S. Army Corps of Engineers
69-A Hagood Avenue
Charleston, SC 29403

Electronic submittal

RE: Draft Fish & Wildlife Coordination Act Report, Waccamaw River Flood Risk Management Study.

Dear Mrs. Plasynski and Mr. Brown,

The Fish and Wildlife Coordination Act (FWCA) requires consultation with the fish and wildlife agencies of States where the "*...waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified... by any public or private agency under Federal permit or license...".* Consultation is to be undertaken for the purpose of "*...preventing loss of and damage to wildlife resources."* (16 U.S.C. 661 et seq.). Therefore, personnel with the South Carolina Department of Natural Resources (SCDNR) reviewed and provided comments on the Draft Fish and Wildlife Coordination Act Report (DFWCAR) prepared by the United States Fish and Wildlife Service (USFWS) for the U.S. Army Corps of Engineers and Horry County Waccamaw River Flood Risk Management Study. Based on the information the SCDNR provided, and comments from the National Marine Fisheries Service, the SCDNR concurs with the assessment of impacts and recommendations to avoid impact that have been provided.

Sincerely,

Lorianne Riggin

Lorianne Riggin
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803-734-4199

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INTRODUCTION

Purpose

Horry County and all eight of its municipalities are vulnerable and at risk to coastal storms and flooding, as evidenced by past events. The impacts of coastal storms and flooding are expected to increase due to climate change impacts, such as sea level rise. The purpose of the Waccamaw River Flood Risk Management Feasibility Study is to investigate and recommend potential structural and nonstructural solutions to reduce damages and life/safety impacts from coastal storms.

Authorities

The authority to investigate a flood control project for the Waccamaw River in Horry County, South Carolina, is provided in Section 445 of Water Resources Development Act (WRDA) 1999 (P.L. 106-53). The investigated flood control structures include structural, non-structural, and nature-based measures. The structural measures include floodwalls/levees, a detention pond impounded by levees/flood barriers, removal of weirs, road elevation, floodgate, benching, and relief bridges. The non-structural measures include buyouts/acquisition, elevating structures, and implementing flood water systems. Water farming is the nature-based measure that has been investigated.

A completed U.S. Army Corps of Engineers (USACE) navigation project overlaps the study area. Section 445 of WRDA includes the authority to recommend Flood Risk Management (FRM) measures, including structures or changes to the river in the footprint of this completed USACE navigation project, which was originally authorized by the Rivers and Harbor Acts of June 14, 1880 - S. Ex. Doc. 117, 46th Cong., 2d session and Annual Report, 1880, p. 848, and of July 3, 1930 - H. Doc. 82, 70th Cong, 1st session.

There are multiple completed USACE FRM projects within the Waccamaw River basin in Horry County, South Carolina. Section 216 of the Flood Control Act of 1970 (33 U.S.C. 549a) provides authority to review the operation of these FRM projects and recommend modifications. These completed FRM projects were originally authorized under the following Continuing Authorities Program (CAP) authorities, Section 205 of the Flood Control Act of 1948, and Section 208 of the Flood Control Act of 1954.

This Fish and Wildlife Coordination Act Report (CAR) is authorized by the Fish and Wildlife Coordination Act (FWCA) (16 U.S. Code Section 661 through 667e; the Act of March 10, 1934; Ch. 55; 48 Stat. 401). It provides for the U.S. Fish and Wildlife Service's (Service) and the respective State agency exercising administration over the wildlife resource of the State involvement in evaluating potential impacts to fish and wildlife resources from proposed water resource development projects, to make recommendations for preventing their loss or damage, and to offer improved measures.

This CAR evaluates existing and future fish and wildlife resources within the Waccamaw River Flood Risk Management project area and affected areas. USACE Charleston District and the Service prepared this CAR with comments from The National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) and South Carolina Department of Natural resources (DNR).

Project History and Scope

Scoping for this study began in October 2022, when USACE solicited agency comments via a letter describing the study purpose and authorities. An Interagency Coordination Team (ICT) was formed and met in November

2022. The ICT consisted of state, federal, local, and regional stakeholders to review problems, objectives, constraints, and opportunities. The ICT met several times, including in March 2023, September 2023, and February 2024, to evaluate alternatives. Throughout this scoping phase, funds were allocated for development of a CAR to evaluate the potential impacts of study measures being considered on wildlife resources. Development of a draft CAR coincided with the selection of a Tentatively Selected Plan (TSP), and the development of a draft Integrated Feasibility Report and Environmental Assessment (IFREA).

USACE and the Service agreed to build upon the existing study objectives and alternatives. The primary focus of the CAR is to analyze impacts to fish and wildlife resources from the proposed measures, as well as identify potential strategies for minimization and mitigation. The CAR includes potential permanent impacts to aquatic and benthic resources, while temporary impacts are addressed in the IFREA. The temporary impacts are expected to be minor with the implementation of standard best management practices. The descriptions of upland habitats and terrestrial resources in the study area and potential effects on these resources are also included in the IFREA.

A list of possible structural and nonstructural measures, and natural or nature-based features was generated. An initial array of conceptual alternatives was formulated from the meetings. Several of the alternatives were then screened for their effectiveness in meeting study objectives, feasibility, cost, and other factors. The final array of alternatives included a no action alternative (or a Future Without Project alternative) and several action alternatives for each flood impact area.

Based on the evaluation of the alternatives, the TSP was chosen. The TSP in the Conway Flood Impact Area was Plan C3 for Relief Bridges (cross drains) and in the Socastee Flood Impact Area was Plan S3 for Barrier Removal. The Conway Relief Bridges (cross drains) have a benefit-to-cost ratio of 5.5. The Socastee Barrier Removal has a benefit-to-cost ratio of 10.7. For the Longs & Red Bluff and the Bucksport Flood Impact Areas, the No Action Alternative was tentatively selected. These alternative plans best meet the planning criteria, reduce flood risk to nearby communities, and provide positive benefits to the communities.

The draft reports were released to the public and agencies for review in September of 2024, and the public review ended in October of 2024. The draft CAR was used as a foundation for this final CAR. The draft CAR included an analysis of all possible measures, but this final CAR only considers the Recommended plan. The Agency Decision Milestone occurred in December of 2024, where the Recommended Plan was solidified. The Recommended Plan was the same as the TSP.

The Recommended Plan is:

(1) The construction of relief bridges (cross drains) in Conway, and

(2) The removal of weirs along Socastee Creek in Socastee.

DESCRIPTION OF THE STUDY AREA AND RECOMMENDED PLAN

Study Area and Region of Influence

The study area encompasses approximately 81 miles of the Waccamaw River from the North Carolina-South Carolina border to Wachesaw Landing in Horry County, South Carolina, and equates to 345 square miles (mi^2) of the Lower Pee Dee Basin (HUC-6 030402). Within the broader Lower Pee Dee Basin, the study area functionally overlaps with at least three smaller basins, primarily the Waccamaw River (HUC-8 03040206), and partially the Little Pee Dee (HUC-8 03040204) and Coastal Carolina-Sampit (HUC-8 03040207) basins.

The Waccamaw River Basin itself encompasses approximately 1,651 mi^2 in southeastern North Carolina and northeastern South Carolina (597 mi^2 of which are in South Carolina). The Waccamaw River stems from Lake Waccamaw in Columbus County, NC, and flows 140 miles southwest accepting drainage from Kingston Lake and the Atlantic Intracoastal Waterway via Socastee Creek and flowing further downstream to join the waters of the Great Pee Dee River before reaching Winyah Bay in Georgetown County, SC. Major tributaries to the river in Horry County include Buck Creek, Simpson Creek, Todd Creek, Crabtree Swamp, and Tilly Swamp. The Waccamaw River has a maximum width of 4,000 feet in the tidal reaches of Winyah Bay, narrowing quickly (within two miles) to 2,000 feet, and then narrowing gradually to 190 feet at Conway (river mile 42). From Conway to Red Bluff (river mile 67) widths range from 90 to 180 feet, and from Red Bluff to Lake Waccamaw (river mile 140), the width gradually decreases to 35 feet. Tidal influence is detectable as far upstream as Bellamy's Landing (river mile 83).

Floodplains of the Waccamaw River and its tributaries are generally broad, flat, swampy, and prone to frequent and prolonged overflow. The topography and hydrology of the Waccamaw River sets conditions for a high concentration of dissolved organic material and dark color, characteristic of rivers known as "*blackwater*" rivers. The Great Pee Dee and Little Pee Dee rivers have flat gradients and backwater effects which contribute to the extremely slow downstream movement of floodwaters and urban flooding. When extreme weather events occur, flooding along the Waccamaw floodplain typically lasts a few days, but can last up to four to five weeks depending on antecedent moisture conditions and rainfall intensity and duration. Several tributaries to the Waccamaw are affected by its backwater, particularly when local rainfall events affect the hydrology of tributaries prior to the Waccamaw.

The entire study area is distributed into four flood impact areas within Horry County. These are segmented according to geographic relation to developed municipalities and defined based-on measures of impacts to structures from previous flooding events. These four flood impact areas are identified as Longs/Red Bluff, Conway, Socastee, and Bucksport (Figure A). This report will analyze the study area as a whole—or region of influence (ROI)—and the impacts of the proposed flood-mitigation measures on fish and wildlife. The ROI supports numerous different habitat types, including open water, freshwater marsh, managed wetlands, and others (Table 1, *Appendix A*).

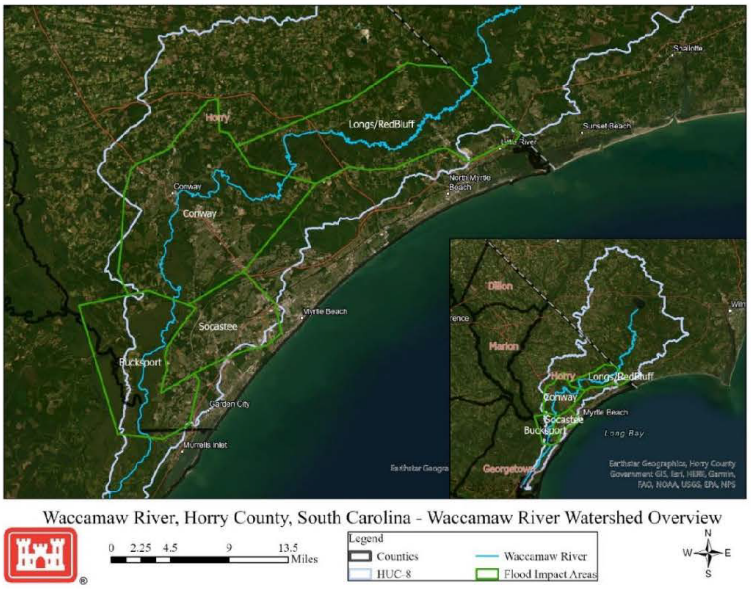

Figure A: Waccamaw River, Horry County, South Carolina - Waccamaw River Watershed Overview

Existing Projects in Study Area

There are several other USACE projects that are authorized under the Rivers and Harbors Act of 1880 and 1930 within the project area. Within the Waccamaw River, the USACE maintains a navigation channel 12 feet deep at mean low water (MLW), with an 80-foot bottom width from the mouth of the river into Winyah Bay upstream to Conway. This federal navigation channel was initially constructed in 1923 (41.5 miles). Upstream, the USACE also maintains a navigation channel 4 feet deep at MLW and 50 feet wide from Conway to Red Bluff (25.5 miles) which was initially constructed in 1931, and a cleared channel from Red Bluff to Lake Waccamaw, NC. The USACE also manages operations and maintenance along the Atlantic Intercoastal Waterway (AIWW), which spans the extent of coastal Horry County.

Horry County and Conway are actively advancing several projects independently which are designed to address flooding concerns in the study area. These projects are described in detail in the IFREA.

Geographic and Ecological Features

The study area encompasses approximately 81 miles of the Waccamaw River from the North Carolina-South Carolina border to Wachesaw Landing in Horry County, South Carolina and equates to 345 square miles (mi^2) of the Lower Pee Dee Basin (HUC-6 030402). Within the broader Lower Pee Dee Basin, the study area functionally overlaps with at least three smaller basins being primarily the Waccamaw River (HUC-8 03040206), as well as partially within the Little Pee Dee (HUC-8 03040204) and Coastal Carolina-Sampit (HUC-8 03040207) basins. The ROI supports numerous different habitat types, including open water,

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Economic Growth

According to the United States Census Bureau, Horry County has over 350,000 residents as of 2019, with the median home value of $172,500 during 2014 – 2018. The area is regionally and nationally significant due to the tourism draw and economic contributions of the Myrtle Beach Grand Strand region. Historical population data for Horry County showed a growth rate of 37% from 2000 to 2010, with urban localities like Conway East seeing growth of up to 107% during the same period (US Census Bureau, Waccamaw Regional Council of Governments, SC Budget and Control Board). Projected growth from 2010-2030 was estimated to also be around 36.5%, with some localities like Little River and Myrtle Beach projected to continue growing by over 50% (GSATS 2035 Long Range Transportation Plan, US Census Bureau, Waccamaw Regional Council of Governments, SC Budget and Control Board). As a result of tremendous population increases and subsequent urban development patterns, the natural hydrology of the Waccamaw region has been altered significantly over the past several decades. One of the major physical changes associated with urban development is the increase in impervious surface area that covers the landscape.

Land Use

In their IMAGINE 2040 Comprehensive Plan (Horry County Council 2019), Horry County identified approximately 40.66% of land use in the county as "*vacant land,*" defined as "*land area not developed for a specific use or assigned a land use classification*". Another 20.9% is considered agricultural and forestland and 8.6% is conservation/preservation. Future land use, as envisioned in the plan, is anticipated to become 38.9% scenic and conservation areas, and 35.2% rural, collectively making up about 74% of land use. Based on the similarities in how the County defines each of these land use types, it is likely that agricultural and forestland (equivalent to rural) will increase by up to roughly 15%. The conservation/preservation land will

increase roughly 30% by 2040, while vacant land will no longer be considered "*vacant*". Given these assumptions alongside previous 20-year trends in changes in forested and wetland cover from 1996 to 2016, which saw roughly 10% decline in total area of these cover types, forested and wetland cover may continue to decline with expanding development.

In Horry County from 1996 to 2016, total net developed land cover increased from 8.43% to 12.7% (50.59% increase) and impervious surfaces increased from 2.43% to 3.76% (54.37% increase). This is reflected in total net wetland cover decline of 5.32% (from 41.63% of total area to 39.42%) with associated conversion to developed land cover and a total net forested cover decline of 15.53% (from 51.6% of total area to 43.59%). However, forested cover changes are also reflected in increases in both developed land covers and scrub/shrub. Similar changes occurred in the Waccamaw River Watershed over the same period (NOAA Coastal Services Center C-CAP Landcover Atlas 2024). A similar trend is expected to continue, particularly extending from current urban centers including Conway, Socastee, and the Grand Strand area.

Modeling - Rainfall and Sea Level Rise

USACE (2023) modeled the Waccamaw River basin to help evaluate existing flood risk and as a tool to gauge the effectiveness of potential flood risk reduction projects. Findings included an increase of rainfall at the study location from approximately 12.68 inches to 14.53 inches for the 100-year average recurrence interval. This is an increase of approximately 14.6%. The results of the simulation indicate that climate non-stationarity could have a significant impact on future water surface elevations and flooding conditions within the Pee Dee and Waccamaw River basins. A 14.6% increase in total rainfall for a 96-hour event produced a rise in water surface elevation of more than two feet for the Waccamaw River at Conway, SC.

Recent research in the study area have indicated that rates of sea level rise (SLR) have averaged around one inch per year (Williams and O'Halloran 2023) and that water levels in the Waccamaw Watershed may outpace long-term projections. Analyses of water levels along the Waccamaw River have shown that although rapid changes in tidal range are not expected with current levels of SLR, mean low water is rising significantly faster than daily mean or high tide (Williams and O'Halloran 2023). The implication of these findings is likely to be increased periods of inundation in the tidal wetlands along the estuary and tidal river. As indicated by SCDNR (2021), despite uncertainty, most models project a rise of about two feet in South Carolina over the next century. Sea levels have already risen by approximately one foot in South Carolina and will most likely hit two feet by 2050. Projections for sea level rise by 2150 range from 2 to 16 feet (SCOR 2023).

The rise of two feet is expected to represent landward intrusion of 39-197 feet, affecting the boundaries between estuarine waters and tidal freshwater river and their associated habitats (e.g., tidal salt marsh) and wildlife. This estimate may, however, be an underestimation of SLR and intrusion into the watershed (Williams and O'Halloran 2023).

Recommended Plan / Tentatively Selected Plan (TSP)

Based on the evaluation of the alternatives, the TSP and Recommended Plan resulted in the same decision. In the Conway Flood Impact Area is Plan C3 for Relief Bridges (cross drains) and in the Socastee Flood Impact Area is Plan S3 for Barrier Removal. The Conway Relief Bridges (cross drains) have a benefit-to-cost ratio of 5.5. The Socastee Barrier Removal has a benefit-to-cost ratio of 10.7. These alternative plans best meet the planning criteria, reduce flood risk to nearby communities, and provide positive benefits to the communities. The TSP is also the National Economic Development Plan. For the Longs & Red Bluff and the Bucksport Flood Impact Areas, the No Action Alternative is tentatively selected.

Alternative plans were considered including floodwalls/levees, a detention pond impounded by levees/flood barriers, removal of weirs, road elevation, floodgate, benching, and relief bridges. The proposed non-structural measures include buyouts/acquisition, elevating structures, implementing flood water systems, and water farming. This final CAR focuses on the Recommended Plan decisions (cross drains and barrier removal).

7

FISH AND WILDLIFE RESOURCES

Overview

The Waccamaw River is vital to supporting a multitude of species, plant and animal, as it winds from the North Carolina state line to its terminus at Winyah Bay. The Wildlife Conservation and Recreation Program created the South Carolina Wildlife Action Plan (SWAP) under the federal Appropriations Act of 2001 with a purpose to develop a wildlife conservation planning and restoration strategy for rare and sensitive species. The SWAP lists species because they are rare or designated as at-risk due to knowledge deficiencies; species common in South Carolina but designated as rare or declining elsewhere; or species that serve as indicators of detrimental environmental conditions.

Tables A-3 and A-4 (Appendix A) provide a list of all the SWAP conservation priority species, state protected species and federally protected species that are located within the ROI and need to be considered when developing flood risk management solutions in and around the Waccamaw River. Please note that the take of state threatened, and endangered species is prohibited under S.C. Code of Laws §50-15-20 and §50-15-30 respectively. Additionally, S.C. Code of Laws §16-11-590 provides additional protections for the Venus flytrap (*Dionaea muscipula*). This statute requires landowner consent for the cutting, collection, breaking or other destruction to this globally rare plant species. The SCDNR will work with landowners to remove and relocate Venus flytrap plants that may be impacted when minimization and avoidance of destruction cannot occur.

Many of the known species in the ROI are documented within the Waccamaw River National Wildlife Refuge (NWR), and thus, many of the species inventoried herein are in reference to their known occurrence in the refuge. Some of these resources are listed as threatened or endangered species under the Endangered Species Act of 1973, as amended (16 USC §1531), for which the Services have jurisdiction (See "Listed Species" Section). While all species in this section may be found in the ROI, not all are found in the area of the Recommended Plan.

Protected Lands

The Waccamaw NWR consists of 23,000 acres of permanently protected land in southwestern Horry County. The South Carolina Department of Natural Resources (SCDNR) has established a land acquisition program to work with willing landowners to purchase additional tracts. The Waccamaw NWR spans parts of Horry, Georgetown, and Marion Counties and encompasses large portions of the Waccamaw, Great Pee Dee, and Little Pee Dee watersheds. The NWR showcases a diversity of wildlife habitats, including a blackwater river swamp, alluvial river floodplain, forested wetlands, longleaf pine ecosystems, and tidal and managed historic rice fields. These tidal freshwater wetlands are some of the most diverse freshwater wetland systems found in North America. Additionally, refuge wetlands play a critical role in filtering stormwater runoff and supplying vital drinking water resources for the greater Grand Strand region.

The Lewis Ocean Bay Heritage Preserve/Wildlife Management Area (LOBHP/WMA) is a 10,427-acre site owned and managed by the SCDNR that protects the best assemblage of Carolina bays in the state. The property features a mosaic of pine savannas and blackwater swamp forests that host 37 rare plant species, most of which depend on fire. Two such species of global conservation importance include the Venus flytrap and Raven's primrose willow (*Ludwigia ravenii*). Due to fire suppression and land conversion, fire suppression and land conversion have decimated the abundance and range of the Venus flytrap; researchers now recognize it from only a few populations in the world – two populations in Horry County and in a few

coastal counties of North Carolina. The largest population in the state centers on LOBHP/WMA.

In addition to rare plants, the LOBHP/WMA provides habitat for the federally endangered red-cockaded woodpecker (*Picoides borealis*) and the pine snake (*Pituophis melanoleucas*), both high conservation priority species in the State's Wildlife Action Plan due to loss of fire-maintained open canopy habitat, and black bear (*Ursus americanus*), a moderate conservation priority in the State Wildlife Action Plan. LOBHP/WMA supports habitat for a large stronghold of the coastal black bear population in South Carolina. Development pressure and habitat loss have caused the coastal bear population to decline from one of the State's largest populations. Today, LOBHP/WMA coastal black bears move from the Carolina Forest area to the Waccamaw River to interact with populations of black bears in the Coastal Plain of North Carolina, maintaining genetic diversity for the continued success of this population.

The SCDNR-owned Waccamaw River Heritage Preserve/Wildlife Management Area (Waccamaw HP/WMA) is an 8,553-acre site established to protect a large, relatively unbroken riverine bottomland hardwood forest ecosystem that borders or surrounds the Waccamaw River. This property contains several rare plants, such as Harper's fimbry (*Fimbristylis perpusilla*) and Plymouth gentian (*Sabatia kennedyana*). The SCDNR manages Waccamaw HP/WMA, which also serves as an important travel corridor for the coastal black bear population. The preserve provides a significant riparian buffer corridor along the Waccamaw River, enhancing the water quality benefits of the entire watershed ecosystem. The preserve offers residents and visitors several outdoor recreation opportunities and direct access to the Waccamaw River through one of seven boat landings in the area.

In addition to the 41,980 acres protected by the Service and the SCDNR, local governments, municipalities, and private entities have protected approximately 4,000 additional acres with conservation easements.

Fishery/Aquatic Resources

Within the Waccamaw River basin are several mollusks, crustaceans, and fish that are of conservation concern. Throughout the Waccamaw River NWR, several mollusk species are known to inhabit open waters, including several freshwater mussels ranging from moderate to highest SWAP priority as identified by SCDNR (Table A-3; Appendix A). These include tidewater mucket (*Leptodea ochracea*), Carolina lance (*Elliptio angustata*), Eastern elliptio (*Elliptio complanate*), Carolina slabshell (*Elliptio congaraea*), pod lance (*Elliptio folliculate*), variable spike (*Elliptio icterina*), Atlantic spike (*Elliptio producta*), yellow lampmussel (*Lampsilis cariosa*), eastern lampmussel (*Lampsilis radiata radiata*), rayed pink fatmucket (*Lampsilis splendida*), eastern pondmussel (*Ligumia nasuta*), Savannah lilliput (*Toxolasma pullus*), and Eastern creekshell (*Villosa delumbis*). Among the ROI, SCDNR (2023) has also documented a mussel without SWAP priority, Eastern pondhorn (*Uniomerus carolinanus*), and a freshwater snail with High priority, ridged lioplax (*Lioplax subcarinate*).

Among the crustaceans, several crayfish are designated as species of moderate to high conservation priority in the SWAP as decided by taxa groups that are coordinated by SCDNR with input from taxonomic experts. These include Coastal Plain crayfish, Santee crayfish, Waccamaw crayfish, Cedar Creek crayfish, and Carolina Sandhills crayfish. Among the broader study area, SCDNR (2023) has also documented the digger crayfish (*Creaserinus fodiens*). Further downstream near Winyah Bay, the Chesapeake blue crab (*Callinectes sapidus*) is a common crustacean in the estuary (SCDNR 2023).

Around 70 species of fish are known to occur within the boundaries of the Waccamaw River NWR, including freshwater, anadromous, catadromous, estuarine-dependent, and marine fish (USFWS 2008*a*). Among these,

23 species are listed in the SWAP as species of greatest conservation need (SGCN). Anadromous fish include the striped bass, American shad, hickory shad, blueback herring; catadromous fish species include the American eel; and freshwater fish include largemouth bass, redbreast sunfish, bluegill, redear sunfish, warmouth, pumpkinseed, black crappie, chain pickerel, redfin pickerel, bowfin, snail bullhead, white catfish, swampfish, Carolina pygmy sunfish (state threatened), banded sunfish, sawcheek darter, banded killifish, and ironcolor shiner. Both shortnose and Atlantic sturgeon, federally endangered species, are also documented in the Waccamaw River basin. Shortnose sturgeons are also a state endangered species.

Essential Fish Habitat

From the mouth of Winyah Bay at the Atlantic Ocean to just north of Butler Island in the Waccamaw River is designated by NOAA Fisheries as Essential Fish Habitat (EFH) Habitat of Particular Concern (HAPC) for penaeid shrimp.

Coastal, estuarine, and riverine waters that include all of Winyah Bay, and the Waccamaw River to the junction with the AIWW are designated as EFH for snapper-grouper and spiny lobster. Cartilaginous fishes, such as sandbar sharks (*Carcharhinus plumbeus*), Atlantic sharpnose sharks (*Rhizoprionodon terraenovae*), finetooth sharks (*Carcharhinus isodon*), blacktip sharks (*Carcharhinus limbatus*), lemon sharks (*Negaprion brevirostris*), spinner sharks (*Carcharhinus brevipinna*), and bull sharks (*Carcharhinus leucas*) can be found in middle and lower portions of the Winyah Bay (Collatos et al. 2020). Winyah Bay to Georgetown is designated as EFH for neonate, juvenile and adult sand tiger sharks; neonate spinner (*Carcharhinus brevipinna*) and blacktip sharks; and juvenile sandbar sharks. Winyah Bay through the Waccamaw River up to Bull Creek is designated EFH for juvenile and adult tiger and blacktip sharks. Many species of shark in the bay become increasingly limited as salinity levels decline in the middle portions of the bay (around 25 ppt: Collatos et al. 2020), particularly during low tides (around 15 ppt: Collatos et al. 2020). Nevertheless, the bay may serve as secondary nursery grounds (Collatos et al. 2020) where juveniles mature and contribute to population growth.

Wildlife Resources

Several mammals, amphibians, reptiles, insects, birds, and plants that are of conservation concern are within the Waccamaw River basin.

Mammals

Within the NWR, bottomland hardwood forests provide habitat for about 40 species of mammals. This includes black bear, bats, deer, bobcat, raccoon, beaver, mink, river otter, marsh rabbit, and squirrels. Among these, SGCN include eight species of bat, mink, Eastern woodrat, meadow vole, and black bear. Additionally, multiple species of bats have ranges in the study area and South Carolina is home to 15 different bat species. Species include Rafinesque's Big-eared (state endangered), Big Brown, Eastern Red, Hoary, Seminole and Southeastern bat species as well as federally protected bats such as the Northern Long-eared Bat (NLEB) and the proposed for listing, Tricolored Bat (TCB).

The Rafinesque's Big-eared Bat is state endangered. It inhabits black gum (*Nyssa sylvatica*) and water tupelo (*Nyssa aquatic*) stands, bald cypress (*Taxodium distichum*) swamp forests, maritime forests, and hardwood or mixed mature forested bottomlands (Cochran 1999, Hofmann et al. 1999, Lance et al. 2001, Gooding and Langford 2004, Trousdale and Beckett 2005). Trees standing 59 to 82 feet tall with large cavities, defined as 3.6 feet tall by 1.2 feet wide, should be surveyed to determine maternity roost occupancy May 1st to July 31st

(Mirowsky 1998, Gooding and Langford 2004, Trousdale and Beckett 2005, Carver and Ashley 2008).

Marine mammals are also known in the ROI and include bottlenose dolphin and West Indian manatee. Both are afforded Federal protection under the Marine Mammal Protection Act (MMPA), though the West Indian manatee is also a federally listed threatened species under the ESA and state endangered under state statute and regulations (SC Ann. 50-13; Code of Regulations 123-150).

While common bottlenose dolphins (*Tursiops truncatus*) can be found in nearshore coastal waters and estuaries of the Atlantic Coast from New York to Florida, bottlenose dolphin have been documented in numbers in Winyah Bay (Brusa 2012; Silva et al. 2019). Anecdotes in media stories have also provided some evidence of bottlenose dolphins in the Waccamaw River as far upstream as Conway, but often these stories involve rescue or mortality that follow these sightings. These individuals of the Northern South Carolina Estuarine System Stock (NSCESS) are described as dolphins that inhabit estuarine and coastal waters within 1 km of the shoreline form Murrells Inlet to Price Inlet (NOAA 2022).

Amphibians and Reptiles

Within the Waccamaw River basin, over 100 species of amphibians and reptiles are likely to occur. Documented within the Waccamaw River NWR, aquatic salamanders include the greater siren (*Siren lacertina*), Eastern lesser siren (*Siren intermedia*), two-toed amphiuma (*Amphiuma means*), dwarf water dog (*Necturus punctatus*), and broken-striped newt (*Notophthalmus viridescens*). Common terrestrial salamanders within the NWR are the marbled salamander (*Ambystoma opacum*) and South Carolina slimy salamander (*Plethodon variolatus*). Among frogs, the most encountered are the American bull frog (*Lithobates catesbeianus*), Southern leopard frog *(Lithobates sphenocephalus*), and green treefrog (*Hyla cinerea*). Among snakes, the most widespread species are the brown water snake *(Nerodia taxispilota*) and Eastern cottonmouth (*Agkistrodon piscivorus*). Lastly, among turtles, the most common are the Florida cooter (*Pseudemys floridana*) and yellowbelly sliders (*Trachemys scripta scripta*). Over 20 SGCN are known to occur within the ROI including American alligator (*Alligator mississippiensis*), common snapping turtle (*Chelydra serpentina*), spotted turtle (*Clemmys guttata*) (state threatened), diamondback terrapin (*Malaclemys terrapin*), Southern hognose snake (*Heterodon simus*) (state threatened), chicken turtle (*Deirochelys reticularia*), striped mud turtle (*Kinosternon baurii*), slender glass lizard (*Ophisaurus attenuates*), pinesnake (*Pituophis melanoleucus*), and Eastern box turtle. There are four species of sea turtles known to occur in or near waters of Winyah Bay, all of which are federally listed as threatened or endangered species: Kemp's ridley, leatherback, loggerhead and green.

Insects

There are also a few insects that are of conservation concern, such as the at-risk American bumble bee, the Palatka skipper (*Euphyes pilatka*) and the Monarch Butterfly, a species proposed for listing as threatened.

Birds

Within the Waccamaw River NWR, approximately 200 species of bird have been recorded (USFWS 2008*a*), of which 100 or more are listed in the SCDNR SWAP as SGCN (SCNDR 2014). Contiguous forested wetland ecosystems within the Waccamaw watershed serve as important habitat for transient neotropical migratory species, as well as feeding, foraging, and nesting habitat for other temperate migratory and resident species (USFWS 2008*a*). There are several bottomland hardwood birds that are SGCN within the ROI including barred owl (*Strix varia*), red-shouldered hawk (*Buteo lineatus*), wood duck (*Aix sponsa*), yellow-crowned

night heron, great blue heron, green heron, little blue heron, snowy egret, black-crowned night heron, wood stork (state endangered and federally threatened), swallow-tailed kite (state endangered), bald eagle (state threatened and protected under the Bald & Golden Eagle Protection Act), yellow-billed cuckoo (*Coccyzus americanus*), Acadian flycatcher (*Empidonax virescens*), prothonotary warbler (*Protonotaria citrea*), Swainson's warbler (*Limnothlypis swainsonii*) and Northern parula (*Setophaga americana*). Swallow-tailed kites have their highest nesting density in South Carolina (2001-2004) within the NWR and represents among the northernmost nests known to the species.

Southern pine forests are also within the NWR and are valued by vulnerable species like Northern bobwhite (*Colinus virginianus*), Bachman's sparrow (*Peucaea aestivalis*), wintering Henslow's sparrow (*Ammodramus henslowii*), southeastern American kestrel (*Falco sparverius paulus*), brown-headed nuthatch (*Sitta pusilla*), Baltimore oriole, red-cockaded woodpecker (state and federally endangered), and prairie warbler (*Setophaga discolor*).

Coastal wetlands near the Winyah Bay drainage area, serve as wintering and staging areas for migratory waterfowl. The area also serves as wintering habitat for more ducks than any comparable habitat in South Carolina, and the river system provides a flight corridor for birds migrating between coastal wetlands. Forested floodplains also provide resting and feeding areas for waterfowl during stopovers. These include SGCN such as American green-winged teal (*Anas carolinensis*), mallards (*Anas platyrhynchos*), and Northern pintails (*Anas acuta*). Wood ducks also nest and produce offspring year-round in the NWR.

In the southern reaches of the ROI, a highly vulnerable group of birds—marsh and wading birds—occupy tidal marsh. These include many SGCN such as American bittern (*Botaurus lentiginosus*), pied-billed grebe (*Podilymbusp Podiceps*), American coot (*Fulica americana*), king rail (*Rallus elegans*), least bittern (*Ixobrychus exilis*), and American purple gallinule (*Porphyrio martinicus*). Others include Great egrets, green herons, little blue herons, snowy egrets, yellow-crowned night herons, and black-crowned night herons. Nearby, shorebird habitats along the coastal plain may provide for more SGCN such as greater and lesser yellowlegs (*Tringa melanoleuca*; *Tri. flavipes),* spotted sandpiper (*Actitis macularius*), and American woodcock (*Scolopax minor*).

Plants

SCDNR has identified numerous species of interest in the ROI including several at-risk species like Harper's fimbry, Venus flytrap, and wireleaf dropseed (Table 2, *Appendix A*). These more sensitive species of plants are most often found in habitats that have highly refined disturbance regimens and are often anthropogenically altered. Each of these at-risk species is addressed individually herein. However, more common plant species are mentioned or inferred based on their supporting habitats that are common throughout the study area and are referred to below.

Harper's fimbry is an annual sedge that occurs in the eastern U.S. on the Lower Coastal Plain, with highly variable year-to-year abundance at a site. The plants are restricted to areas in ponds and rivers that are exposed, but not desiccated, during seasonal low-water periods. Both alteration to site hydrology from drainage or excessive flooding impact the species and habitat negatively (NatureServe Explorer 2024*a*). Several observations of the species have been made by SCDNR (2023) since as recently as 2019 in the Longs/Red Bluff flood impact area of the ROI.

The Venus flytrap is a narrow endemic of the coastal plain of North and South Carolina, occurring in scattered pine savannas and flatwoods. The species has very narrow habitat needs which include frequent natural fire,

open understory and low nutrient soils. This more often is in areas between pine savannas or wet pine flatwoods and pocosins, with predominately wet or moist soils (NatureServe Explorer 2024*b*). An observation of this species was made by SCDNR (2023) as recently as 2021 at a timber lot close to the floodplain of the Conway flood impact area.

Wireleaf dropseed is a perennial graminoid endemic to the Coastal Plain that grows in permanently moist to wet pine savannas. The species is often found in habitats like ponds and longleaf pine dominated landscapes with interspersed patches of shrubs. It can also be found in interhabitat areas of pine/oak/wiregrass uplands and red maple-sweet gum-swamp tupelo drainages, as well as pitcher plant bogs and broad seepage slopes of small streams (NatureServe Explorer 2024*c*). An observation of this species was made by SCDNR (2023) as recently as 2023 in a disturbed patch of woody wetland in a broader landscape including patches of developed land and evergreen forest in the Socastee flood impact area (See *Appendix A* for a full list of SGCN and non-SGCN plant species in the ROI) (SCDNR 2023).

Listed Species

Some of these resources are listed as threatened or endangered species under the Endangered Species Act of 1973, as amended (16 USC §1531), for which the Services have jurisdiction. Table 1 shows the federally listed species that have the potential be found in the ROI due to their geographic ranges and suitable habitat. This table was generated by the Service's program called, "*Information for Planning & Consultation*" (IPAC). Although these species have the potential to be in the ROI due to their ranges, not all have suitable habitat in the area.

Table 1: Federally listed species under jurisdiction of the Services in the ROI

Common Name	Scientific Name	Status
American chaffseed	*Schwalbea americana*	E
Atlantic sturgeon	*Acipenser oxyrinchus*	E, CH*
Eastern black rail	*Laterallus jamaicensis jamaicensis*	T
Green Sea Turtle	*Chelonia mydas*	T, PCH
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E, PCH
Leatherback Sea Turtle	*Dermochelys coriacea*	E, CH
Loggerhead Sea Turtle	*Caretta caretta*	E, CH
Monarch butterfly	*Danaus plexippus*	PT, PCH
Northern long-eared bat	*Myotis septentrionalis*	E
Piping Plover	*Charadrius melodus*	T, CH
Pondberry	*Lindera melissifolia*	E
Red-cockaded woodpecker	*Picoides borealis*	E
Rufa Red Knot	*Calidris canutus rufa*	T, PCH
Shortnose sturgeon	*Acipenser brevirostrum*	E
Tricolored bat	*Perimyotis subflavus*	PE
West Indian manatee	*Trichechus manatus*	T, CH
Wood stork	*Mycteria americana*	T

Key: E - Endangered PE - Proposed Endangered T - Threatened PT – Proposed Threatened
CH - Critical Habitat PCH - Proposed Critical Habitat
*This is the sole critical habitat found within the ROI

Fish and Critical Habitat

Atlantic sturgeon and shortnose sturgeon are both endangered species found in the ROI. Shortnose sturgeon spend most of their time as adults in fresh and brackish water but do venture into lower coastal reaches and the ocean on rare occasions. Atlantic sturgeon is a subtropical, anadromous species that typically migrates up rivers in the spring and fall in this region to spawn. Both are bottom feeders. Historically, overfishing affected sturgeon populations. Current prominent threats to these species include habitat loss or fragmentation, dredging, migration/passage barriers, decreased water quality, and entanglement in fishing gear, as well as vessel strikes for Atlantic sturgeon. Shortnose sturgeons are currently found in downstream portions of the Waccamaw River, and the Carolina Distinct Population of Atlantic sturgeon is found throughout portions of the Great Pee Dee River and in the Waccamaw River up to Bull Creek which is designated as Critical Habitat for the Atlantic sturgeon.

Carolina Unit 5 is designated as critical habitat for the Carolina and South Atlantic DPS of Atlantic sturgeon. However, the Waccamaw River is believed to not support spawning and juvenile recruitment or to contain suitable habitat features to support spawning above its confluence with Bull Creek which links it to the Pee Dee River. Post and Waldrop (2020 and 2022) have documented Atlantic Sturgeon ascending further up the Waccamaw River than in previous years. Two adults were detected at the receiver [river kilometer (RKM) 61] near Toddville in the spring of 2020. Additionally, six fish tagged in 2022 in the Waccamaw River remained in the river that year, travelling between RKM 25.7 and 49.1. The receiver at RKM 61 is the uppermost receiver in the river, so sturgeon may have potentially traveled even further upstream. This reflects the presence of sturgeon but does not indicate any spawning.

Mammals

As noted in Table 1, the West Indian manatee is a federally-listed threatened species. Manatees can inhabit both salt and fresh waters and are found at shallow depths (5-20'). In the waters of the continental US, they and are most abundant in the warm waters of peninsular Florida. During the summer months manatees on the eastern coast of Florida have been reported to travel as far north as Cape Cod, Massachusetts (USFWS 2008*b*). Manatees that inhabit and travel through South Carolina waters during the warmer months will feed on salt marsh grasses at high tide and submerged algae beds at low tide. Manatees have been sited near the Charleston Peninsula in the Cooper River, the Ashley River, the Atlantic Intracoastal Water Way, and Shem Creek; a tidally influenced saltwater creek that drains directly into Charleston Harbor before draining into the Atlantic Ocean.

In the spring, summer, and fall, Northern long-eared bat (NLEB) and tricolored bat (TCB) occur in a wide variety of forested or wooded habitats where they roost and forage. NLEB roost under bark, and in cracks, crevices and cavities of live or dead trees, while TCB roost in clusters of leaves in live and dead deciduous trees, Spanish moss (*Tillandsia usneoides*), and clusters of dead pine needles. NLEB and TCB often overwinter in subterranean features (e.g., caves and abandoned mines) or other cave-like structures, but in the southern portions of their ranges, where caves and mines are sparse, NLEB and TCB also roost in trees, road-associated culverts, and bridges and remain active and feed during the winter (USFWS 2024*a*).

Reptiles

Leatherback sea turtles, found in offshore waters, and Kemp's ridley sea turtles, found in nearshore waters, are not expected to be in the ROI. Loggerhead and green sea turtles are the most common species in South Carolina waters, and their distribution at different life stages varies including offshore waters, bays, inlets,

river mouths, salt marshes, creeks, ship channels, and sandy beaches for nesting. Subadult and adult loggerheads move into coastal waters, such as Winyah Bay, to prey on mollusks, crustaceans, and fish. Although loggerheads and greens could be found in Winyah Bay, they are unlikely to wander into the shallow, altered tidal creeks upstream the Waccamaw River. Additionally, they will not be nesting in this area.

Threats to sea turtles include vessel strikes, dredging, fishing by-catch and entanglement, degradation of foraging habitat, pollution, and disease. Beyond the ROI, near Georgetown, critical habitat for nesting loggerhead sea turtles is federally designated extending in both directions from the mouth of Winyah Bay to North Inlet along North Island (LOGG-T-SC-01) and to North Santee Inlet along South Island (LOGG-T-SC-02 & LOGG-T-SC-03). Additionally, nearshore critical habitat is designated from North Inlet to Five Fathom Creek Inlet (crossing Winyah Bay and North Santee Inlet) from mean high water line seaward 1.6 kilometers (LOGG-N-6).

Insects

The Monarch Butterfly is proposed for listing as a threatened species with proposed critical habitat under the ESA. It is proposed with protective regulations under section 4(d) of the ESA. It is also considered a species of highest conservation priority in the 2015 SWAP (SCDNR 2015). Monarch Butterflies inhabit a variety of habitats where they feed on nectar; however, the species is dependent upon milkweed species for reproduction as that is the sole food source for larvae (USFWS(*b*) n.d.).

Birds

The endangered red-cockaded woodpecker (RCW) is known to nest within the NWR in mature pine forest of Sandy Island. Wood stork, a federally threatened and state endangered species, have also had rookeries documented in the ROI. Additionally, the federally protected, eastern black rail range is partially in the study area, but unlikely present due to unsuitable habitat. Finally, piping plovers and Rufa red knots are two federally protected shorebird species that are found along the SC coast.

The wide range of bald eagles span across coastal South Carolina and the study area. Bald eagles build their nests along coasts, riverbanks, and lakes. Usually in SC, nests are found in tall, live pines and are within one mile to large bodies of water. Bald eagles are federally protected under the Bald and Golden Eagle Protection Act (54 Stat. 250, as amended, 16 U.S.C. 668a-d) and the Migratory Bird Treaty Act (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.).

Plants

Within the ROI, there are several plant species that are federally protected, such as American Chaffseed, and Pondberry. American chaffseed occurs in fire-maintained longleaf pine flatwoods and savannas. Chaffseed is dependent on factors like fire, mowing, or fluctuating water tables to maintain the open to partly-open conditions that it requires (USFWS(*a*) n.d.). Pondberry, for the most part, is associated with wetland habitats such as bottomland and hardwoods in the interior areas, and the margins of sinks, ponds and other depressions in the more coastal sites. The plants generally grow in shaded areas but may also be found in full sun (USFWS(*c*) n.d.).

IMPACTS OF THE RECOMMENDED PLAN ON FISH AND WILDLIFE RESOURCES

The goal of flood risk management projects is to help prevent or reduce flood risks, including improving safety and reducing property damage. Flood risk management projects range in impacts to fish and wildlife resources. This section analyzes the impacts on fish and wildlife resources from the Recommended Plan (same as the TSP).

The Recommended Plan includes:

(1). The construction of relief bridges (cross drains) in Conway.

(2). The Removal of weirs along Socastee Creek in Socastee.

Relief Bridges

The plan is to add relief bridges or culverts in Conway at 501 Business, 501 Bypass, and 905 to increase conveyance through these areas where potential bottlenecking of floodwaters occurs. The Edward E. Burroughs relief bridges will most likely consist of culverts due to the proximity of the existing bridge. The proposed protections include decreasing the flood depths and the size of the floodplain upstream of the Edward E. Burroughs highway along the Waccamaw River. This relief bridge will convey more water away from the inundated zone. It is expected to decrease the water depths and possibly reduce the size of the floodplain upstream of Highway 501 Business that crosses the Waccamaw River. Potential interference with a railroad crossing at 905 will require mitigation. The plan proposes installing drainage infrastructure on Hwy 501, which will consist of a new bridge and culverts to allow more flow, depending on space and SCDOT requirements.

Fishery/Aquatic

Relief bridges and culverts both functionally have similar impacts on riverine systems, though impacts are generally more severe the narrower a waterway is constrained by such hardened structures. Poor planning, poor construction, or degradation of the culvert over time can cause culverts to lose habitat connectivity. Culverts are known for reducing the movement of fish and other aquatic organisms by creating high-velocity flows (Mahlum et al. 2014), high hanging heights (Burford et al. 2009), and obstruction by built-up debris and sediment (Wellman et al. 2000). However, properly designed culverts can enhance habitat connectivity (Lehrter et al. 2023).

A loss of habitat connectivity can impact fish movement, migration, and reproduction. This decline can lead to reduced species diversity, population numbers, and population resilience (Lehrter et al. 2023, NOAA Fisheries, n.d.). Freshwater mussels are obligatory parasites and rely on species-specific host fishes for reproduction and dispersal. Freshwater mussels or their glochidia must encounter their required host fish to successfully attach and metamorphose into juvenile mussels. Changes to aquatic habitats that alter natural habitat niches and available food resources can cause host fishes to move to their preferred habitats, which may be away from the mussel populations using them as hosts. Furthermore, dams or other structures that impede fish migration directly affect mussel distribution and range (Watters 1996; Eads et al. 2015).

The accumulation of fine sediments within and downstream of culverts can also occur, creating changes to benthic habitat for fish and invertebrates (Quigley and Harper 2000). These factors can contribute to changes in the biodiversity and community compositions of streams intersected by culverts and relief bridges.

Sedimentation can also negatively affect freshwater fish by impacting their feeding behavior and spawning success (Chapman et al. 2014). All freshwater mussels are extremely sensitive to sedimentation, which largely associates with disturbances of nearby riparian habitats, development or construction, clear-cutting, and removal of riparian buffers. The effects of sedimentation on unionid mussels are undeniable. Sedimentation interferes with mussels' ability to feed by decreasing the availability of food particles or directly disrupting the filter-feeding and respiration processes of mussels. Not only do particles interfere with feeding, but reproduction also suffers due to a lack of fertilization and, in some instances, complete reproductive failure. Negative interactions between host fishes and mussel larvae, including negative impacts on glochidial encystment, also affect mussel reproduction. Beyond these negative effects on feeding, respiration, and reproduction, sedimentation can directly smother unionid mussels, resulting in mortality. An environmental review on this topic regarding unionids can be found in Goldsmith et al. 2021.

Relief bridges can also have both positive and negative hydrologic and hydraulic effects. They can minimize the risk of flooding by allowing water to flow more freely underneath, especially during heavy rainfall or flood events. By providing a larger opening for water to pass through, relief bridges can reduce the chances of water backing up and causing localized flooding. By maintaining a clear path for water flow, relief bridges help stabilize the natural channels underneath. This stabilization can prevent erosion and sediment buildup, maintaining the integrity of the watercourse and reducing the risk of channel shifting or bank erosion. Relief bridges can increase the hydraulic capacity of waterways by providing a wider and deeper opening for water to pass through. This improvement can enhance overall drainage and reduce the likelihood of overtopping during high-flow events.

If properly installed, the relief bridge along Highway 905 in Conway could provide a net benefit to the environment by enhancing connectivity of floodplain habitat, which currently intersects with elevated roadways and bridges. Increasing downstream conveyance of floodwaters may reduce some of the areal extent of the floodplain but would allow for more natural movement of floodwaters throughout the system of floodplains. Relief at Highway 905 may also restore floodplain connectivity between the Waccamaw River and Kingston Lake, which the roadway currently reduces.

Wildlife – Mammals

Depending on the size, material, and design of culverts, they can be harmful or beneficial for different mammals, including the West Indian manatee, Northern Long-Eared Bat (NLEB), and Tricolored Bat (TCB). TCBs are opportunistic regarding their roosts, and newly installed culvert pipes can incidentally serve as excellent roosts. Culverts account for the majority of hibernacula documented in Mississippi, Georgia, and Louisiana (Limon et al. 2018, North American Bat Monitoring Program 2021). In road-associated culverts in the southern U.S., TCBs move within and between culverts throughout the winter (Anderson et al. 2019).

Culverts can be detrimental to animal movement in various ways. They can create barriers through elevation drops, become clogged with debris, produce excessive water velocities, lack bank-edge areas, generate excessive turbulence, have insufficient water depth, and disrupt channel substrate continuity (USFS 2008). During in-water construction, risks to manatees arise, with the potential for injury or death. Additionally, manatees can become stuck and lost when entering culverts and pipes. Entrapment within culverts can lead to starvation, drowning, and death.

Wildlife – Amphibians/Reptiles

Similar to the impacts on fishery and aquatic resources, the design of the culvert will have effects on

amphibians and reptiles in the area. Culverts can act as barriers or connectors between habitats. If the water velocity is too high, it can pose a challenge for amphibians and reptiles to use the culvert. Additionally, if the bottom of the culvert does not align with the ground or water level, wildlife cannot pass through and utilize the culvert.

Roadways significantly affect herpetofauna populations, leading to high rates of direct mortalities on the roads, as well as habitat fragmentation and reductions in gene flow and habitat utilization (Andrews et al. 2007). Research has shown that amphibians and reptiles can use culverts as wildlife crossings with roadways. The most successful structures for herpetofauna combine guide fences and underpasses to funnel organisms beneath roadways (Dodd et al. 2004; Aresco 2005; Andrews et al. 2007; Patrick 2010).

Wildlife – Insects

Relief bridges and culverts can fragment habitats and change the composition of surrounding vegetation. They can alter hydrology and water flow, disrupting natural water regimes. This disruption can impact wildlife, such as the monarch butterfly, which relies on milkweed, including aquatic milkweed. Changes in hydrology and vegetation can have negative or positive effects, depending on project specifics such as location or culvert design.

Wildlife – Birds

Construction of the relief bridges or culverts can cause temporary disturbances, and impacts may vary depending on the time of year. Birds are most vulnerable at different times throughout the year. The wood stork and eastern black rail are particularly vulnerable during their nesting seasons. Eastern black rails also undergo a flightless molt period, which is another vulnerable time. Springtime is when these birds and other non-listed species undergo their nesting season. The wood stork's nesting season runs from March to August, while the eastern black rail's breeding season occurs from April to August. The flightless molt period for the eastern black rail lasts from August to October.

Wildlife – Plants

As mentioned, culverts can change the hydrology of an area and, therefore, alter vegetation composition. Changes in dominant plant life can create a domino effect, leading to changes in other species in the area. The entire aquatic ecosystem is interconnected, and all species depend on each other for food and other essential interactions. The conservation of any target species relies on a healthy and diverse ecosystem, making it essential to focus on habitat quality (including plants) and continuity for aquatic communities rather than on one individual species (USFS 2008).

Barrier Removal

Barrier removal involves removing the two existing weirs on the Socastee Creek Federal Project. Water currently flows around the weirs, eroding the area and damaging the weir structures. This measure would increase conveyance in the adjacent flood impact area. The original construction of the weirs aimed to maintain a certain groundwater level to mitigate the loss of surrounding wetland areas. However, with increased development in this area, the weirs are unlikely to preserve the natural habitat as originally intended.

Some considerations and assumptions indicate that floodplain encroachment and preconstruction site clearing may pose environmental impacts. Removing the weir requires a perpetual 25-foot-wide easement for

maintenance on both sides, plus a 10-foot-wide temporary easement during construction, totaling 70 feet. Floodplain encroachment and pre-construction site clearing will pose temporary environmental impacts. Limited equipment use will result in minor dust and emissions, especially compared to larger construction projects.

Fishery/Aquatic

Direct effects to aquatic habitat from weir removal include induced erosion upstream and downstream, sedimentation of fine grains downstream (Thomas et al. 2014), and an increase in flow velocity upstream (Im et al. 2011). Dispersion of built-up sediment downstream will be a limited, temporary impact in Socastee Creek and will minimize through the use of turbidity curtains. This action is unlikely to have measurable effects on water quality (i.e., through increased turbidity or sedimentation) of the Atlantic Intracoastal Waterway (AIWW) given the distance between the weirs and the waterway, along with the use of avoidance and minimization measures like turbidity curtains.

Sedimentation undeniably affects unionid mussels, but this disturbance is expected to be temporary. Sedimentation interferes with mussels' ability to feed by decreasing the availability of food particles or directly disrupting the filter-feeding and respiration processes. Particles not only interfere with feeding but also impair reproduction due to a lack of fertilization, which can lead to complete reproductive failure. Negative interactions between host fishes and mussel larvae, including adverse impacts on glochidial encystment, also affect mussel reproduction. Beyond these negative effects on feeding, respiration, and reproduction, sedimentation can directly smother unionid mussels, resulting in mortality. An environmental review on this topic regarding unionids appears in Goldsmith et al. 2021.

Long-term positive effects of removing existing weirs in Socastee Creek likely include restoring natural flow and sinuosity, promoting the growth of bankside vegetation, and increasing the capacity for aquatic organisms to move upstream (Im et al. 2011; Thomas et al. 2014; Kim and Choi 2019). The potential for adverse downstream effects may be more limited than the potential for beneficial upstream effects, as habitat suitability may improve for a broader diversity of native lotic fish and invertebrate species (Im et al. 2011; Im et al. 2018; Kim and Choi 2019). Similarly, restoring natural flow conditions has shown to increase fish abundance systemwide (Im et al. 2018) and improve the capacity for bi-directional movement of aquatic organisms (Birnie-Gauvin et al. 2018). All these effects are expected to yield wider beneficial ecosystem impacts (Lefcheck et al. 2015; Thompson et al. 2017).

Weirs are designed to facilitate fish passage, but they can act as barriers for non-target weak-swimming or crawling species. Weirs disrupt streambed continuity and may limit the movement of benthic organisms and aquatic and riparian-dependent species that require dry or shallowly submerged surfaces for movement (USFS 2008).

Macroinvertebrates characterized as swimmers, clingers, and sprawlers benefit the most from weir removal, while reduced habitat for burrowers reflects a drop in species dominance (Kim and Choi 2019). Effects on fish community structure depend on existing guilds and may exhibit modest changes in diversity and dominance of fish species generally (Im et al. 2019). However, greater continuity between upstream and downstream reaches is expected, and some evidence suggests increased fish abundance following weir removal (Im et al. 2019). Furthermore, barrier removal improves the capacity for aquatic organisms to move for feeding and spawning, potentially increasing their populations (Birnie-Gauvin et al. 2018). Potential improvements in habitat connectivity, lower trophic level biodiversity, and increased populations create conditions for higher ecosystem function (Lefcheck et al. 2015; Thompson et al. 2017).

Wildlife – Mammals

The removal process of the weirs may cause temporary disturbances. Impacts to the West Indian manatee are possible due to their documented use of the AIWW and the potential changes in upstream hydrology and sedimentation. However, this species exists in low numbers and infrequently visits the area.

The removal requires permanent and temporary easements on both sides, along with preconstruction site clearing. Removing trees can impact bats because of their roosting, breeding, and foraging behaviors. Bats also have critical periods for hibernation, torpor, pupping, or summer occupancy. Construction that affects these behaviors, especially during critical periods, can negatively impact bats.

Wildlife – Amphibians/Reptiles

The removal process of the weirs may cause temporary disturbances. Impacts to amphibians and reptiles in the area are possible due to their use of the AIWW and potential changes in upstream hydrology and sedimentation.

The expected sedimentation and dust are minimal. However, sediment and nutrient loading in freshwater can lead to habitat degradation and negatively impact habitat suitability for amphibians and reptiles in the area. Tadpoles are particularly sensitive to alterations in their environment. Even moderate sedimentation in waterways can negatively affect tadpoles, impacting their growth and survival to metamorphosis (Wood and Richardson 2008).

Wildlife – Insects

The removal process of the weirs may cause temporary disturbances. Impacts to insects in the area are possible due to their use of the AIWW and potential changes in upstream hydrology and sedimentation.

The removal requires permanent and temporary easements on both sides, along with preconstruction site clearing. Monarch butterflies rely on specific vegetation, such as milkweed. If the removal displaces or removes milkweed, it will affect habitat suitability for the monarch butterfly.

Wildlife – Birds

Removing the weirs can cause temporary disturbances, such as increased noise, and impacts may vary depending on the time of year. Birds are most vulnerable at different times throughout the year. The wood stork and eastern black rail are particularly vulnerable during their nesting seasons. Eastern black rails also undergo a flightless molt period, which is another vulnerable time. Springtime is when these birds and other non-listed species are nesting. The wood stork's nesting season runs from March to August, while the eastern black rail's breeding season occurs from April to August. The flightless molt period for the eastern black rail lasts from August to October.

Wildlife – Plants

Permanent removal of vegetation may occur during the preconstruction site clearing phase. Depending on the plant species removed, this action can impact other species that utilize the area.

RECOMMENDATIONS AND POSITION OF THE SERVICES

The Recommended Plan is expected to have minimal impacts to fish and wildlife resources. The Service recommends the following fish and wildlife conservation recommendations are implemented concurrently with project implementation:

- The Service recommends following the specific species conservation measures in Appendix B.
- The Service recommends using the U.S. Forest Service guidelines and stream simulation method when designing the culverts and relief bridges to avoid impacts to the entire ecosystem and associated species. The measures can be found in "*Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings*" (USFS 2008).
- The Service recommends designing culverts to prevent manatee entrapment. All culverts 8 inches to 8 feet in diameter must be grated to prevent manatee entrapment. To effectively prevent manatee access, grates must be permanently fixed, spaced a maximum of 8 inches apart (may be less for culverts smaller than 16 inches in diameter) and may be installed diagonally, horizontally or vertically. For new culverts, grates must be attached prior to installation of the culverts. Culverts less than 8 inches or greater than 8 feet in diameter are exempt from this requirement.
- The Service recommends considering bat management when designing the culverts and relief bridges. In the culverts, weep holes and roughened concrete can be attractive for the bats. For the bridges, bats prefer parallel box beam and prestressed girder type bridges. On bridges, bat boxes, bat condos, or bat roosts can be installed as another management technique (Wetzel and Roby 2023).
- The Service recommends installing erosion and sedimentation control measures before any land-disturbing activities. Sedimentation control measures can be placed both within the work area and at the outer limits of the site to contain runoff before it leaves the area, with removal of these measures after project completion.
- The Service recommends regular inspections of the culverts and relief bridges to maintain and ensure that debris and obstructions do not impede movement.
- The Service recommends taking proactive measures to prevent the establishment of invasive species in disturbed habitats. Strategies to limit invasions include thoroughly inspecting and cleaning all construction equipment before and after use, preserving trees and riparian vegetation whenever possible, reseeding disturbed soil or fill areas with native plant species appropriate for the ecoregion, and implementing monitoring and maintenance plans that include measures to control invasive plants.
- The Service recommends following avoidance and minimization measures for birds found in the Service's "Avoidance and Minimization Measures: Transportation" and the "Nationwide Avoidance & Minimization Measures for Birds."

In addition to the recommendations from Service, NMFS has also provided rationalized support or otherwise for several measures to be considered in further refinement of project development. These were developed before the selection of the Recommend Plan and therefore, may not be applicable to the chosen Recommended Plan.

NMFS fully supports:

- Nonstructural alternatives as its first option (i.e., acquisitions, elevations, and flood warning systems).
- For reasons cited above for each respective measure—barrier (weir) removal, raising of Pee Dee Highway with appropriate-sized bridges or culverts, limited benching, and relief bridges which include appropriately-sized culverts.

NMFS does not support, because of their unavoidable and potentially severe impacts to fish and wildlife resources, the following:

- Floodwalls or levees (and associated gates and pumps), detention ponds and floodgates. Levees are particularly egregious because while they may provide immediate protection to a section of stream bank, stream velocity increases and the downstream erosional impacts are intensified.

Lastly:

- A nature-based solution, water farming, poses a number of unknowns and may not be a viable measure. If the measure served as a deterrent to private development of the land, then it would be expected to provide some benefit.

APPENDIX A

SWAP CONSERVATION PRIORITY SPECIES, STATE PROTECTED SPECIES AND FEDERALLY PROTECTED SPECIES THAT ARE LOCATED WITHIN THE ROI

Table A-1: Supporting habitats found throughout the ROI.

Habitat Type	Description
Open Water	Open water includes all unvegetated water bodies. In the ROI, this refers predominately to the Waccamaw River, some of its tributaries, and the mouth of the Waccamaw River at Winyah Bay.
Freshwater Marsh	Freshwater marsh are a type of freshwater wetlands dominated by emergent vegetation. Most of these marshes in the ROI are tidally influenced. Freshwater marshes remain flooded or saturated except during extremely dry weather periods. Most freshwater marshes in the ROI have intersecting abandoned dikes and canals erected for rice cultivation during the 18th and 19th centuries. This habitat type supports a great degree of plant diversity relative to similar habitats in the ROI. Common species of freshwater marsh plants are giant cutgrass, pickerelweed, wild rice, jewelweed, water parsnip, smartweeds, yellow pondlily, water hemlock, arrowhead, rose mallow, soft-stem bulrush, giant cordgrass, cattail, loosestrife, white water lily and alligator weed. Woody vegetation including tag alder, bald cypress, buttonbush, tupelo and black gum also grow on abandoned rice field levees.
Managed Wetlands	Managed wetlands in the ROI are generally former rice field areas impounded by dikes and levees, where hydrology is altered primarily for growth of emergent vegetation attractive to waterfowl. This may include smartweed, panic grass, wild millet, red root, water shield, spikerush, arrow-arrum, white water lily, southern naiad, Asiatic dayflower, soft-stem bulrush, wild rice, and water grass. Cultivated grains may also grown during drawdown periods.
Deciduous Forested Wetlands – Temporarily and Seasonally Flooded Tidal	Deciduous forested wetlands of this type are periodically influenced by tidal fluctuations. Flooding with lunar tides and high river flows often occurs in the winter through late spring. Inundation periods vary from few days to weeks in winter and early spring and as late as into the summer. These habitat types support a high level of diversity, but common trees include red maple, overcup oak, swamp chestnut oak, water oak, laurel oak, water hickory, green ash, sweet gum, river birch, swamp tupelo, bald cypress, and loblolly pine.
Deciduous Forested Wetlands – Semipermanently Flooded Tidal	Deciduous forested wetlands of this type remain flooded or saturated throughout most years but may be susceptible to drought periods. Tidal amplitudes influence water depths in these forests. Dominant plant species include swamp tupelo, bald cypress, green ash, water tupelo, and red maple.

Deciduous Forested and Shrub Wetlands – Regularly Flooded Tidal	Deciduous forested and shrub wetlands of this type remain flooded or saturated throughout most years. Water depths fluctuate regularly with tides. Dominant species of plants often include swamp privet, buttonbush, and tag alder.
Deciduous Forested and Shrub Wetlands – Temporarily Flooded or Saturated	Deciduous forested and shrub wetlands of this type remain flooded or saturated throughout the winter and briefly during spring. Tidal influences are often lacking in these habitats and usually occurs at the higher elevations. Typical plant species include swamp chestnut oak, water oak, cherrybark oak, loblolly pine, several species of hickories, white oak, tulip poplar, ironwood, sycamore, and sweetgum.
Deciduous Forested and Shrub Wetlands – Seasonal and Semipermanently Flooded	Deciduous forested and shrub wetlands of this type have varied periods of flooding, being for extensive periods during the growing season to throughout most of annual cycles. Tidal influence is little to none. Typical species in drier soils include water oak, green ash, American elm, and sweetgum. In wet soils species include overcup oak, water hickory, water tupelo, swamp tupelo, and bald cypress.
Evergreen Forested and Shrub Wetlands	Evergreen forested and shrub wetlands rarely experience inundation from flooding, but periodically retain soil moisture at the surface. This habitat is often at high elevations in the floodplain and results from poorly drained soils or pockets in surface topography. Common species include loblolly pine, spruce pine, live oak, and American holly. Beyond floodplain, habitats matching this definition may include bay swamps, pine savannahs, or wet pine flatwoods and are dominated by pond pine, loblolly bay, sweet bay, red bay, titi, fetter-bush, wax myrtle, zenobia, and sweet gallberry.
Upland Forests	Upland forests include any area that does not meet the definition of wetland or deepwater habitat as classified by Cowardin et al. (1979). Upland plant communities are highly diverse and include maritime sandhill community, longleaf pine savannahs, and flatwoods with intermittent inclusions of small evergreen and deciduous depressions, pocosins, freshwater depression meadows, broad-leafed deciduous swamps, and pond pine woodlands.

Table A-2: List of SGCN and non-SGCN plant species identified in the ROI by SCDNR (2023).

Common Name	Scientific Name	SWAP Priority
Scale-leaf Agalinis	*Agalinis aphylla*	Moderate
Pinebarrens Peanut-grass	*Amphicarpum amphicarpon*	N/A
Tawny Bluestem, Bog Bluestem	*Andropogon mohrii*	N/A

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Purple Silkyscale	*Anthenantia rufa*	N/A
Big Three-awn	*Aristida condensata*	N/A
Stalked Milkweed, Savanna Milkweed	*Asclepias pedicellata*	N/A
Aquatic Milkweed	*Asclepias perennis*	N/A
Savanna Honeycomb-head, Yellow Balduina	*Balduina uniflora*	N/A
Crowfoot Sedge, Ravenfoot Sedge	*Carex crus-corvi*	N/A
Cypress-knee Sedge, Epiphytic Sedge	*Carex decomposita*	High
Elliott's Sedge	*Carex elliottii*	Moderate
Leatherleaf, Cassandra	*Chamaedaphne calyculata*	N/A
Twig-rush, Fen-sedge, Smooth Sawgrass	*Cladium mariscoides*	Moderate
Swamp Coreopsis	*Coreopsis gladiata*	N/A
Beadle's Coreopsis	*Coreopsis palustris*	N/A
Rose Coreopsis	*Coreopsis rosea*	High
Georgia Sunrose, Georgia Frostweed	*Crocanthemum georgianum*	N/A
Le Conte's Flatsedge	*Cyperus lecontei*	Moderate
Smallflower Halfchaff	*Cyperus subsquarrosus*	N/A
Venus Flytrap, Meadow Clam, Tippitiwitchet	*Dionaea muscipula*	High
Robbins's Spikerush	*Eleocharis robbinsii*	N/A
Viviparous Spikerush	*Eleocharis vivipara*	Moderate
Green-fly Orchid	*Epidendrum conopseum*	N/A
Recurved Eupatorium	*Eupatorium recurvans*	Moderate
Harper's Fimbry	*Fimbristylis perpusilla*	High
Swamp Jessamine	*Gelsemium rankinii*	N/A
Pinebarren Gentian	*Gentiana autumnalis*	High
Mud-babies, Dwarf-burhead	*Helanthium tenellum*	N/A
Pygmy Spiderlily, Waccamaw Spiderlily	*Hymenocallis pygmaea*	N/A
Sarvis Holly	*Ilex amelanchier*	N/A
Brown-fruited Rush	*Juncus pelocarpus*	N/A
Southern Bogbutton	*Lachnocaulon beyrichianum*	N/A
Brown Bogbutton	*Lachnocaulon minus*	Moderate
Carolina Lilaeopsis	*Lilaeopsis carolinensis*	Moderate
Pondspice	*Litsea aestivalis*	High
Long Beach Seedbox, Coastal Plain Water-purslane	*Ludwigia brevipes*	High
Carolina Birds-in-a-nest, Carolina Macbridea	*Macbridea caroliniana*	High
Narrowleaf Pondlily, Bonnets	*Nuphar sagittifolia*	N/A
Riverbank Evening-primrose	*Oenothera riparia*	N/A
Spiked Medusa, Smooth-lipped Eulophia	*Orthochilus ecristatus*	High
Savanna Cowbane	*Oxypolis ternata*	High
Carolina Grass-of-Parnassus, Savanna Parnassia, Eyebright	*Parnassia caroliniana*	High
Tidal Marsh Obedient-plant, Swamp Obedient-plant	*Physostegia leptophylla*	N/A
Sandhill Goldenaster	*Pityopsis pinifolia*	N/A
Pineland Plantain	*Plantago sparsiflora*	High
Swamp-forest Beaksedge	*Rhynchospora decurrens*	N/A
Narrow-fruit Horned Beaksedge	*Rhynchospora inundata*	N/A
Feather-bristled Beaksedge	*Rhynchospora oligantha*	N/A
Plymouth Gentian	*Sabatia kennedyana*	High
Weatherby's Arrowhead	*Sagittaria weatherbiana*	Moderate
Yellow Pitcherplant, Trumpets	*Sarracenia flava*	N/A
Chaffseed	*Schwalbea americana*	Highest
Baldwin's Nutrush	*Scleria baldwinii*	N/A
Beautiful Goldenrod, Carolina Goldenrod	*Solidago pulchra*	High

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Wireleaf Dropseed	*Sporobolus teretifolius*	High
Smooth Hedge-nettle	*Stachys tenuifolia*	Moderate
Yellow Hatpins, Bantam-buttons	*Syngonanthus flavidulus*	N/A
Shortleaf Yellow-eyed-grass	*Xyris brevifolia*	Moderate
Elliott's Yellow-eyed-grass	*Xyris elliottii*	N/A
Savanna Yellow-eyed-grass	*Xyris flabelliformis*	Moderate
Florida Atamasco-lily, Red-margined Atamasco-lily	*Zephyranthes simpsonii*	High

Table A-3: Animal Species for consideration during study development.

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
INSECT				
Bombus pensylvanicus	American Bumble Bee	At-Risk Species	NA	NA
Danaus plexippus	Monarch Butterfly	Proposed Threatened	NA	Highest
FRESHWATER MUSSEL				
Atlantichonca ochracea	Tidewater Mucket	NA	NA	High
Elliptio angustata	Carolina Lance	NA	NA	Moderate
Elliptio complanata	Eastern Elliptio	NA	NA	Moderate
Elliptio congaraea	Carolina Slabshell	NA	NA	Moderate
Elliptio folliculata	Pod Lance	NA	NA	High
Elliptio icterina	Variable Spike	NA	NA	Moderate
Elliptio producta	Atlantic Spike	NA	NA	High
Lampsilis cariosa	Yellow Lampmussel	NA	NA	Highest
Lampsilis radiata	Eastern Lampmussel	NA	NA	High
Lampsilis splendida	Rayed Pink Fatmucket	NA	NA	High
Sagittunio nasutus	Eastern Pondmussel	NA	NA	High
Toxolasma pullus	Savannah Lilliput	NA	NA	Highest
Villosa delumbis	Eastern Creekshell	NA	NA	Moderate
FRESHWATER SNAIL				
Lioplax subcarinata	Ridged Lioplax	NA	NA	High
CRAYFISH				
Procambarus ancylus	Coastal Plain Crayfish	NA	NA	Moderate
Procambarus blandingii	Santee Crayfish	NA	NA	Moderate

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
Procambarus braswelli	Waccamaw Crayfish	NA	NA	High
Procambarus chacei	Cedar Creek Crayfish	NA	NA	Moderate
Procambarus pearsei	Carolina Sandhills Crayfish	NA	NA	Moderate
FISH				
Acipenser brevirostrum	Shortnose Sturgeon	Federally Endangered	State Endangered	Highest
Acipenser oxyrinchus	Atlantic Sturgeon	Federally Endangered	NA	Highest
Alosa aestivalis	Blueback Herring	NA	NA	Highest
Alosa mediocris	Hickory Shad	NA	NA	Highest
Alosa sapidissima	American Shad	NA	NA	Highest
Ameiurus brunneus	Snail Bullhead	NA	NA	Moderate
Ameiurus catus	White Catfish	NA	NA	Moderate
Ameiurus platycephalus	Flat Bullhead	NA	NA	Moderate
Anguilla rostrata	American Eel	NA	NA	Highest
Chologaster cornuta	Swampfish	NA	NA	Moderate
Elassoma boehlkei	Carolina Pygmy Sunfish	NA	State Threatened	Highest
Enneacanthus obesus	Banded Sunfish	NA	NA	Moderate
Etheostoma serrifer	Sawcheek Darter	NA	NA	Moderate
Fundulus diaphanus	Banded Killifish	NA	NA	Moderate
Notropis chalybaeus	Ironcolor Shiner	NA	NA	Moderate
REPTILE				
Chelydra serpentina	Snapping Turtle	NA	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Clemmys guttata	Spotted Turtle	At-Risk Species	State Threatened	High
Deirochelys reticularia	Chicken Turtle	NA	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Heterodon simus	Southern Hog-nosed Snake	NA	State Threatened	Highest

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Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
Kinosternon baurii	Striped Mud Turtle	NA	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Ophisaurus attenuatus	Slender Glass Lizard	NA	NA	Moderate
Pituophis melanoleucus	Pinesnake	NA	NA	Highest
Terrapene carolina	Eastern Box Turtle	NA	Possession regulated under S.C. Code of laws 50-15-70	Moderate
BIRD				
Anhinga anhinga	Anhinga	Migratory Bird Treaty Act	NA	Moderate
Ardea alba	Great Egret	Migratory Bird Treaty Act	NA	NA
Ardea herodias	Great Blue Heron	Migratory Bird Treaty Act	NA	Moderate
Butorides virescens	Green Heron	Migratory Bird Treaty Act	NA	Highest
Dryobates borealis	Red-cockaded Woodpecker	Federally Endangered	State Endangered	Highest
Egretta caerulea	Little Blue Heron	Migratory Bird Treaty Act	NA	Highest
Egretta thula	Snowy Egret	Migratory Bird Treaty Act	NA	Moderate
Elanoides forficatus	Swallow-tailed Kite	Migratory Bird Treaty Act	State Endangered	Highest
Haliaeetus leucocephalus	Bald Eagle	Bald & Golden Eagle Protection Act	State Threatened	High
Icterus galbula	Baltimore Oriole	Migratory Bird Treaty Act	NA	High
Mycteria americana	Wood Stork	Federally Threatened	State Endangered	Highest
Nyctanassa violacea	Yellow-crowned Night-Heron	Migratory Bird Treaty Act	NA	Highest
Nycticorax nycticorax	Black-crowned Night-Heron	Migratory Bird Treaty Act	NA	Highest
Sternula antillarum	Least Tern	Migratory Bird Treaty Act	State Threatened	Highest
MAMMAL				
Corynorhinus rafinesquii	Rafinesque's Big-eared Bat	NA	State Endangered	Highest

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Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
Eptesicus fuscus	Big Brown Bat	NA	NA	Highest
Lasiurus borealis	Eastern Red Bat	NA	NA	Highest
Lasiurus cinereus	Hoary Bat	NA	NA	Highest
Lasiurus seminolus	Seminole Bat	NA	NA	Highest
Myotis austroriparius	Southeastern Bat	NA	NA	Highest
Sciurus niger	Eastern Fox Squirrel	NA	NA	Moderate
Trichechus manatus	Florida Manatee	LT: Federally Threatened	State Endangered	Highest
Ursus americanus	American Black Bear	NA	NA	Moderate

Table A-4: Plant Species for consideration during study development.

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
Agalinis aphylla	Scale-leaf Agalinis	NA	NA	Moderate
Calamovilfa brevipilis	Pinebarren Sandreed	NA	NA	Moderate
Carex decomposita	Cypress-knee Sedge, Epiphytic Sedge	NA	NA	High
Carex elliottii	Elliott's Sedge	NA	NA	Moderate
Ceratiola ericoides	Rosemary, Florida Rosemary, Sandhill Rosemary, Sand Heath	NA	NA	Moderate
Cladium mariscoides	Twig-rush, Fen-sedge, Smooth Sawgrass	NA	NA	Moderate
Coreopsis rosea	Rose Coreopsis	NA	NA	High
Dionaea muscipula	Venus Flytrap, Meadow Clam, Tippitiwitchet	At-Risk Species	NA	High
Eleocharis vivipara	Viviparous Spikerush	NA	NA	Moderate
Eupatorium recurvans	Recurved Eupatorium	NA	NA	Moderate
Fimbristylis perpusilla	Harper's Fimbry	At-Risk Species	NA	High
Gentiana autumnalis	Pinebarren Gentian	NA	NA	High
Lachnocaulon minus	Brown Bogbutton	NA	NA	Moderate
Lechea torreyi var. congesta	Sandhill Pinweed	NA	NA	NA
Lilaeopsis carolinensis	Carolina Lilaeopsis	NA	NA	Moderate

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Litsea aestivalis	Pondspice	NA	NA	High
Ludwigia brevipes	Long Beach Seedbox, Coastal Plain Water-purslane	NA	NA	High
Ludwigia lanceolata	Lanceleaf Seedbox	NA	NA	High
Ludwigia ravenii	Raven's Seedbox	At-Risk Species	NA	NA
Macbridea caroliniana	Carolina Birds-in-a-nest, Carolina Macbridea	NA	NA	High
Orthochilus ecristatus	Spiked Medusa, Smooth-lipped Eulophia	NA	NA	High
Oxypolis ternata	Savanna Cowbane	NA	NA	High
Parnassia caroliniana	Carolina Grass-of-Parnassus, Savanna Parnassia, Eyebright	NA	NA	High
Peltandra sagittifolia	Spoonflower, White Arrow-arum	NA	NA	Moderate
Plantago sparsiflora	Pineland Plantain	NA	NA	High
Rhexia aristosa	Awned Meadow-beauty, Bristly Meadow-beauty	NA	NA	High
Rhynchospora pallida	Pale Beaksedge	NA	NA	High
Sabatia decandra	Bartram's Rose-gentian	NA	NA	Moderate
Sabatia kennedyana	Plymouth Gentian	NA	NA	High
Sagittaria weatherbiana	Weatherby's Arrowhead	NA	NA	Moderate
Schwalbea americana	Chaffseed	Federally Endangered	NA	Highest
Solidago pulchra	Beautiful Goldenrod, Carolina Goldenrod	NA	NA	High
Spiranthes laciniata	Lace-lip Ladies'-tresses	NA	NA	Moderate
Sporobolus teretifolius	Wireleaf Dropseed	At-Risk Species	NA	High
Xyris brevifolia	Shortleaf Yellow-eyed-grass	NA	NA	Moderate
Xyris flabelliformis	Savanna Yellow-eyed-grass	NA	NA	Moderate

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APPENDIX B

Recommended Conservation Measures for Species Found in the ROI

Recommended Conservation Measures for Fish:

- Make all practicable efforts to avoid collisions, disturbances, and risk to the shortnose sturgeon and Atlantic sturgeon.

Recommended Conservation Measures for Manatees:

- All personnel associated with the project should be instructed about the potential presence of manatees, manatee speed zones, and the need to avoid collisions with and injury to manatees. Should a proposed action directly or indirectly affect the West Indian manatee, further coordination with the Service office will be necessary. More protection measures can be found in "*Manatee Protection Measures for South Carolina*" (USFWS 2021).

Recommended Conservation Measures for Bats:

- The SCDNR and the Service recommend conducting acoustic surveys for northern long-eared bats (NLEB) and tricolored bats (TCB) by a qualified individual to assess the area's usage.
- Take of a state endangered species is prohibited under S.C. Code of Laws §50-15-30. Before any land-clearing activities in the proposed project area, the SCDNR recommends conducting a threatened and endangered species assessment to identify suitable habitat and submit the findings to SCDNR for review.
    - If suitable habitat for Rafinesque's big-eared bat exists in the area, the SCDNR recommends assuming the presence of Rafinesque's big-eared bat in forested wetlands.
    - To further protect these areas, establish a 1,000-foot buffer and avoid tree clearing from May 1st to July 31st to minimize disturbance and habitat destruction that may affect females during gestation or maternal care for pups.
    - Tree clearing outside of forested wetlands and their associated buffers may occur in non-wetland areas or habitats not used for Rafinesque's big-eared bat maternity roosting at any time.
    - In wetlands that do not serve as Rafinesque's big-eared bat habitat but are spotted turtle habitats, tree clearing should occur only from August to December to prevent impacts to spotted turtles during reproduction. However, if wetlands are dry from January to June, clearing may proceed, provided no surface water is present.
- Tree removal should occur outside of the two sensitive seasons, Winter Torpor (Dec. 15 – Feb. 15) and Pupping season (May 1 – Jul. 15). The timing of standing tree removal and the number of acres removed should be included in a final report.
- If a survey for bats has not been completed, avoid modifying or demolishing structures (bridges and/or culverts) during the two sensitive seasons, Winter Torpor (Dec. 15 – Feb. 15) and Pupping Season (May 1 – Jul. 15).
- Snags should be retained where possible across the landscape, when not a safety hazard.
- Avoid work activities that will cause chronic noise from one half hour before official sunset times until one half hour after official sunrise times. Note: Chronic noise is noise that is continuous or occurs repeatedly again and again for a long time.
- Avoid the use of artificial lighting within 1000 feet of suitable roosting habitat from one half hour before official sunset times until one half hour after official sunrise times.

- Report any dead bats found during or after activities have commenced to the Service immediately.

Recommended Conservation Measures for Sea Turtles:

- Make all practicable efforts to avoid collisions and other disturbances affecting loggerhead, green, leatherback, and Kemp's ridley sea turtles. If a turtle is injured or killed, USACE must contact the SC Marine Turtle Conservation Program stranding hotline at 1-800-922-5431.

Recommended Conservation Measures for Waterbirds:

- Due to the challenges of documenting all nesting colonies, the SCDNR and the Service recommend that a qualified biologist inspect the proposed construction site for both documented and undocumented nesting waterbird colonies during the nesting season each year that construction is ongoing.

Recommended Conservation Measures for Migratory Birds:

- For migratory birds in the project area, the Service recommends conducting vegetation removal, maintenance, and ground disturbance outside of the nesting season.
    - Minimize unnecessary disturbances to migratory bird habitat during project implementation.
    - Avoid destroying active nests and injuring migratory birds during demolition, repair, or cleaning.
    - Using shielded, downcast lights can reduce the potential to attract birds.
- If an active nest is detected, halt construction activities until nestlings have fledged or the nest is unoccupied. Vegetation removal activities may proceed only if a buffer zone has been established around the nest, with restrictions on activities within that zone until the nest is no longer in use.

Recommended Conservation Measures for Bald Eagles:

- During project construction, inform on-site personnel about the possible presence of nesting bald eagles (*Haliaeetus leucocephalus*) near the project boundary. Personnel should identify, avoid, and immediately report any such nests to this office.
- The Service recommends protecting all bald eagle nests (active, inactive, or seemingly abandoned) and avoiding the removal of any large trees. Additionally, no major activities should occur during the nesting period (September 1 – June 1).
- If an active or inactive eagle nest is discovered within 2 miles of the project footprint, follow the bald and golden eagle guidelines to determine whether disturbance will occur or if an incidental take permit is needed.

Recommended Conservation Measures for Wood Stork:

A qualified biologist should survey the area for the presence of wood storks or suitable habitat. The following measures should be followed if wood storks are found:

- Educate personnel on avoiding areas being used by birds.
- At active colony's location:
    - Establish a primary zone where disturbance is minimized. The primary zone should extent 1,000 – 1,500 feet (ft) in all directions from the colony when there is no vegetation or aquatic boundary; if there are natural barriers, then the zone can be reduced to 500 ft in all directions.
        - Recommend avoiding activities at any time in this zone:
        - Removal of vegetation or lumbering

        - Any activity that reduces the area, depth, or length of flooding in wetlands under and surrounding the colony, except where periodic (less than annual) water control may be required to maintain the health of the aquatic woody vegetation
        - Construction of buildings, roadways, powerlines, towers, etc.
        - No human entry should occur between 300 ft (where solid vegetation screens exist) and 750 ft (no vegetation screens) from a feeding site
        - No aircraft operations closer than 500 feet
    - Establish a secondary zone: 1,000 – 2,500 feet from the primary zone OR 2,500 feet radius from the outer edge of the colony
        - Avoid these activities if possible:
        - Any increase in human activity above the level that existed previously should be avoided
        - Any alteration in the area's hydrology that might cause changes in the primary zone
        - Any substantial (>20 percent) decrease in the area of wetlands and woods of potential value to storks for roosting and feeding
        - Avoid the sensitive timeframes (breeding and nesting): February 15th – August 31st; the most sensitive timeframe is the early nesting period: February 15th – April 15th
- Feeding sites should not be subjected to water management practices that alter traditional water levels or the seasonally normal drying patterns and rates. Sharp rises in water levels are especially disruptive to feeding storks.
- Introducing contaminants, fertilizers, or herbicides into wetlands that contain stork foraging sites should be avoided, especially those compounds that could adversely alter the diversity and numbers of native fishes or that could substantially change the characteristics of aquatic vegetation. An increase in the density and height of emergent vegetation can degrade or destroy sites' value as feeding habitat.

Recommended Conservation Measures for Red-Cockaded Woodpecker:

A qualified biologist should survey the area for the presence of red-cockaded woodpeckers or optimal habitat features. If red-cockaded woodpeckers are found, then the following measures should be followed:

- Educate personnel on avoiding areas being used by birds.
- Minimize project impacts within clusters and foraging habitat whenever possible (i.e., conduct large pine removal outside of nesting season, which is late April through late June; trim branches instead of completely removing tree; switch building plans to retain large pines).
- Remove vines and thick underbrush/mid-story to improve site suitability.
- Mark cavity trees for easy identification and to reduce risk of accidental damage or removal.
- Avoid the use of heavy machinery and vehicles within 15.25 m (50 ft) of cavity trees, and do not use at all within 15.25 m (50 ft) of cavity trees in wet areas.
- Do not establish plow lines within 61 m (200 ft) of cavity trees.
- The Service recommends that occupied habitats be avoided and preserved.
    - The first measure is to modify the project footprint to avoid direct impacts to RCW habitat. This habitat could be designated as an environmentally sensitive area and set aside by deed restriction, easement, or another protective covenant.

- If the occupied habitat on the property exceeds 5 acres (2 hectares), then a habitat management plan is also recommended.
- Incorporating these recommendations into the project design and documenting them in the habitat management plan might result in the project being not likely to adversely affect the RCW.

- On-site habitat enhancements are recommended by the Service in situations where a project proposes to impact occupied RCW habitat. If the site has been physically altered by exotic species invasion, lack of fire, or other anthropogenic actions, these alterations have produced on-site habitat conditions that have resulted in marginally suitable habitats for RCW's survival and propagation.

Recommended Conservation Measures for Eastern Black Rail:

A qualified biologist should survey the area for the presence of eastern black rail or suitable habitat. If eastern black rails or suitable habitat are found, then the following measures should be followed:

- Educate personnel on avoiding areas being used by birds.
- If suitable habitat for eastern black rails exists in the project area, the SCDNR suggests conducting three or more call-response surveys specifically targeting black rails during April and May. The SCDNR can provide a protocol upon request.
  - Contact the SCDNR and the Service if black rails are found within the project area.
  - Avoid all disturbances during the sensitive timeframes (nesting, brooding, or flightless molt periods): April 1 through October 31, with nesting peaking the third week of June.
    - Disturbances include:
      - Habitat fragmentation, alteration, or destruction of habitat
      - Ditching or changes to hydrology that would lead to the loss of habitat
      - Prescribed fire, haying, mowing, grazing and mechanical treatments
      - Replacing water control structures
  - At all times, vehicle and foot traffic should not occur within 150 feet of the birds or within 10 feet of optimal habitat features.
  - The recommended buffers should be maintained for the duration of the work activities even if the birds depart or relocate. Personnel and vehicles should follow existing/ established travel and access corridors and maintain slow speeds to avoid disturbing birds.

Recommended Conservation Measures for Rufa Red Knot and Piping Plover:

A qualified biologist should survey the project area for the presence of rufa red knots or piping plovers or suitable habitat features (i.e., inlets, bayside sand and mud flats, tidal pools, and wrack lines). If the species are found, or suitable habitat identified, then the following measures should be followed:

- Educate personnel on avoiding those areas being used by the birds.
- Do not disturb foraging or roosting rufa red knots or piping plovers to the maximum extent practicable.
- When rufa red knots or piping plovers are identified, vehicle and foot traffic should not occur within 150 feet of the birds or within 10 feet of optimal habitat features (even when birds are not present). The recommended buffers should be maintained for the duration of the work activities even if the birds depart or relocate. Personnel and vehicles should follow existing/established travel and access corridors and maintain slow speeds to avoid disturbing birds.
- Stay 500 feet or more away from high tide roosting areas, including from large flocks of shorebirds

when possible, as rufa red knots and/or piping plovers may occur in mixed flocks. If birds in the area are repeatedly being flushed (i.e., flying away), then you are too close and need to back away.

- Designate access points and travel corridors away from known foraging and roosting areas and keep all personnel, vehicles, and equipment within those designated corridors to minimize disturbance to birds and beach topographic alterations. Post and rope, as needed, to designate shorebird foraging and concentrated roosting sites during construction.
- Do not block major egress points in channels, rivers, passes, and bays to avoid disturbing natural coastal processes.
- Maintain a clean work site and remove all trash and work-related debris on a daily basis.
- Make poles/pier pilings within 300 feet of shorebird use areas avian predator-free by using pointed tops instead of flat tops.

Recommended Conservation Measures for Monarch Butterfly:

A qualified biologist should survey the area for the presence of monarch butterflies or optimal habitat features. If monarch butterflies are found, the following conservation measures should be followed:

- Seed mixes will include a minimum of 9 total species of native flowering plants including 3 species per blooming periods of April to June, June to July, and August to October.
- Seed mixes should be free of invasive or aggressive non-native species that inhibit diversity when established. When including milkweed species, seed mixes will include regionally appropriate native species and must avoid using tropical milkweed or other non-native species.
- Schedule mowing to enhance floral resources.
- Remove plants that are invasive or listed as noxious weeds (by using techniques including targeted herbicide, prescribed burns, as appropriate).
- Use buffer areas for forests adjacent to roadways, mow infrequently, and create native plant communities to improve transition zone between forest and roads.
- Limit insecticide exposure where possible, using established Integrated Pest Management guidance and/or approved Pesticide Use Permits.
- Use of herbicides should be monitored to avoid spraying areas of milk weed, the only host plant that supports the species.

Recommended Conservation Measures for Plants:

A qualified Biologist or Botanist should survey the area for the presence of federally listed plant species during the most optimum time depending on the species.

- Survey windows for listing plants can be found below. For most species, the survey is good for 3 years.
    - The survey windows for American chaffseed are May to August, and for pondberry, they are February to March or September to October.

If federally listed plant species are found, then the following measures should be followed:

- Survey the construction extents and prepare maps showing habitats that should be preserved, such as old trees, rare species, trees of unusual size or shape, and trees with special wildlife value for food, resting, and nesting. Preserving a network of trees along with structural measures can provide soil stability and maintain microhabitat conditions for other species. For instance, shade trees can prevent soils from drying and hardening, retain soil structure, prevent erosion, and support essential geochemical processes.
- High-visibility fencing should be placed around listed plant sites to ensure there will be no accidental

encroachment.

- No access or staging areas should be permitted within listed plant sites.
- Projects should be designed to avoid and leave listed plants within the project footprint undisturbed.
- Any listed plants in the project footprint that cannot be left undisturbed should be relocated, during the dormant season, to suitable habitat outside the project footprint. The Service should be contacted to help develop a relocation plan. Relocation plans should include follow up monitoring during the spring following translocation. Contact the Service for help developing a relocation plan.
- Invasive non-native plant species across the site should be monitored post-construction for five years, especially along the interface between construction activities and protected plant populations. If any non-native plant species start spreading into the protected area of site, they should be removed or treated. If herbicide is used to control invasive non-native plants, a barrier (such as cardboard or plastic) will be used to protect any listed plants located within 15 feet of herbicide treatment areas. Herbicides will not be used on days with high winds.
- No broadcast spraying of herbicides, no fertilizers. Spot herbicide treatment can be used as needed with protection of the listed plants to prohibit off-target impacts.

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F CLEAN WATER ACT COMPLIANCE RECORD

Nationwide Permit 14 - Linear Transportation Projects
Effective Date: February 25, 2022; Expiration Date: March 14, 2026
(NWP Final Notice, 86 FR 73522)

Nationwide Permit 14 - Linear Transportation Projects. Activities required for crossings of waters of the United States associated with the construction, expansion, modification, or improvement of linear transportation projects (e.g., roads, highways, railways, trails, driveways, airport runways, and taxiways) in waters of the United States. For linear transportation projects in non-tidal waters, the discharge of dredged or fill material cannot cause the loss of greater than 1/2-acre of waters of the United States. For linear transportation projects in tidal waters, the discharge of dredged or fill material cannot cause the loss of greater than 1/3-acre of waters of the United States. Any stream channel modification, including bank stabilization, is limited to the minimum necessary to construct or protect the linear transportation project; such modifications must be in the immediate vicinity of the project.

This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to construct the linear transportation project. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges of dredged or fill material, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

This NWP cannot be used to authorize non-linear features commonly associated with transportation projects, such as vehicle maintenance or storage buildings, parking lots, train stations, or aircraft hangars.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if: (1) the loss of waters of the United States exceeds 1/10-acre; or (2) there is a discharge of dredged or fill material in a special aquatic site, including wetlands. (See general condition 32.) (Authorities: Sections 10 and 404)

Note 1: For linear transportation projects crossing a single waterbody more than one time at separate and distant locations, or multiple waterbodies at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. Linear transportation projects must comply with 33 CFR 330.6(d).

Note 2: Some discharges of dredged or fill material for the construction of farm roads or forest roads, or temporary roads for moving mining equipment, may qualify for an exemption under Section 404(f) of the Clean Water Act (see 33 CFR 323.4).

Note 3: For NWP 14 activities that require pre-construction notification, the PCN must include any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings that require Department of the Army authorization but do not require pre-construction notification (see paragraph (b)(4) of general condition 32). The district engineer will evaluate the PCN in accordance with Section D, "District Engineer's Decision." The district engineer may require mitigation to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see general condition 23).

2021 Nationwide Permit General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as applicable, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/or Coastal Zone Management Act consistency for an NWP. Every person who may wish to obtain permit authorization under one or more NWPs, or who is currently relying on an existing or prior permit authorization under one or more NWPs, has been and is on notice that all of the provisions of 33 CFR 330.1 through 330.6 apply to every NWP authorization. Note especially 33 CFR 330.5 relating to the modification, suspension, or revocation of any NWP authorization.

1. **Navigation.** (a) No activity may cause more than a minimal adverse effect on navigation.

(b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.

(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his or her authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. **Aquatic Life Movements.** No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain

low flows to sustain the movement of those aquatic species. If a bottomless culvert cannot be used, then the crossing should be designed and constructed to minimize adverse effects to aquatic life movements.

3. **Spawning Areas.** Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. **Migratory Bird Breeding Areas.** Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. **Shellfish Beds.** No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.

6. **Suitable Material.** No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see section 307 of the Clean Water Act).

7. **Water Supply Intakes.** No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. **Adverse Effects From Impoundments.** If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. **Management of Water Flows.** To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

10. **Fills Within 100-Year Floodplains.** The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. **Equipment.** Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. **Soil Erosion and Sediment Controls.** Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow, or during low tides.

13. **Removal of Temporary Structures and Fills.** Temporary structures must be removed, to the maximum extent practicable, after their use has been discontinued. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. **Proper Maintenance.** Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

15. **Single and Complete Project.** The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

16. **Wild and Scenic Rivers.** (a) No NWP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.

(b) If a proposed NWP activity will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, the permittee must submit a pre-construction notification (see general condition 32). The district engineer will coordinate the PCN with the Federal agency with direct management responsibility for that river. Permittees shall not begin the NWP activity until notified by the district engineer that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status.

(c) Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: http://www.rivers.gov/.

17. **Tribal Rights.** No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

18. **Endangered Species.** (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify designated critical habitat or critical habitat proposed for such designation. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless ESA section 7 consultation addressing the consequences of the proposed activity on listed species or critical habitat has been completed. See 50 CFR 402.02 for the definition of "effects of the action" for the purposes of ESA section 7 consultation, as well as 50 CFR 402.17, which provides further explanation under ESA section 7 regarding "activities that are reasonably certain to occur" and "consequences caused by the proposed action."

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA (see 33 CFR 330.4(f)(1)). If pre-construction notification is required for the proposed activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if any listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed such designation) might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat or critical habitat proposed for such designation, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation), the pre-construction notification must include the name(s) of the endangered or threatened species (or species proposed for listing) that might be affected by the proposed activity or that utilize the designated critical habitat (or critical habitat proposed for such designation) that might be affected by the proposed activity. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete pre-construction notification. For activities where the non-Federal applicant has identified listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation) that might be affected or is in the vicinity of the activity, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification that the proposed activity will have "no effect" on listed species (or species proposed for listing or designated critical habitat (or critical habitat proposed for such designation), or until ESA section 7 consultation or conference has been completed. If the non-Federal

applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(d) As a result of formal or informal consultation or conference with the FWS or NMFS the district engineer may add species-specific permit conditions to the NWPs.

(e) Authorization of an activity by an NWP does not authorize the “take” of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with “incidental take” provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word “harm” in the definition of “take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

(f) If the non-federal permittee has a valid ESA section 10(a)(1)(B) incidental take permit with an approved Habitat Conservation Plan for a project or a group of projects that includes the proposed NWP activity, the non-federal applicant should provide a copy of that ESA section 10(a)(1)(B) permit with the PCN required by paragraph (c) of this general condition. The district engineer will coordinate with the agency that issued the ESA section 10(a)(1)(B) permit to determine whether the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation conducted for the ESA section 10(a)(1)(B) permit. If that coordination results in concurrence from the agency that the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation for the ESA section 10(a)(1)(B) permit, the district engineer does not need to conduct a separate ESA section 7 consultation for the proposed NWP activity. The district engineer will notify the non-federal applicant within 45 days of receipt of a complete pre-construction notification whether the ESA section 10(a)(1)(B) permit covers the proposed NWP activity or whether additional ESA section 7 consultation is required.

(g) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the FWS and NMFS or their world wide web pages at http://www.fws.gov/ or http://www.fws.gov/ipac and http://www.nmfs.noaa.gov/pr/species/esa/ respectively.

19. **Migratory Birds and Bald and Golden Eagles.** The permittee is responsible for ensuring that an action authorized by an NWP complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The permittee is responsible for contacting the appropriate local office of the U.S. Fish and Wildlife Service to determine what measures, if any, are necessary or appropriate to reduce adverse effects to migratory birds or eagles, including whether "incidental take" permits are necessary and

available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

20. **Historic Properties.** (a) No activity is authorized under any NWP which may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(b) Federal permittees should follow their own procedures for complying with the requirements of section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)(1)). If pre-construction notification is required for the proposed NWP activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation is not submitted, then additional consultation under section 106 may be necessary. The respective federal agency is responsible for fulfilling its obligation to comply with section 106.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if the NWP activity might have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties might have the potential to be affected by the proposed NWP activity or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of, or potential for, the presence of historic properties can be sought from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or designated tribal representative, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts commensurate with potential impacts, which may include background research, consultation, oral history interviews, sample field investigation, and/or field survey. Based on the information submitted in the PCN and these identification efforts, the district engineer shall determine whether the proposed NWP activity has the potential to cause effects on the historic properties. Section 106 consultation is not required when the district engineer determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). Section 106 consultation is required when the district engineer determines that the activity has the potential to cause effects on historic properties. The district engineer will conduct consultation with consulting parties identified under 36 CFR 800.2(c) when he or she makes any of the following effect determinations for the purposes of section 106 of the NHPA: no historic properties affected, no adverse effect, or adverse effect.

(d) Where the non-Federal applicant has identified historic properties on which the proposed NWP activity might have the potential to cause effects and has so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects to historic properties or that NHPA section 106 consultation has been completed. For non-federal permittees, the district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA section 106 consultation is required. If NHPA section 106 consultation is required, the district engineer will notify the non-Federal applicant that he or she cannot begin the activity until section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(e) Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. 306113) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

21. **Discovery of Previously Unknown Remains and Artifacts.** Permittees that discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by an NWP, they must immediately notify the district engineer of what they have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal, and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

22. **Designated Critical Resource Waters.** Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.

(a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, 52, 57 and 58 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38, and 54, notification is required in accordance with general condition 32, for any activity proposed by permittees in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after she or he determines that the impacts to the critical resource waters will be no more than minimal.

23. **Mitigation.** The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal:

(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects.

(d) Compensatory mitigation at a minimum one-for-one ratio will be required for all losses of stream bed that exceed 3/100-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. This compensatory mitigation requirement may be satisfied through the restoration or enhancement of riparian areas next to streams in accordance with paragraph (e) of this general condition. For losses of stream bed of 3/100-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects. Compensatory mitigation for losses of streams should be provided, if practicable, through stream

rehabilitation, enhancement, or preservation, since streams are difficult-to-replace resources (see 33 CFR 332.3(e)(3)).

(e) Compensatory mitigation plans for NWP activities in or near streams or other open waters will normally include a requirement for the restoration or enhancement, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, the restoration or maintenance/protection of riparian areas may be the only compensatory mitigation required. If restoring riparian areas involves planting vegetation, only native species should be planted. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to restore or maintain/protect a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or maintaining/protecting a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of minimization or compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

(f) Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

(1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in no more than minimal adverse environmental effects. For the NWPs, the preferred mechanism for providing compensatory mitigation is mitigation bank credits or in-lieu fee program credits (see 33 CFR 332.3(b)(2) and (3)). However, if an appropriate number and type of mitigation bank or in-lieu credits are not available at the time the PCN is submitted to the district engineer, the district engineer may approve the use of permittee-responsible mitigation.

(2) The amount of compensatory mitigation required by the district engineer must be sufficient to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see 33 CFR 330.1(e)(3)). (See also 33 CFR 332.3(f).)

(3) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, aquatic resource restoration should be the first compensatory mitigation option considered for permittee-responsible mitigation.

(4) If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan

may be used by the district engineer to make the decision on the NWP verification request, but a final mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) through (14) must be approved by the district engineer before the permittee begins work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)). If permittee-responsible mitigation is the proposed option, and the proposed compensatory mitigation site is located on land in which another federal agency holds an easement, the district engineer will coordinate with that federal agency to determine if proposed compensatory mitigation project is compatible with the terms of the easement.

(5) If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan needs to address only the baseline conditions at the impact site and the number of credits to be provided (see 33 CFR 332.4(c)(1)(ii)).

(6) Compensatory mitigation requirements (e.g., resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan (see 33 CFR 332.4(c)(1)(ii)).

(g) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any NWP activity resulting in the loss of greater than 1/2-acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that an NWP activity already meeting the established acreage limits also satisfies the no more than minimal impact requirement for the NWPs.

(h) Permittees may propose the use of mitigation banks, in-lieu fee programs, or permittee-responsible mitigation. When developing a compensatory mitigation proposal, the permittee must consider appropriate and practicable options consistent with the framework at 33 CFR 332.3(b). For activities resulting in the loss of marine or estuarine resources, permittee-responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee-responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.

(i) Where certain functions and services of waters of the United States are permanently adversely affected by a regulated activity, such as discharges of dredged or fill material into waters of the United States that will convert a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may

be required to reduce the adverse environmental effects of the activity to the no more than minimal level.

24. **Safety of Impoundment Structures.** To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state or federal, dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

25. **Water Quality.** (a) Where the certifying authority (state, authorized tribe, or EPA, as appropriate) has not previously certified compliance of an NWP with CWA section 401, a CWA section 401 water quality certification for the proposed discharge must be obtained or waived (see 33 CFR 330.4(c)). If the permittee cannot comply with all of the conditions of a water quality certification previously issued by certifying authority for the issuance of the NWP, then the permittee must obtain a water quality certification or waiver for the proposed discharge in order for the activity to be authorized by an NWP.

(b) If the NWP activity requires pre-construction notification and the certifying authority has not previously certified compliance of an NWP with CWA section 401, the proposed discharge is not authorized by an NWP until water quality certification is obtained or waived. If the certifying authority issues a water quality certification for the proposed discharge, the permittee must submit a copy of the certification to the district engineer. The discharge is not authorized by an NWP until the district engineer has notified the permittee that the water quality certification requirement has been satisfied by the issuance of a water quality certification or a waiver.

(c) The district engineer or certifying authority may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

26. **Coastal Zone Management.** In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). If the permittee cannot comply with all of the conditions of a coastal zone management consistency concurrence previously issued by the state, then the permittee must obtain an individual coastal zone management consistency concurrence or presumption of concurrence in order for the activity to be authorized by an NWP. The district engineer or a state may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

27. **Regional and Case-By-Case Conditions.** The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state,

Indian Tribe, or U.S. EPA in its CWA section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

28. **Use of Multiple Nationwide Permits.** The use of more than one NWP for a single and complete project is authorized, subject to the following restrictions:

(a) If only one of the NWPs used to authorize the single and complete project has a specified acreage limit, the acreage loss of waters of the United States cannot exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1⁄3-acre.

(b) If one or more of the NWPs used to authorize the single and complete project has specified acreage limits, the acreage loss of waters of the United States authorized by those NWPs cannot exceed their respective specified acreage limits. For example, if a commercial development is constructed under NWP 39, and the single and complete project includes the filling of an upland ditch authorized by NWP 46, the maximum acreage loss of waters of the United States for the commercial development under NWP 39 cannot exceed 1/2-acre, and the total acreage loss of waters of United States due to the NWP 39 and 46 activities cannot exceed 1 acre.

29. **Transfer of Nationwide Permit Verifications.** If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:

"When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

_____
(Transferee)

_____
(Date)

30. **Compliance Certification.** Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and implementation of any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include:

(a) A statement that the authorized activity was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions;

(b) A statement that the implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and

(c) The signature of the permittee certifying the completion of the activity and mitigation.

The completed certification document must be submitted to the district engineer within 30 days of completion of the authorized activity or the implementation of any required compensatory mitigation, whichever occurs later.

31. **Activities Affecting Structures or Works Built by the United States.** If an NWP activity also requires review by, or permission from, the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers (USACE) federally authorized Civil Works project (a "USACE project"), the prospective permittee must submit a pre-construction notification. See paragraph (b)(10) of general condition 32. An activity that requires section 408 permission and/or review is not authorized by an NWP until the appropriate Corps office issues the section 408 permission or completes its review to alter, occupy, or use the USACE project, and the district engineer issues a written NWP verification.

32. **Pre-Construction Notification.** (a) *Timing*. Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. The request must specify the information needed to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

(1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

(2) 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or are in the vicinity of the activity, or to notify the Corps pursuant to general condition 20 that the activity might have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)) has been completed. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) *Contents of Pre-Construction Notification*: The PCN must be in writing and include the following information:

(1) Name, address and telephone numbers of the prospective permittee;

(2) Location of the proposed activity;

(3) Identify the specific NWP or NWP(s) the prospective permittee wants to use to authorize the proposed activity;

(4) (i) A description of the proposed activity; the activity's purpose; direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; a description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity; and any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings for linear projects that require Department of the Army authorization but do not require pre-construction notification. The description of the proposed activity and any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no

more than minimal and to determine the need for compensatory mitigation or other mitigation measures.

(ii) For linear projects where one or more single and complete crossings require pre-construction notification, the PCN must include the quantity of anticipated losses of wetlands, other special aquatic sites, and other waters for each single and complete crossing of those wetlands, other special aquatic sites, and other waters (including those single and complete crossings authorized by an NWP but do not require PCNs). This information will be used by the district engineer to evaluate the cumulative adverse environmental effects of the proposed linear project, and does not change those non-PCN NWP activities into NWP PCNs.

(iii) Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the activity and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);

(5) The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial and intermittent streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. Furthermore, the 45-day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;

(6) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands or 3/100-acre of stream bed and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(7) For non-federal permittees, if any listed species (or species proposed for listing) or designated critical habitat (or critical habitat proposed for such designation) might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat (or critical habitat proposed for such designation), the PCN must include the name(s) of those endangered or threatened species (or species proposed for listing) that might be affected by the proposed activity or utilize the designated critical habitat (or critical habitat proposed for such designation) that might be affected by the proposed activity. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with the Endangered Species Act;

transmission, or e-mail that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse environmental effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district engineer will fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure that the net adverse environmental effects of the proposed activity are no more than minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

(4) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

(5) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of pre-construction notifications to expedite agency coordination.

2021 District Engineer's Decision

1. In reviewing the PCN for the proposed activity, the district engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest. If a project proponent requests authorization by a specific NWP, the district engineer should issue the NWP verification for that activity if it meets the terms and conditions of that NWP, unless he or she determines, after considering mitigation, that the proposed activity will result in more than minimal individual and cumulative adverse effects on the aquatic environment and other aspects of the public interest and exercises discretionary authority to require an individual permit for the proposed activity. For a linear project, this determination will include an evaluation of the single and complete crossings of waters of the United States that require PCNs to determine whether they individually satisfy the terms and conditions of the NWP(s), as well as the cumulative effects caused by all of the crossings of waters of the United States authorized by an NWP. If an applicant requests a waiver of an applicable limit, as provided for in NWPs 13, 36, or 54, the district engineer will only grant the waiver upon a written determination that the NWP activity will result in only minimal individual and cumulative adverse environmental effects.

2. When making minimal adverse environmental effects determinations the district engineer will consider the direct and indirect effects caused by the NWP activity. He or she will also consider the cumulative adverse environmental effects caused by activities authorized by an NWP and whether those cumulative adverse environmental effects are no more than minimal. The district engineer will also consider site specific factors, such as the environmental setting in the vicinity of the NWP activity, the type of resource that will be affected by the NWP activity, the functions provided by the aquatic resources that will be affected by the NWP activity, the degree or magnitude to which the aquatic resources perform those functions, the extent that aquatic resource functions will be lost as a result of the NWP activity (e.g., partial or complete loss), the duration of the adverse effects (temporary or permanent), the importance of the aquatic resource functions to the region (e.g., watershed or ecoregion), and mitigation required by the district engineer. If an appropriate functional or condition assessment method is available and practicable to use, that assessment method may be used by the district engineer to assist in the minimal adverse environmental effects determination. The district engineer may add case-specific special conditions to the NWP authorization to address site-specific environmental concerns.

3. If the proposed activity requires a PCN and will result in a loss of greater than 1/10-acre of wetlands or 3/100-acre of stream bed, the prospective permittee should submit a mitigation proposal with the PCN. Applicants may also propose compensatory mitigation for NWP activities with smaller impacts, or for impacts to other types of waters. The district engineer will consider any proposed compensatory mitigation or other mitigation measures the applicant has included in the proposal in determining whether the net adverse environmental effects of the proposed activity are no more than minimal. The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse environmental effects are no more than minimal, after considering mitigation, the district engineer will notify the permittee and include any activity-specific conditions in the NWP verification the district engineer deems necessary. Conditions for compensatory mitigation requirements must comply with the appropriate provisions at 33 CFR 332.3(k). The district engineer must approve the final mitigation plan before the permittee commences work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the district engineer will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the proposed compensatory mitigation plan within 45 calendar days of receiving a complete PCN and determine whether the proposed mitigation would ensure that the NWP activity results in no more than minimal adverse environmental effects. If the net adverse environmental effects of the NWP activity (after consideration of the mitigation proposal) are determined by the district engineer to be no more than minimal, the district engineer will provide a timely written response to the applicant. The response will state that the NWP activity can proceed under the terms and conditions of the NWP, including any activity-specific conditions added to the NWP authorization by the district engineer.

4. If the district engineer determines that the adverse environmental effects of the proposed activity are more than minimal, then the district engineer will notify the applicant either: (a) that the activity does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (b) that the activity is authorized under the NWP subject to the applicant's submission of a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal; or (c) that the activity is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal adverse environmental effects, the activity will be authorized within the 45-day PCN period (unless additional time is required to comply with general conditions 18, 20, and/or 31), with activity-specific conditions that state the mitigation requirements. The authorization will include the necessary conceptual or detailed mitigation plan or a requirement that the applicant submit a mitigation plan that would reduce the adverse environmental effects so that they are no more than minimal. When compensatory mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan or has determined that prior approval of a final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation.

2021 Further Information

1. District engineers have authority to determine if an activity complies with the terms and conditions of an NWP.

2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.

3. NWPs do not grant any property rights or exclusive privileges.

4. NWPs do not authorize any injury to the property or rights of others.

5. NWPs do not authorize interference with any existing or proposed Federal project (see general condition 31).

2021 Nationwide Permit Definitions

Best management practices (BMPs): Policies, practices, procedures, or structures implemented to mitigate the adverse environmental effects on surface water quality resulting from development. BMPs are categorized as structural or non-structural.

Compensatory mitigation: The restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which

remain after all appropriate and practicable avoidance and minimization has been achieved.

Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.

Direct effects: Effects that are caused by the activity and occur at the same time and place.

Discharge: The term "discharge" means any discharge of dredged or fill material into waters of the United States.

Ecological reference: A model used to plan and design an aquatic habitat and riparian area restoration, enhancement, or establishment activity under NWP 27. An ecological reference may be based on the structure, functions, and dynamics of an aquatic habitat type or a riparian area type that currently exists in the region where the proposed NWP 27 activity is located. Alternatively, an ecological reference may be based on a conceptual model for the aquatic habitat type or riparian area type to be restored, enhanced, or established as a result of the proposed NWP 27 activity. An ecological reference takes into account the range of variation of the aquatic habitat type or riparian area type in the region.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area.

High Tide Line: The line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm.

Historic Property: Any prehistoric or historic district, site (including archaeological site), building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This

term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).

Independent utility: A test to determine what constitutes a single and complete non-linear project in the Corps Regulatory Program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Indirect effects: Effects that are caused by the activity and are later in time or farther removed in distance, but are still reasonably foreseeable.

Loss of waters of the United States: Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. The loss of stream bed includes the acres of stream bed that are permanently adversely affected by filling or excavation because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the United States is a threshold measurement of the impact to jurisdictional waters or wetlands for determining whether a project may qualify for an NWP; it is not a net threshold that is calculated after considering compensatory mitigation that may be used to offset losses of aquatic functions and services. Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the United States. Impacts resulting from activities that do not require Department of the Army authorization, such as activities eligible for exemptions under section 404(f) of the Clean Water Act, are not considered when calculating the loss of waters of the United States.

Navigable waters: Waters subject to section 10 of the Rivers and Harbors Act of 1899. These waters are defined at 33 CFR part 329.

Non-tidal wetland: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. Non-tidal wetlands contiguous to tidal waters are located landward of the high tide line (i.e., spring high tide line).

Open water: For purposes of the NWPs, an open water is any area that in a year with normal patterns of precipitation has water flowing or standing above ground to the extent that an ordinary high water mark can be determined. Aquatic vegetation within the area of flowing or standing water is either non-emergent, sparse, or absent. Vegetated shallows are considered to be open waters. Examples of “open waters” include rivers, streams, lakes, and ponds.

Ordinary High Water Mark: The term ordinary high water mark means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

Perennial stream: A perennial stream has surface water flowing continuously year-round during a typical year.

Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

Pre-construction notification: A request submitted by the project proponent to the Corps for confirmation that a particular activity is authorized by nationwide permit. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Pre-construction notification may be required by the terms and conditions of a nationwide permit, or by regional conditions. A pre-construction notification may be voluntarily submitted in cases where pre-construction notification is not required and the project proponent wants confirmation that the activity is authorized by nationwide permit.

Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: re-establishment and rehabilitation.

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic

characteristics. The rapid movement of water over a course substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Riparian areas: Riparian areas are lands next to streams, lakes, and estuarine-marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects riverine, lacustrine, estuarine, and marine waters with their adjacent wetlands, non-wetland waters, or uplands. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality. (See general condition 23.)

Shellfish seeding: The placement of shellfish seed and/or suitable substrate to increase shellfish production. Shellfish seed consists of immature individual shellfish or individual shellfish attached to shells or shell fragments (i.e., spat on shell). Suitable substrate may consist of shellfish shells, shell fragments, or other appropriate materials placed into waters for shellfish habitat.

Single and complete linear project: A linear project is a project constructed for the purpose of getting people, goods, or services from a point of origin to a terminal point, which often involves multiple crossings of one or more waterbodies at separate and distant locations. The term "single and complete project" is defined as that portion of the total linear project proposed or accomplished by one owner/developer or partnership or other association of owners/developers that includes all crossings of a single water of the United States (i.e., a single waterbody) at a specific location. For linear projects crossing a single or multiple waterbodies several times at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Single and complete non-linear project: For non-linear projects, the term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete non-linear project must have independent utility (see definition of "independent utility"). Single and complete non-linear projects may not be "piecemealed" to avoid the limits in an NWP authorization.

Stormwater management: Stormwater management is the mechanism for controlling stormwater runoff for the purposes of reducing downstream erosion, water quality degradation, and flooding and mitigating the adverse effects of changes in land use on the aquatic environment.

Stormwater management facilities: Stormwater management facilities are those facilities, including but not limited to, stormwater retention and detention ponds and best management practices, which retain water for a period of time to control runoff and/or

improve the quality (i.e., by reducing the concentration of nutrients, sediments, hazardous substances and other pollutants) of stormwater runoff.

Stream bed: The substrate of the stream channel between the ordinary high water marks. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the stream bed, but outside of the ordinary high water marks, are not considered part of the stream bed.

Stream channelization: The manipulation of a stream's course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized jurisdictional stream remains a water of the United States.

Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

Tidal wetland: A tidal wetland is a jurisdictional wetland that is inundated by tidal waters. Tidal waters rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by other waters, wind, or other effects. Tidal wetlands are located channelward of the high tide line.

Tribal lands: Any lands title to which is either: 1) held in trust by the United States for the benefit of any Indian tribe or individual; or 2) held by any Indian tribe or individual subject to restrictions by the United States against alienation.

Tribal rights: Those rights legally accruing to a tribe or tribes by virtue of inherent sovereign authority, unextinguished aboriginal title, treaty, statute, judicial decisions, executive order or agreement, and that give rise to legally enforceable remedies.

Vegetated shallows: Vegetated shallows are special aquatic sites under the 404(b)(1) Guidelines. They are areas that are permanently inundated and under normal circumstances have rooted aquatic vegetation, such as seagrasses in marine and estuarine systems and a variety of vascular rooted plants in freshwater systems.

Waterbody: For purposes of the NWPs, a waterbody is a "water of the United States." If a wetland is adjacent to a waterbody determined to be a water of the United States, that waterbody and any adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)).

ADDITIONAL INFORMATION

Information about the U.S. Army Corps of Engineers Regulatory Program, including nationwide permits, may also be accessed at

http://www.swt.usace.army.mil/Missions/Regulatory.aspx or
http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx

Nationwide Permit 53 - Removal of Low-Head Dams
Effective Date: February 25, 2022; Expiration Date: March 14, 2026
(NWP Final Notice, 86 FR 73522)

Nationwide Permit 53 - Removal of Low-Head Dams. Structures and work in navigable waters of the United States and discharges of dredged or fill material into waters of the United States associated with the removal of low-head dams.

For the purposes of this NWP, the term "low-head dam" is generally defined as a dam or weir built across a stream to pass flows from upstream over all, or nearly all, of the width of the dam crest and does not have a separate spillway or spillway gates, but it may have an uncontrolled spillway. The dam crest is the top of the dam from left abutment to right abutment. A low-head dam may have been built for a range of purposes (e.g., check dam, mill dam, irrigation, water supply, recreation, hydroelectric, or cooling pond), but in all cases, it provides little or no storage function.

The removed low-head dam structure must be deposited and retained in an area that has no waters of the United States unless otherwise specifically approved by the district engineer under separate authorization.

Because the removal of the low-head dam will result in a net increase in ecological functions and services provided by the stream, as a general rule compensatory mitigation is not required for activities authorized by this NWP. However, the district engineer may determine for a particular low-head dam removal activity that compensatory mitigation is necessary to ensure that the authorized activity results in no more than minimal adverse environmental effects.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 32.) (Authorities: Sections 10 and 404)

Note: This NWP does not authorize discharges of dredged or fill material into waters of the United States or structures or work in navigable waters to restore the stream in the vicinity of the low-head dam, including the former impoundment area. Nationwide permit 27 or other Department of the Army permits may authorize such activities. This NWP does not authorize discharges of dredged or fill material into waters of the United States or structures or work in navigable waters to stabilize stream banks. Bank stabilization activities may be authorized by NWP 13 or other Department of the Army permits.

2021 Nationwide Permit General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as applicable, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, CHARLESTON DISTRICT
69A HAGOOD AVENUE
CHARLESTON, SOUTH CAROLINA 29403-5107

FINAL REGIONAL CONDITIONS FOR THE 2021 NATIONWIDE PERMITS IN CHARLESTON DISTRICT (SAC)

Effective Date for Modified Regional Conditions for 16 NWPs: January 19, 2022
Effective Date for Regional Conditions for 41 NWPs: February 25, 2022
Expiration Date for Regional Conditions for All NWPs: March 14, 2026

This Regional Condition document supersedes all prior Regional Condition documents for the Charleston District.

A. BACKGROUND/APPLICABILITY

1. The following regional conditions have been approved by the Division Engineer for the South Atlantic Division (SAD) for use in the Charleston District (SAC) for the following Nationwide Permits (NWPs):

   a. The NWPs published in the January 13, 2021 Federal Register (86 FR 2744) announcing the reissuance of twelve (12) existing NWPs (that is, NWPs 12, 21, 29, 39, 40, 42, 43, 44, 48, 50, 51, and 52) and issuance of four (4) new NWPs (that is, NWPs 55, 56, 57, and 58), as well as the reissuance of NWP general conditions and definitions with some modifications. These 16 NWPs were effective on March 15, 2021 and will expire on March 14, 2026; and

   b. The NWPs published in the December 27, 2021 Federal Register (86 FR 73522) announcing the reissuance of the remaining unmodified forty (40) existing NWPs (that is, NWPs 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 27, 28, 30, 31, 32, 33, 34, 35, 36, 37, 38, 41, 45, 46, 49, 53, and 54) and issuance of one (1) new NWP (that is, NWP 59). At this time, NWPs 26 and 47 are reserved. These 41 NWPs will be effective as of February 25, 2022 and will expire on March 14, 2026.

2. Status of Activities Under Prior NWPs and/or Regional Conditions.

   i. 16 NWPs: The modified regional conditions that were issued on January 19, 2022 and are incorporated in this document **supersede** the previous regional conditions that were approved for the 16 NWPs that went into effect on March 15, 2021, **except** for the following scenarios:

      1. NWP verification letters for one or more of the 16 NWPs that were issued **prior** to January 19, 2022; or

2. NWP activities that do not require a pre-construction notification (PCN)[1], are covered by one or more of the 16 NWPs, and have either commenced, are under contract to commence, or have been completed **prior** to January 19, 2022.

ii. 40 NWPs: For information about whether an activity can continue under the 2017 versions of the 40 existing NWPs (for example, the status of prior permit verifications and pre-construction notifications) and, accordingly, the 2017 Regional Conditions, see the discussion in the Reissuance and Modification of Nationwide Permits at 86 FR 73522 in Section I.D. on page 73525 or contact the Charleston District Regulatory Office directly.

3. The following regional conditions will provide additional protection for the aquatic environment that is necessary to ensure that the NWPs authorize only those activities with no more than minimal adverse environmental effects.

4. As specified, under NWP General Condition 27, Regional and Case-By-Case Conditions: The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case-specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its Section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

B. EXCLUDED WATERS AND/OR AREAS

Not applicable.

C. REGIONAL CONDITIONS APPLICABLE TO ALL NWPs

1. Use of nationwide permits does not preclude requirements to obtain all other applicable Federal, State, county, and local government authorizations.

2. NWP activities are not authorized in areas known or suspected to have sediment contamination, with the exception of the following: (1) activities authorized by NWP 38; (2) activities authorized by NWP 53 when used in combination with NWP 38; (3) sediment sampling for dredging projects authorized by NWP 6; and (4) activities authorized by NWP 20.

3. For all proposed activities, both temporary and permanent, that would be located within a FEMA designated floodway, the prospective permittee must submit a PCN to the District Engineer in accordance with General Condition 32.

[1] The acronym "PCN" used throughout this document refers to *Pre-Construction Notification*, as defined in NWP General Condition 32.

4. For all NWPs, the prospective permittee must submit a PCN to the District Engineer in accordance with General Conditions 31 and 32, for any activity that would be located in or adjacent to an authorized USACE Civil Works project, including Federal Navigation projects:

   a. **USACE Civil Works projects:** Buck Creek in Horry County, Eagle Creek in Dorchester County, Kingstree Branch in Williamsburg County, Sawmill Branch in Berkeley and Dorchester Counties, Scotts Creek in Newberry County, Socastee Creek in Horry County and Turkey Creek in Sumter County, Wilson Branch in Chesterfield County, Edisto River in Orangeburg and Dorchester Counties, North Edisto River in Aitken and Orangeburg Counties, Folly Beach in Charleston County, Hunting Island Beach, waste water treatment plant and water line in Beaufort County, Myrtle Beach in Georgetown and Horry County, Pawleys Island Beach in Georgetown County, Edisto Island Beach in Charleston County, Crab Bank in Charleston County, Morris Island Lighthouse in Charleston County, Miller Corner Disposal area Phragmites Control in Georgetown County, Cape Marsh Management area (Santee Coastal Reserve) in Charleston County, Murphy Island in Charleston County, Pocotaligo River and Swamp in Clarendon and Sumter Counties, Pinopolis Dam in Berkeley County, Battery Pringle in Charleston County, Castle Pinckney in Charleston County, Pompion Hill Chapel along the Cooper River in Berkeley County, Drayton Hall in Charleston County, Indian Bluff in Orangeburg County, Singleton Swash at Shore Drive in Horry County, Turkey Creek Bridge at Pineview Drive in Lancaster, Big Dutchman Creek Bridge at West Oak Drive in Rock Hill, SC, Calabash Branch Bridge at Tom Joye Road in Clover, Blue Branch Bridge at Fortanberry Road in Gaffney, Glenn Creek Bridge at Sulphur Springs Road in Spartanburg County, Cow Castle Creek (Bowman) in Orangeburg County, Cowpen Swamp at Simpson Creek in Horry County, Crabtree Swamp in Horry County, Saluda River (North, South, and Middle Fork) in Greenville County, Shot Pouch Creek in Sumter County, Simpson Creek in Horry County, and Todd Swamp in Horry County.

   b. **Defined Federal Navigation projects:** Ashley River (0.5 miles east of Hwy 7 bridge downstream to the Atlantic Intracoastal Waterway (AIWW)), Atlantic Intracoastal Waterway ((AIWW) GA/SC line to SC/NC line), Brookgreen Garden Canal, Calabash Creek, Charleston Harbor (including the Cooper River, Town Creek, Shem Creek to Coleman Blvd and Mount Pleasant Channel), Folly River, Georgetown Harbor (Winyah Bay, Sampit River and Bypass Channel), Jeremy Creek, Little River Inlet, Murrells Inlet (Main Creek), Port Royal Harbor, Shipyard River, Savannah River (Below Augusta) and Town Creek McClellanville (i.e., Five Fathoms Creek, AIWW to Bulls Bay).

   c. **Undefined Federal Navigation projects**: Adams Creek, Archers Creek (From intersection with Beaufort River for 2 miles), Edisto River (River mile 0.00 to 175.0), Great Pee Dee River (Waccamaw River via Bull Creek then to

Smith Mills, then to Cheraw), Lynches River/Clark Creek (Clark Creek to Lynches River, River Mile 0.0 to 56.0), Mingo Creek (to Hemmingway Bridge), Salkehatchie River (5 miles above Toby's Bluff to Hickory Hill, River mile 20.4 to 62.3), Santee River (Closed to navigation at mile 87 (Santee Dam)), Waccamaw River (river mile 0.0 to 90 (state line)), Wateree River (Mouth to Camden), and Village Creek (Morgan River to Porpoise Fish Co., 2.2 miles).

5. For all proposed activities that would be located in or adjacent to an authorized Federal Navigation project, as referenced in Regional Condition C.4.b, the project drawings must include the following information: (1) State Plane Coordinates (NAD 1983) for a minimum of two corners of each structure or fill where it is closest to the Federal channel; (2) the distance from the watermost edge of the proposed structure or fill to the nearest edge of the Federal channel; and (3) Mean Low Water line and the Mean High Water line.

6. For all NWPs requiring a PCN and when the activity involves the discharge of dredged or fill material into waters of the U.S. associated with mechanized land clearing that results in the permanent conversion of forested or scrub-shrub wetlands to herbaceous wetlands, the PCN should include the following information: (1) a written description and/or drawings of the proposed conversion activity and (2) acreage of the permanent conversion.

D. REGIONAL CONDITIONS APPLICABLE TO <u>SPECIFIC</u> NWPs

1. For NWP 3, paragraph (a) activities, the prospective permittee must submit a PCN to the District Engineer in accordance with General Condition #32 for the repair, rehabilitation or replacement of existing utility lines, which include electric lines and/or telecommunication lines, constructed over navigable waters of the United States (i.e., Section 10 waters), and existing utility lines, electric lines, telecommunication lines and/or pipelines routed in or under navigable waters of the United States (i.e., Section 10 waters), even if no discharge of dredged or fill material occurs.

2. For NWP 3, the prospective permittee must submit a PCN to the District Engineer in accordance with General Condition 32, for maintenance activities related to stormwater management that would occur in tidal waters, including tidal wetlands.

3. For NWPs 3, 11, 12, 13, 14, 15, 20, 22, 33, 57, 58, and 59, temporary structures, fills, and/or work, including the use of temporary mats, are authorized for the minimum amount of time necessary to accomplish the work, which shall not exceed a period of 180 days without additional Corps approval. **However, temporary sidecast material authorized by NWPs 12, 57, or 58 cannot ever exceed a period of 180 days.** The temporary structures, fills, and/or work, including the use of temporary mats, shall be removed as soon as the work is

complete and the disturbed areas be restored to pre-construction contours and conditions. The temporary mats include timber mats, metal, synthetic and/or artificial mats, or other materials that may serve the purpose of mats.

4. For NWPs 3, 11, 12, 13, 14, 15, 20, 22, 33, 57, 58 and 59 that require PCNs and when the activity involves temporary structures, fills, and/or work, including the use of temporary mats, the PCN should include the following information: (1) a written description and/or drawings of the proposed temporary activities that will be used during project construction; (2) the timeframe that the proposed temporary activities will be in place; and (3) specifications of how pre-construction contours will be re-established and verified after construction. Temporary mats include timber mats, metal, synthetic and/or artificial mats, or other materials that may serve the purpose of mats.

5. For NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, 52, 57 and 58 in accordance with General Condition 22(a) and for NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38 and 54, in accordance with General Condition 22(b), the ACE Basin National Estuarine Research Reserve and the North Inlet Winyah Bay National Estuarine Research Reserve are Designated Critical Resource Waters. Activities described in the NWPs listed herein are subject to the limitations and/or PCN requirements listed in General Condition 22 (a) and (b).

6. For NWPs 7 and 58 activities that involve intake structures, the associated intake structure must be screened to prevent entrainment of juvenile and larval organisms, and the inflow velocity of the associated intake structures cannot exceed 0.5 feet/second.

7. For NWPs 12, 57 and 58 activities that involve horizontal directional drilling beneath navigable waters of the United States (i.e., Section 10 waters), the PCN should include a proposed remediation plan (i.e., frac-out plan).

8. For NWPs 12, 14, 29, 39, 46, 51, 52, 57 and 58 activities that involve crossings, all culverts must be adequately sized to maintain flow. For these activities that require submittal of a PCN, the PCN should include the minimum size of and number of culvert/pipes that are proposed.

9. For NWPs 12, 14, 18, 43, 51, 57 and 58, the prospective permittee must submit a PCN to the District Engineer in accordance with General Condition #32, for activities that involve the loss of greater than 0.005 acre of stream bed.

10. For NWPs 12, 14, 18, 21, 29, 39, 40, 42, 43, 44, 50, 51, 52, 57, 58 and 59, activities that involve the loss of greater than 0.005 acre of stream bed, compensatory mitigation will be required and the PCN should include a compensatory mitigation plan.

11. For NWPs 12, 14, 18, 21, 27, 29, 39, 40, 42, 43, 44, 50, 51, 52, 57, 58, and 59, the discharge cannot cause the loss of greater than 0.05 acre of stream bed.

12. For NWPs 29 and 39, the discharges of dredged or fill material for the construction of stormwater management facilities in perennial streams are not authorized.

13. For NWP 33, the prospective permittee must submit a PCN to the District Engineer, in accordance with General Condition #32, for temporary construction, access, and dewatering activities that impact greater than 0.1 acre of non-tidal waters of the United States, including wetlands. In addition, the PCN should include a restoration plan.

14. For existing NWP 48 activities that involve changing from bottom culture to floating or suspended culture OR proposed NWP 48 activities that involve floating or suspended culture, the prospective permittee must submit a PCN to the District Engineer in accordance with General Condition #32.

15. For proposed NWP 48 activities involving floating or suspended culture and/or proposed NWPs 55 and 56 activities that will occur adjacent to property that is not owned by the prospective permittee, the PCN should include the following information:

    a. A map or depiction that shows the adjacent property(ies) and adjacent property owners' contact information. Note: This information may be obtained online from the applicable county's tax information pages.

    b. A signed letter(s) of "no objection" to the proposed mariculture activity from each of the adjacent property owner(s). Each letter shall include the name, mailing address, property address, property Tax Map Parcel (TMS) number, and signature of the property owner. Or, if the prospective permittee is unable to obtain a letter(s) of "no objection", the Corps will notify the adjacent property owner(s) of the proposed project by letter wherein the adjacent property owner will be given 15 days to provide comments.

16. For NWP 53, the PCN should include a Tier I evaluation, in accordance with the Inland Testing Manual, for the project area immediately upstream of the low-head dam. If the Tier I evaluation indicates contaminated sediments are present, a Tier II evaluation may be required.

17. The prospective permittee is advised of the following for activities under any NWP for which (1) the 401 Water Quality Certifications (WQC) were denied (see F.1.a), and/or (2) activities under the NWP were found to be inconsistent with the S.C. Coastal Zone Management Program and, therefore, concurrence with the Coastal Zone Consistency determination was denied (see F.2.a), and/or (3) the

proposed activity is located in one of the "Critical Areas" of the Coastal Zone (see F.3):

a. For NWPs 12, 14, 16, 17, 21, 23, 29, 34, 39, 44, 46, 49, 50, 54, 57, 58 and 59 where WQC was denied, the prospective permittee should provide to the Corps a copy of the Individual WQC or evidence demonstrating a waiver was granted.

b. For NWPs 12, 14, 16, 17, 21, 23, 24, 29, 34, 35, 39, 42, 44, 46, 49, 50, 51, 55, 56, 57, 58 and 59 where concurrence with the Coastal Zone Consistency was denied, the prospective permittee should provide to the Corps a copy of the Individual CZC Concurrence or presumed concurrence for the proposed activity.

c. For all NWPs in any of the "Critical Areas" of the Coastal Zone, an Individual Critical Area permit is required (see F.3). Therefore, the prospective permittee should provide a copy of the Individual Critical Area permit to the Corps for the proposed activity.

Note: For WQC conditions on activities under NWPs 43, 51, and 52, see F.1.b. For Coastal Zone Consistency conditions on activities under NWPs 43 and 52, see F.2.b.

18. For NWPs 12, 57 and 58, the prospective permittee must submit a PCN to the District Engineer in accordance with General Condition 32 if the activity involves the discharge of dredged or fill material into waters of the U.S. associated with mechanized land clearing that results in the permanent conversion of forested or scrub-shrub wetlands to herbaceous wetlands for a maintained right-of-way.

E. ACTIVITY SPECIFIC REGIONAL CONDITIONS

Not applicable.

F. SECTION 401 WATER QUALITY CERTIFICATION (WQC) AND/OR COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION SUMMARY AND APPLICABLE CONDITIONS

1. Water Quality Certification (WQC)

a. WQC Denied

The Water Quality Certifications (WQC) for the following NWPs are denied; therefore, an Individual WQC, or evidence demonstrating a waiver was granted, from the South Carolina Department of Health and Environmental Control (SCDHEC) will be required for authorization under these NWPs:

NWPs 12, 14, 16, 17, 21, 23, 29, 34, 39, 44, 46, 49, 50, 54, 57, 58 and 59.

b. **WQC Granted With Conditions**

The following WQC Conditions, as stated in the SCDHEC's Notice of Department Decision dated November 25, 2020, are also considered 2021 NWP Regional Conditions:

i. For NWP 43, "Activities authorized by this certification are limited to maintenance of existing facilities, such as stormwater ponds, detention and retention basins, water control structures, outfall structures, emergency spillways, and existing ponds, that are proposed for use as water quantity or volume control. This NWP cannot be used for existing ponds that are proposed to be converted into water quality treatment facilities, such as sediment basins, sediment traps, or other similar structures."

ii. For NWP 51, "This NWP is not certified for activities that cause the loss of more than 300 linear feet of stream bed."

iii. For NWP 52, "This NWP is not certified for activities that cause the loss of more than 300 linear feet of stream bed."

c. **WQC Granted Without Conditions**

The WQCs for NWPs 3, 4, 5, 6, 7, 13, 15, 18, 19, 20, 22, 25, 27, 30, 31, 32, 33, 36, 37, 38, 40, 41, 42, 45, 48 and 53 were granted without conditions.

d. **No WQC Required**
NWPs 1, 2, 8, 9, 10, 11, 24, 28, 35, 55 and 56 do not require WQCs.

2. **Coastal Zone Consistency (CZC)**

a. **CZC Concurrence Denied**

The following NWPs were found to be inconsistent with the S.C. Coastal Zone Management Program; thus, the CZC concurrence is denied and an Individual CZC concurrence, or presumed concurrence for the proposed activity, will be required for these NWPs:

NWPs 12, 14, 16, 17, 21, 23, 24, 29, 34, 35, 39, 42, 44, 46, 49, 50, 51, 54, 55, 56, 57, 58 and 59.

b. **CZC Concurrence Granted With Conditions**

The following CZC Conditions, as stated in the SCDHEC's Notice of Department Decision dated November 25, 2020, are also considered 2021 NWP Regional Conditions:

i. For NWP 43, "Activities authorized by this certification are limited to maintenance of existing facilities, such as stormwater ponds, detention and retention basins, water control structures, outfall structures, emergency spillways, and existing ponds that are proposed for use as water quantity or volume control. This NWP cannot be used for existing ponds that are proposed to be converted into water quality treatment facilities such as sediment basins, sediment traps, or other similar structures."

ii. For NWP 52, "This NWP is not certified for activities that cause the loss of more than 300 linear feet of stream bed."

c. **CZC Concurrence Granted Without Conditions**

The CZCs for NWPs 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 15, 18, 19, 20, 22, 25, 27, 28, 30, 31, 32, 33, 36, 37, 38, 40, 41, 45, 48 and 53 were granted without conditions.

d. **No CZC required**

Not applicable.

3. Coastal Zone Consistency (CZC) General Condition

The following CZC General Condition, as stated in the SCDHEC 401/CZC Letter dated December 14, 2020, is considered a 2021 NWP Regional Condition:

For all NWPs, "Activities in the Critical Areas (as defined in 48-39-10, R 30.1(D) and R 30.10) require a direct permit from SCDHEC OCRM. SCDHEC OCRM's action on direct critical areas permits will serve as the consistency determination for the critical area activity."

G. DISTRICT POINT OF CONTACT

Tracy D. Sanders
USACE- Charleston District
69A Hagood Avenue
Charleston, South Carolina 29403
843-329-8044
Tracy.d.sanders@usace.army.mil
SAC.RD.Charleston@usace.army.mil

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, CHARLESTON DISTRICT
69 A HAGOOD AVENUE
CHARLESTON SC 29403-5107

August 14, 2024

Michele Culbreath
Project Manager
Water Quality Certification & Wetlands Section
S.C. Dept. of Environmental Services (SCDES)
1362 McMillan Avenue, Suite 300
Charleston, SC 29405

Dear Ms. Culbreath

The US Army Corps of Engineers (USACE) is proposing to construct relief bridges (cross drains) in Conway, SC and to remove two existing weirs in Socastee, SC. The actions have been identified as components of the tentatively selected plan in the draft *Waccamaw River, Horry County, South Carolina Flood Risk Management Integrated Feasibility Study and Environmental Assessment* (authorized under Section 445 of WRDA 1999 [P.L. 106-53]) scheduled for public comment on September 4, 2024. These actions were found to provide flood risk reduction to surrounding areas.

In accordance with Section 401 of the Clean Water Act (33 USC § 1341), USACE must obtain certification from the South Carolina Department of Environmental Services (DES), Bureau of Water, that any proposed discharges will comply with the applicable provisions of the Clean Water Act. USACE has determined that the project meets the conditions outlined under the 2021 General State Certification for Nationwide Permit 14 and 53. In accordance with the U.S. Environmental Protection Agency's (EPA) current water quality certification regulations at 40 CFR Part 121.4, USACE is submitting this pre-filing meeting request at least 30 days prior to the submittal of the WQC request (40 CFR Part 121.4(a)).

Thank you for your time, consideration, and assistance in this matter. If you require additional information or have any questions regarding the project, please do not hesitate to contact Niko Brown at (603)-258-8589 or niko.r.brown@usace.army.mil.

Respectfully,

Nancy Parrish
Chief Planning & Environmental Branch

Description of Proposed Project:

Project Area and Proposal

Under the tentatively selected plan (TSP), relief bridges (cross drains) would be constructed at three locations in Conway, SC and weirs would be removed at two different locations in Socastee, SC.

The relief bridges (cross drains) to be constructed in Conway would be along three existing highways, including Hwy 905 (79.0363053°W 33.8391335°N), Hwy 501 Business (79.0334987°W 33.8255466°N), and E Hwy 501 (79.0409353°W 33.8166853°N) (see Figure 1 below). The current dimensions for desirable function of these cross drains vary in length depending on location but all are of the same width with each having 4 culverts of about 4' in diameter and set 2' apart to total 22' in width. Lengths would be 150', 200' and 300' extending in both directions from centerline of Hwy 905, Hwy 501 Business, and E Hwy 501, respectively. Culverts would be designed with a 1.25-2% slope on the downstream side and include rip rap for slope stability. Use of erosion and sedimentation best management practices (BMPs) would be in place.

The weirs to be removed in Socastee are currently located along Socastee Creek at 78.9544388°W 33.7169190°N and 78.9673896°W 33.7104660°N (see Figure 2 below). The weirs are about 50 feet in length with a 30-ft long spillway set 6" below the weir crest. Use of turbidity curtains and erosion and sedimentation best management practices (BMPs) would be in place.

Estimated Impacts to Water Resources

Relief Bridges (Cross Drains)

Based on data from the National Wetlands Inventory maintained by the U.S. Fish and Wildlife Service (updated June 29, 2024), the total construction footprint in wetlands for these structures is 0.044 acres. The cross drain on Hwy 501 Business would have the greatest overlap with wetlands, requiring permanent impacts to an estimated 0.03 acres (rounded up to nearest 1/10th). This would consist of approximately 0.013 acres of freshwater forested/shrub wetland, and 0.013 acres of riverine wetland (about 26 linear feet of stream impact). The cross drain at Hwy 905 is estimated to overlap with 0.015 acres of freshwater forested/shrub wetland, while E Hwy 501 is estimated to overlap with 0.003 acres of freshwater pond (rounded up to the nearest 1/100th). USACE anticipates that these estimates will remain within the criteria to be authorized under Nationwide Permit 14 (Linear Transportation Projects) with forthcoming design details.

Weir Removals

Weir removals are not considered to have any impacts to wetlands that would require the discharge of dredge material and/or fill. Per NWP 53: the NWP does not authorize discharges of dredged or fill material into waters of the U.S. or structures or work in navigable waters to restore the stream in the

vicinity of the low-head dam, including the former impoundment area. Nationwide permit 27 or other Department of the Army permits may authorize such activities. This NWP does not authorize discharges of dredged or fill material into waters of the United States or structures or work in navigable waters to stabilize stream banks. Bank stabilization activities may be authorized by NWP 13 or other Department of the Army permits.

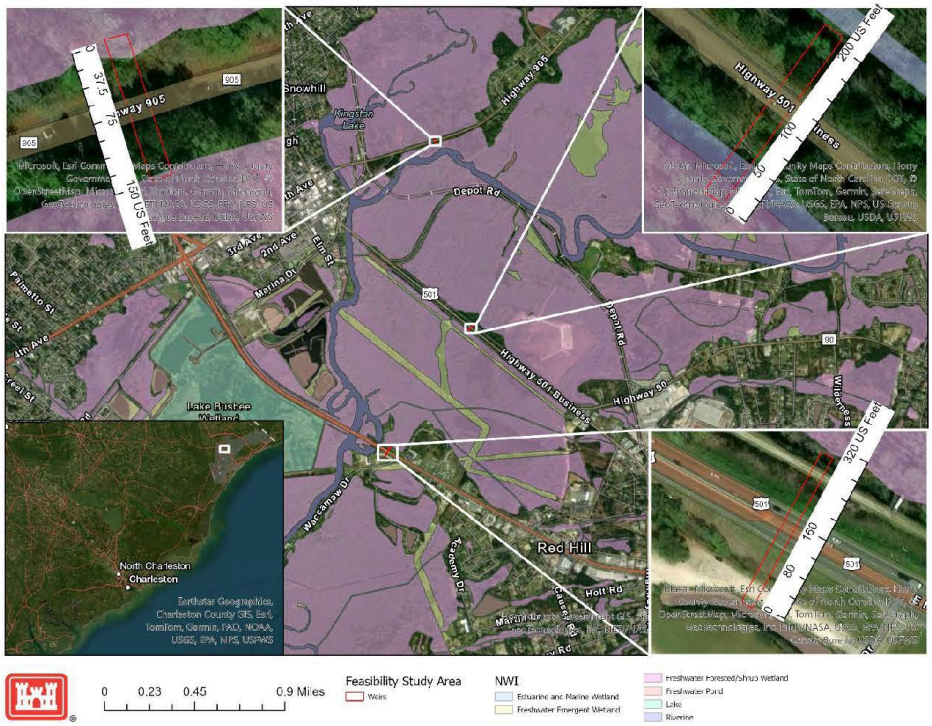

Figure 1. Locations of cross drains in Conway in association with NWI data

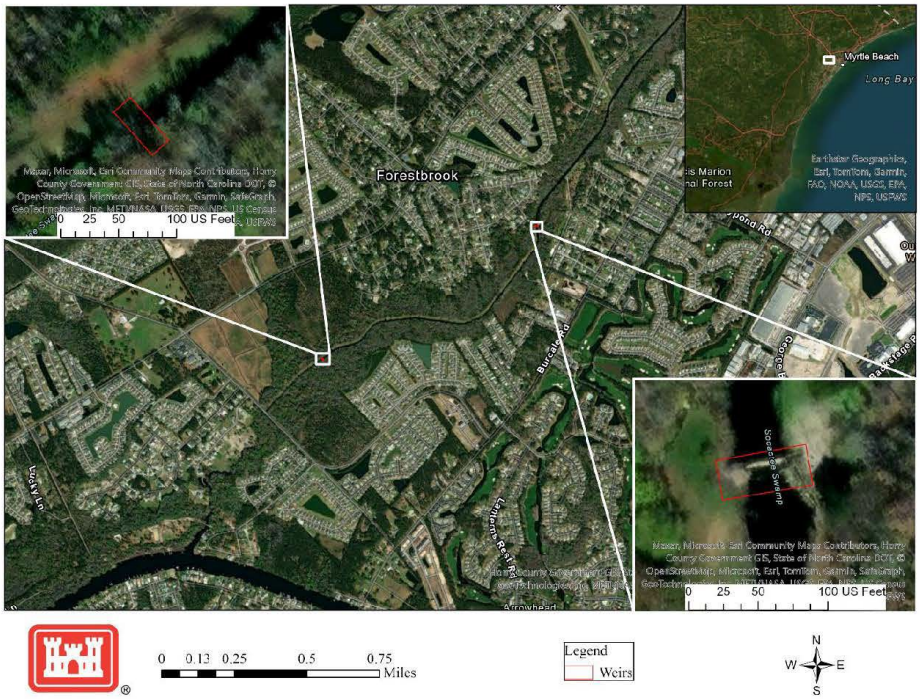

Figure 2. Location of weir removals on Socastee Creek (Swamp)

From:	S. Michele Culbreath
To:	Brown, Niko R CIV USARMY CESAC (USA); WQCWetlands
Cc:	Charles W. Hightower; Parrish, Nancy A CIV USARMY CESAC (USA)
Subject:	[Non-DoD Source] Re: Pre-filing Meeting Request - Horry County – Waccamaw River, Horry County, South Carolina Flood Risk Management Integrated Feasibility Study and Environmental Assessment
Date:	Thursday, August 15, 2024 8:15:48 AM
Attachments:	Outlook-4sidxiuv.png

We have received your request but will not be holding a prefiling meeting for this project.

Michele Culbreath
Project Manager
Water Quality Certification
and Wetlands Section
Division of Water
O: 803-898-4224
michele.culbreath@des.sc.gov
DES.SC.gov

Please note my new email address with the South Carolina Department of Environmental Services (SCDES), which launched as a new state agency on July 1, 2024. While my old DHEC email will direct to me for a while, please update your address book with my new SCDES contact information.

From: Brown, Niko R CIV USARMY CESAC (USA) <Niko.R.Brown@usace.army.mil>
Sent: Wednesday, August 14, 2024 11:05 AM
To: WQCWetlands <wqcwetlands@des.sc.gov>
Cc: S. Michele Culbreath <Michele.Culbreath@des.sc.gov>; Charles W. Hightower <Charles.Hightower@des.sc.gov>; Parrish, Nancy A CIV USARMY CESAC (USA) <Nancy.A.Parrish@usace.army.mil>
Subject: Pre-filing Meeting Request - Horry County – Waccamaw River, Horry County, South Carolina Flood Risk Management Integrated Feasibility Study and Environmental Assessment

*** Caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. ***

Good morning,

The U.S. Army Corps of Engineers (USACE), Charleston District, under the Civil Works program, is proposing to construct relief bridges (cross drains) in Conway, SC and to remove two existing weirs in Socastee, SC. The actions have been identified as components of the tentatively selected plan in the draft *Waccamaw River, Horry County, South Carolina Flood Risk Management Integrated Feasibility Study and Environmental Assessment* (authorized under Section 445 of WRDA 1999 [P.L. 106-53]) scheduled for public comment on September 4, 2024. These actions were found to provide flood risk reduction to surrounding areas.

In accordance with Section 401 of the Clean Water Act (33 USC § 1341), USACE must obtain certification from the South Carolina Department of Environmental Services (DES), Bureau of Water, that any proposed discharges will comply with the applicable provisions of the Clean Water Act. USACE has determined that the project meets the conditions outlined under the 2021 General State Certification for Nationwide Permit 14 and 53. In accordance with the U.S. Environmental Protection Agency's (EPA) current water quality certification regulations at 40 CFR Part 121.4, USACE is submitting this pre-filing meeting request at least 30 days prior to the submittal of the WQC request (40 CFR Part 121.4(a)). Please see the attached letter with the required information to be included in the pre-filing meeting request.

Thank you for your time, consideration, and assistance in this matter. If you require additional information or have any questions regarding the project, please do not hesitate to contact Niko Brown at (603) 258-8589 or niko.r.brown@usace.army.mil.

Best,

Niko Brown
Biologist, Planning & Environmental Branch
USACE – Charleston District
(603) 258-8589

From:	Brown, Niko R CIV USARMY CESAC (USA)
To:	"S. Michele Culbreath"; WQCWetlands
Cc:	Charles W. Hightower; Parrish, Nancy A CIV USARMY CESAC (USA)
Subject:	RE: Pre-filing Meeting Request - Horry County – Waccamaw River, Horry County, South Carolina Flood Risk Management Integrated Feasibility Study and Environmental Assessment
Date:	Wednesday, September 25, 2024 9:01:00 AM
Attachments:	Waccamaw 401 Application.pdf AppendixA3_Civil_TSP_09AUG24.docx image001.png

Good morning Michele,

Please see the attached Federal application form, as well as a copy of the civil engineering appendix which was included in the feasibility study which was recently released for public comment (this is the extent of design to-date). Please note that only the actions related to relief bridges along Highways 905, 501 BUS and E 501, as well as the weir removals in Socastee are the actions being pursued and other alternative measures identified in the appendix should be ignored. As noted in the application and in our previous pre-filing meeting request, the actions associated with the TSP identified meet the criteria for authorization under NWP 14 and 53. It is possible bank stabilization may also be necessary as determined at a later date in association with the weir removals, however, this action would also meet criteria for authorization under NWP 13.

The project proponent hereby certifies that all information contained herein is true, accurate, and complete to the best of my knowledge and belief. Furthermore, the project proponent hereby requests that the certifying authority review and take action on this CWA 401 certification request within the applicable reasonable period of time.

Please let me know if you have any questions.

Thank you!

Niko Brown
Biologist, Planning & Environmental Branch
USACE – Charleston District
(603) 258-8589

From: S. Michele Culbreath <Michele.Culbreath@des.sc.gov>
Sent: Thursday, August 15, 2024 8:11 AM
To: Brown, Niko R CIV USARMY CESAC (USA) <Niko.R.Brown@usace.army.mil>; WQCWetlands <wqcwetlands@des.sc.gov>
Cc: Charles W. Hightower <Charles.Hightower@des.sc.gov>; Parrish, Nancy A CIV USARMY CESAC (USA) <Nancy.A.Parrish@usace.army.mil>
Subject: [Non-DoD Source] Re: Pre-filing Meeting Request - Horry County – Waccamaw River, Horry County, South Carolina Flood Risk Management Integrated Feasibility Study and Environmental Assessment

We have received your request but will not be holding a prefiling meeting for this project.

Joint Federal and State Application Form For Activities Affecting Waters of the United States Or Critical Areas of the State of South Carolina	**This Space for Official Use Only** Application No._____ Date Received_____ Project Manager_____ Watershed # _____

Authorities: 33 USC 401, 33 USC 403, 33 USC 407, 33 USC 408, 33 USC 1341, 33 USC 1344, 33 USC 1413 and Section 48-39-10 et. Seq of the South Carolina Code of Laws. These laws require permits for activities in, or affecting, navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. The Corps of Engineers and the State of South Carolina have established a joint application process for activities requiring both Federal and State review or approval. Under this joint process, you may use this form, together with the required drawings and supporting information, to apply for both the Federal and/or State permit(s).

Drawings and Supplemental Information Requirements: In addition to the information on this form, you must submit a set of drawings and, in some cases, additional information. A completed application form together with all required drawings and supplemental information is required before an application can be considered complete. See the attached instruction sheets for details regarding these requirements. You may attach additional sheets if necessary to provide complete information.

1. Applicant Last Name: Nancy		11. Agent Last Name (agent is not required):	
2. Applicant First Name: Parrish		12. Agent First Name:	
3. Applicant Company Name: U.S. Army Corps of Engineers		13. Agent Company Name:	
4. Applicant Mailing Address: 69A Hagood Ave		14. Agent Mailing Address:	
5. Applicant City: Charleston		15. Agent City:	
6. Applicant State: South Carolina	7. Applicant Zip: 29403	16. Agent State:	17. Agent Zip:
8. Applicant Area Code and Phone No.: 603-258-8589		18. Agent Area Code and Phone No.:	
9. Applicant Fax No.:		19. Agent Fax No.:	
10. Applicant E-mail: niko.r.brown@usac.army.mil		20. Agent E-mail:	

21. Project Name: Waccamaw River, Horry County, South Carolina Flood Risk Management Study		22. Project Street Address: See below	
23. Project City: Conway and Myrtle Beach	24. Project County: Horry	25. Project Zip Code: 29526 and 29579	26. Nearest Waterbody: Waccamaw River and Socastee Creek
27. Tax Parcel ID: 1230003029, 1370003109, 1370002096, 1370003005, 1720006015, 1710001005, 1722801090, 1722801063		28. Property Size (acres): See below	
29. Latitude: See below		30. Longitude: See below	

31. Directions to Project Site (Include Street Numbers, Street Names, and Landmarks and attach additional sheet if necessary):

The relief bridges (cross drains) to be constructed in Conway would be along three existing highways, including Hwy 905 (79.0363053° W 33.8391335°N), Hwy 501 Business (79.0334987°W 33.8255466°N), and E Hwy 501 (79.0409353°W 33.8166853°N). The weirs to be removed in Socastee are currently located along Socastee Creek at 78.9544388°W 33.7169190°N and 78.9673896°W 33.7104660°N.

32. Description of the Overall Project and of Each Activity in or Affecting U.S. Waters or State Critical Areas (attach additional sheets if needed)

The US Army Corps of Engineers (USACE) is proposing to construct relief bridges (cross drains) in Conway, SC and to remove two existing weirs in Socastee, SC. The actions have been identified as components of the tentatively selected plan in the draft Waccamaw River, Horry County, South Carolina Flood Risk Management Integrated Feasibility Study and Environmental Assessment (authorized under Section 445 of WRDA 1999 [P.L. 106-53]). These actions were found to provide flood risk reduction to surrounding areas. Effects to U.S. waters include those associated with construction footprints and any changes to the flow or storage of water and sediments.

33. Overall Project Purpose and the Basic Purpose of Each Activity In or Affecting U.S. Waters (attach additional sheets if needed):

These actions have been identified for their ability to reduce flood risks to neighboring structures and life safety. Construction of relief bridges is expected to improve downstream conveyance of flood waters at existing bottlenecks for storm water along floodplains of the Waccamaw River in Conway. Likewise, removal of existing weirs along Socastee Creek in the Forestbrook area of Myrtle Beach are expected to reduce flood impacts stemming from Socastee Creek.

34. Type and quantity of Materials to Be Discharged

Dirt or Topsoil:	_____	☐cubic yards
Clean Sand:	_____	☐cubic yards
Mud:	_____	☐cubic yards
Clay:	_____	☐cubic yards
Gravel, Rock, or Stone:	_____	☐cubic yards
Concrete:	_____	☐cubic yards
Other (describe):	_____	☐cubic yards
TOTAL:	_____	cubic yards

35. Type and Quantity of Impacts to U.S. Waters (including wetlands).

Filling:	_____	☐acres	☐ sq.ft. _____	☐cubic yards
Backfill & Bedding:	_____	☐acres	☐ sq.ft _____	☐cubic yards
Landclearing:	_____	☐acres	☐ sq.ft _____	☐cubic yards
Dredging:	_____	☐ acres	☐ sq.ft. _____	☐cubic yards
Flooding:	_____	☐acres	☐ sq.ft. _____	☐cubic yards
Draining/Excavation:	0.044	■acres	☐ sq.ft. _____	☐cubic yards
Shading:	_____	☐acres	☐ sq.ft. _____	☐cubic yards
TOTALS:	0.044 acres	0.044 sq.ft.	_____	cubic yards

36. Individually list wetland impacts including mechanized clearing, fill, excavation, flooding, draining, shading, etc. and attach a site map with location of each impact (attach additional sheets if needed).

Impact No.	Wetland Type	Distance to Receiving Water body (LF)	Purpose of Impact (road crossing, impoundment, flooding, etc)	Impact Size (acres)
1	Freshwater Pond	120	Construction footprint of E Hwy 501 relief bridge	0.0026
2	Riverine	3,600	Construction footprint of Hwy 501 BUS relief bridge	0.0136
3	Freshwater Forested/Shrub	175	Construction footprint of Hwy 905 relief bridge	0.0276
			Total Wetland Impacts (acres)	

37. Individually list all seasonal and perennial stream impacts and attach a site map with location of each impact (attach additional sheets)

Impact No.	Seasonal or Perennial Flow	Average Stream Width (LF)	Impact Type (road crossing, impoundment, flooding, etc)	Impact Length (LF)
1	Perennial	25	Northern construction footprint of Hwy 501 BUS relief br	22
2	Perennial	25	Southern construction footprint of Hwy 501 BUS relief br	22
			Total Stream Impacts (Linear Feet)	44

38. Have you commenced work on the project site? ☐ YES ■ NO If yes, describe all work that has occurred and provide dates.

N/A

39. Describe measures taken to avoid and minimize impacts to Waters of the United States:

Erosion Prevention BMPs
Sediment Control BMPs
Possibly during dryer seasons or periods of low traffic

40. Provide a brief description of the proposed mitigation plan to compensate for impacts to aquatic resources or provide justification as to why mitigation should not be required (Attach a copy of the proposed mitigation plan for review).

Impacts per bridge are under 0.1 acres and do not require mitigation under authorization of NWP 14. No mitigation is necessary for weir removals under authorization of NWP 53.

41. See the attached sheet to list the names and addresses of adjacent property owners.

42. List all Corps Permit Authorizations and other Federal , State, or Local Certifications, Approvals, Denials received for work described in this application.

Work is authorized under USACE NWPs 14 and 53 and a General Certification Request was submitted to BCM on 9/13/2024.

43. Authorization of Agent. I hereby authorize the agent whose name is given on page one of this application to act in my behalf in the processing of this application and to furnish supplemental information in support of this application. [1]

BROWN.NIKO.ROBERT.1617428810 Digitally signed by BROWN.NIKO.ROBERT.1617428810 Date: 2024.09.17 09:14:49 -04'00'

Applicant's Signature Date

44. Certification. Application is hereby made for a permit or permits to authorize the work and uses of the work as described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent for the applicant. [1]

Applicant's Signature Date Agent's Signature Date

[1]The application must be signed by the person who desires to undertake the proposed activity or it may be signed by a duly authorized agent if the authorization statement in blocks 11 and 43 have been completed and signed. 18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

#41- Adjacent Property Owner Mailing List

NOTE: A depiction of the adjacent properties with identifying corresponding property owner names must accompany this mailing list.
(Attach additional sheets if necessary)

Applicant Name: USACE Charleston District

Project Name: Waccamaw River, Horry County, South Carolina Flood Risk Management Stud

Property Owner Name	Mailing Address
REDACTED	PO BOX 1605, Conway, SC 29528
REDACTED	1004 WACCAMAW DR, Conway, SC 29526
REDACTED	3114 CULTRA RD, Conway, SC 29526
REDACTED	PO BOX 1236, Conway, SC 29528
REDACTED	1560-C BURCALE RD, Myrtle Beach, SC 29579
REDACTED	3997 LARK HILL DR, Myrtle Beach, SC 29577
REDACTED	175 CARLISLE WAY, Myrtle Beach, SC 29579
REDACTED	466 PAW PAW LN, Myrtle Beach, SC 29579

SC DEPARTMENT of
ENVIRONMENTAL
SERVICES

October 3, 2024

Ms. Nancy Parrish
US Army Corp of Engineers
69A Hagood Avenue
Charleston, South Carolins 29403
niko.r.brown@usace.army.mil

Re: 401 Certification for Authorization Pursuant to Nationwide Permit 14 (Linear Transportation Projects)

Applicant Permit ID No.: NWP 14-02-24

Applicant: US Army Corp of Engineers

County: Horry

Project: Waccamaw River, Horry County, South Carolina Flood Risk Management Study

Dear Ms. Parrish:

On September 15, 2020, the U.S. Army Corps of Engineers (Corps) issued a proposed rule in the Federal Register (85 FR 57298) that announced the reissuance of all the existing NWPs and the proposal to issue five new NWPs. In response to the September 15th proposed rule, the South Carolina Department of Environmental Services (Department) initiated actions to certify the proposed NWPs and on December 14, 2020, the Department issued a final certification in accordance with Section 401 of the Federal Clean Water Act (CWA), as amended, and a certification of consistency with the Coastal Zone Management Act (48-39-10 et.seq.).

info@des.gov | des.sc.gov | 803.898.3432

On January 13, 2021, the Corps published a final rule in the Federal Register (86 FR 2744). In this notice, the Corps announced that it was reissuing only 12 of the existing NWPs and four new NWPs.

On March 8, 2021, the Corps' Charleston District issued their Final Regional Conditions for the 16 NWPs. In that notice, the Charleston District denied the Section 401 Water Quality Certification (401 Certification) for NWP 12, 29, 39, 44, 57 and 58 as well as the Coastal Zone Consistency (CZC) for NWPs 12, 29, 39, 42, 44, 51, 57 and 58. Subsequently, on February 7, 2022 the Corps' Charleston District denied the WQCs for NWP 14, 23, and 46. As a result, the Department is proposing to revise the Individual State Certification for the NWPs that were denied by the Corps Regional conditions to include NWP 14, 23, and 46.

On September 16, 2022, a General State Certification to authorize activities in accordance with S.C. Code Ann. §§ 48-1-10 et seq. and S.C. Code Ann. Regulation 61-101, and S.C. Code Ann. § 48-39-10 et seq. and the S.C. Coastal Zone Management Program document was issued by the South Carolina Department of Environmental Services (DES or the Department) for the Nationwide Permits (NWPs) 12, 14, 23, 29, 39, 44, 46, 57, and 58.

The Department has reviewed the above-reference project in accordance with the September 16, 2022 general certification and, provided the applicant adheres to the certification conditions outlined in the attached document, the Department has determined that there is a reasonable assurance that the work authorized will be conducted in a manner consistent with the certification requirements of Section 401 of the Clean Water Act.

If you have any questions, please email me at Morgan.Amedee@des.sc.gov.

Sincerely,

Morgan Amedee

Morgan D. Amedee
Water Quality Certification and Wetlands Section

cc: USACE

Nationwide Permit Number 14: Linear Transportation Projects
Proposed Conditions for the 401 Water Quality Certification:

1. This NWP is not certified for activities located in or adjacent to (as determined by SCDES) waters defined (as per Regulation 61-68) as Outstanding National Resource Waters (ONRW), Outstanding Resource Waters (ORW), Trout Waters or, SCDNR designated State Scenic Rivers.
2. This NWP is not certified or activities that cause the loss of more than 300 linear feet of stream bed.

G ESA COMPLIANCE RECORD

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
Phone: (843) 727-4707 Fax: (843) 727-4218

In Reply Refer To: 06/24/2025 15:38:40 UTC
Project Code: 2024-0111771
Project Name: Waccamaw Flood Risk Study

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Marine Mammals

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
(843) 727-4707

PROJECT SUMMARY

Project Code: 2024-0111771
Project Name: Waccamaw Flood Risk Study
Project Type: Bridge - New Construction
Project Description: This study is being performed to evaluate alternatives designed to reduce flood impacts in the areas of Longs/Red Bluff, Conway, Socastee and Bucksport. A number of structural and nonstructural alternatives were developed and evaluated and a TSP has been selected which involves (1) construction of three relief bridges in Conway along natural low-points in Highways 501, 501 Business and 905, and (2) removal of two existing low-head weirs on Socastee Creek in Socastee.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@33.709776700000006,-78.96732355871166,14z

Counties: Horry County, South Carolina

ENDANGERED SPECIES ACT SPECIES

There is a total of 12 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

BIRDS

NAME	STATUS
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red-cockaded Woodpecker *Dryobates borealis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7614	Threatened
Rufa Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Wood Stork *Mycteria americana* Population: AL, FL, GA, MS, NC, SC No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8477	Threatened

REPTILES

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

FLOWERING PLANTS

NAME	STATUS
American Chaffseed *Schwalbea americana* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1286	Endangered
Canby's Dropwort *Oxypolis canbyi* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7738	Endangered
Pondberry *Lindera melissifolia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1279	Endangered

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

The following FWS National Wildlife Refuge Lands and Fish Hatcheries lie fully or partially within your project area:

FACILITY NAME	ACRES
WACCAMAW NATIONAL WILDLIFE REFUGE https://www.fws.gov/our-facilities?$keywords="%5C%22WACCAMAW+NATIONAL+WILDLIFE+REFUGE%5C%22"	18,852.009

BALD & GOLDEN EAGLES

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act [2] and the Migratory Bird Treaty Act (MBTA) [1]. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

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1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are Bald Eagles and/or Golden Eagles in your project area.

Measures for Proactively Minimizing Eagle Impacts
For information on how to best avoid and minimize disturbance to nesting bald eagles, please review the National Bald Eagle Management Guidelines. You may employ the timing and activity-specific distance recommendations in this document when designing your project/activity to avoid and minimize eagle impacts. For bald eagle information specific to Alaska, please refer to Bald Eagle Nesting and Sensitivity to Human Activity.

The FWS does not currently have guidelines for avoiding and minimizing disturbance to nesting Golden Eagles. For site-specific recommendations regarding nesting Golden Eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

If disturbance or take of eagles cannot be avoided, an incidental take permit may be available to authorize any take that results from, but is not the purpose of, an otherwise lawful activity. For assistance making this determination for Bald Eagles, visit the Do I Need A Permit Tool. For assistance making this determination for golden eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

Ensure Your Eagle List is Accurate and Complete
If your project area is in a poorly surveyed area in IPaC, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory Birds and Eagles, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to bald or golden eagles on your list, see the "Probability of Presence Summary" below to see when these bald or golden eagles are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

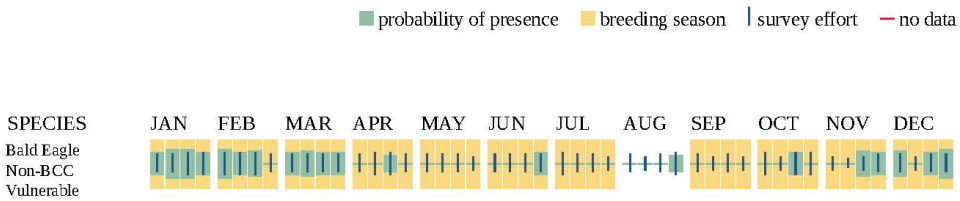
Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds

- Nationwide avoidance and minimization measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

The Migratory Bird Treaty Act (MBTA) [1] prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service).

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Kestrel *Falco sparverius paulus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9587	Breeds Apr 1 to Aug 31
Bachman's Sparrow *Peucaea aestivalis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/6177	Breeds May 1 to Sep 30
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Brown-headed Nuthatch *Sitta pusilla* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9427	Breeds Mar 1 to Jul 15

NAME	BREEDING SEASON
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Chuck-will's-widow *Antrostomus carolinensis* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9604	Breeds May 10 to Jul 10
Coastal (waynes) Black-throated Green Warbler *Setophaga virens waynei* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/11879	Breeds May 1 to Aug 15
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10678	Breeds May 1 to Aug 20
Grasshopper Sparrow *Ammodramus savannarum perpallidus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/8329	Breeds Jun 1 to Aug 20
Least Tern *Sternula antillarum antillarum* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/11919	Breeds Apr 25 to Sep 5
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Painted Bunting *Passerina ciris* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9511	Breeds Apr 25 to Aug 15
Pectoral Sandpiper *Calidris melanotos* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9561	Breeds elsewhere
Prairie Warbler *Setophaga discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9513	Breeds May 1 to Jul 31

NAME	BREEDING SEASON
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9439	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9478	Breeds elsewhere
Semipalmated Sandpiper *Calidris pusilla* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9603	Breeds elsewhere
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Swallow-tailed Kite *Elanoides forficatus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8938	Breeds Mar 10 to Jun 30
Willet *Tringa semipalmata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10669	Breeds Apr 20 to Aug 5
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

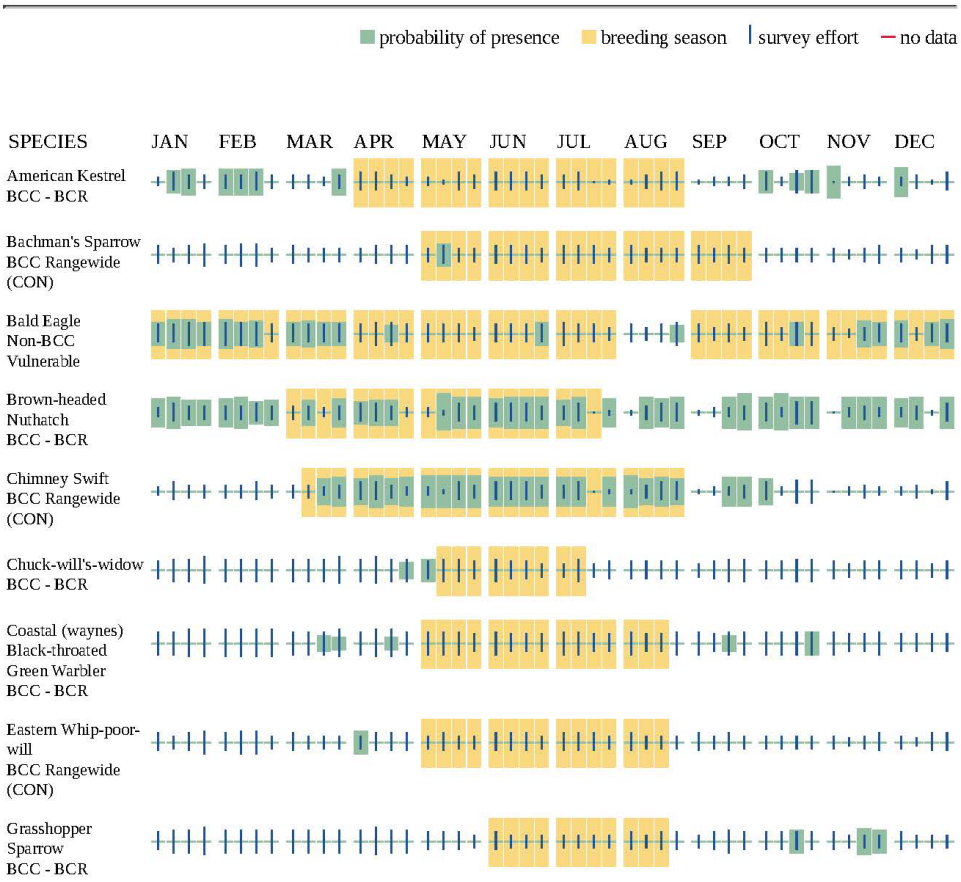
Probability of Presence (■)

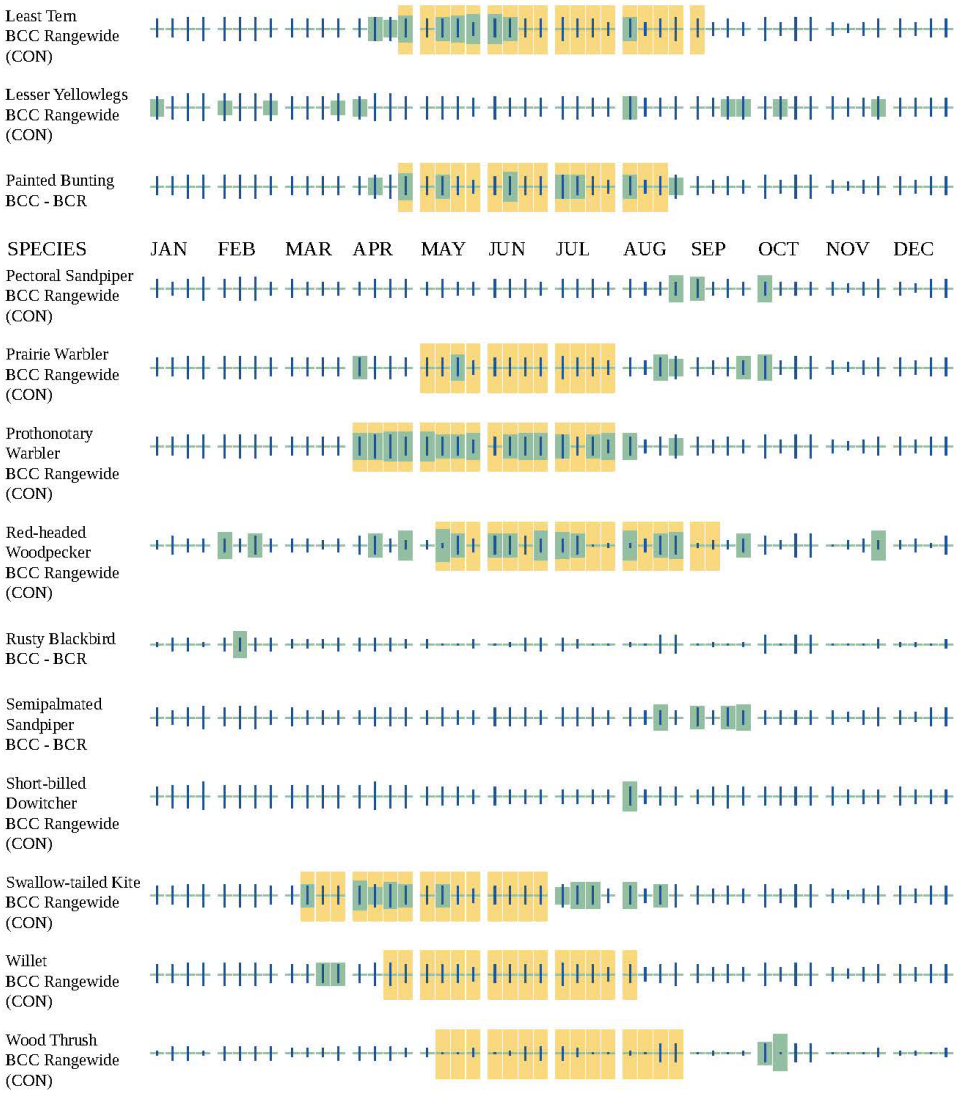
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.





Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds

- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MARINE MAMMALS

Marine mammals are protected under the Marine Mammal Protection Act. Some are also protected under the Endangered Species Act[1] and the Convention on International Trade in Endangered Species of Wild Fauna and Flora[2].

The responsibilities for the protection, conservation, and management of marine mammals are shared by the U.S. Fish and Wildlife Service [responsible for otters, walruses, polar bears, manatees, and dugongs] and NOAA Fisheries[3] [responsible for seals, sea lions, whales, dolphins, and porpoises]. Marine mammals under the responsibility of NOAA Fisheries are **not** shown on this list; for additional information on those species please visit the Marine Mammals page of the NOAA Fisheries website.

The Marine Mammal Protection Act prohibits the take of marine mammals and further coordination may be necessary for project evaluation. Please contact the U.S. Fish and Wildlife Service Field Office shown.

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1. The Endangered Species Act (ESA) of 1973.
2. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is a treaty to ensure that international trade in plants and animals does not threaten their survival in the wild.
3. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

NAME

West Indian Manatee *Trichechus manatus*
Species profile: https://ecos.fws.gov/ecp/species/4469

IPAC USER CONTACT INFORMATION

Agency: Army Corps of Engineers
Name: Niko Brown
Address: 69A Hagood Ave
City: Charleston
State: SC
Zip: 29403
Email niko.r.brown@usace.army.mil
Phone: 8433298145

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, CHARLESTON DISTRICT
69A HAGOOD AVENUE
CHARLESTON, SOUTH CAROLINA 29403-5107

November 22, 2024

Christy Johnson-Hughes
Ecological Services, South Carolina Field Office
U.S. Fish and Wildlife Service
176 Croghan Spur Road, Suite 200
Charleston, SC 29407

Dear Ms. Johnson-Hughes:

The U.S. Army Corps of Engineers (USACE), Charleston District, is proposing to construct relief bridges (cross drains) in Conway, SC and to remove two existing weirs in Socastee, SC. The actions have been identified as components of the tentatively selected plan in the draft Waccamaw River, Horry County, South Carolina Flood Risk Management Integrated Feasibility Study and Environmental Assessment (authorized under Section 445 of WRDA 1999 [P.L. 106-53]) released for public comment on September 9, 2024. We request initiation of informal consultation under section 7(a)(2) of the Endangered Species Act (ESA) for the proposed project. Based on analysis of potential project effects, USACE has made a determination of *may affect, not likely to adversely affect* for an ESA-listed species. Our supporting analysis attached. We request your written concurrence with our determinations.

Pursuant to our request for informal consultation, we are providing the following information:

- A description of the action to be considered;
- A description of the action area;
- A description of any listed species or critical habitat that may be affected by the action; and
- An analysis of the potential routes of effect on any listed species or critical habitat.

USACE has reviewed the proposed project for its potential effects to ESA-listed species and their critical habitat. Based on the attached analysis, USACE has made a determination of *may affect, not likely to adversely affect* for the tricolored bat and West Indian manatee. We request your concurrence with this determination.

If you have questions, please do not hesitate to contact Mr. Niko Brown, Biologist at niko.r.brown@usace.army.mil.

Sincerely,

Nancy Parrish

Nancy Parrish,
Chief of Planning and Environmental Branch

Enclosure

Description of Federal Action

Project Area and Proposal

Under the tentatively selected plan (TSP), relief bridges (cross drains) would be constructed at three locations in Conway, SC and weirs would be removed at two different locations in Socastee, SC.

The relief bridges (cross drains) to be constructed in Conway would be along three existing highways, including Hwy 905 (79.0363053°W 33.8391335°N), Hwy 501 Business (79.0334987°W 33.8255466°N), and E Hwy 501 (79.0409353°W 33.8166853°N) (see Figure 1 below). The current dimensions for desirable function of these cross drains vary in length depending on location but all are of the same width with each having 4 culverts of about 4' in diameter and set 2' apart to total 22' in width. Lengths would be 150', 200' and 300' extending in both directions from centerline of Hwy 905, Hwy 501 Business, and E Hwy 501, respectively. Culverts would be designed with a 1.25-2% slope on the downstream side and include rip rap for slope stability. Use of erosion and sedimentation best management practices (BMPs) would be in place. Some tree removal would be required but would be less than 0.1 acres at each construction and are consisting of trees in a relatively high disturbance roadside area.

The weirs to be removed in Socastee are currently located along Socastee Creek at 78.9544388°W 33.7169190°N and 78.9673896°W 33.7104660°N (see Figure 2 below). The weirs are about 50 feet in length with a 30-ft long spillway set 6" below the weir crest. Use of turbidity curtains and erosion and sedimentation best management practices (BMPs) would be in place.

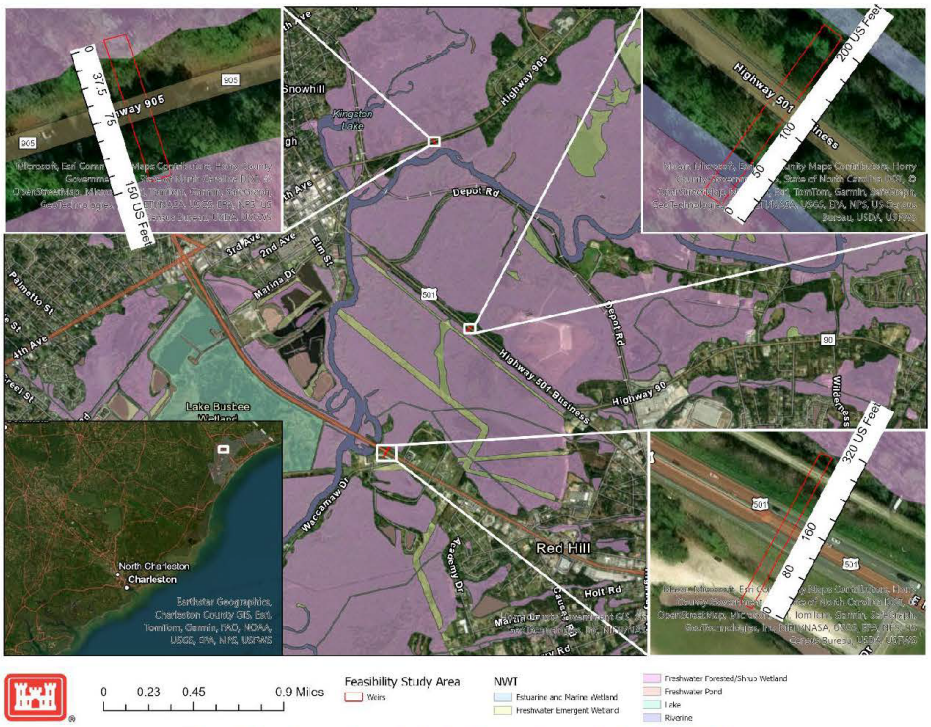


Figure 1. Locations of cross drains in Conway in association with NWI data

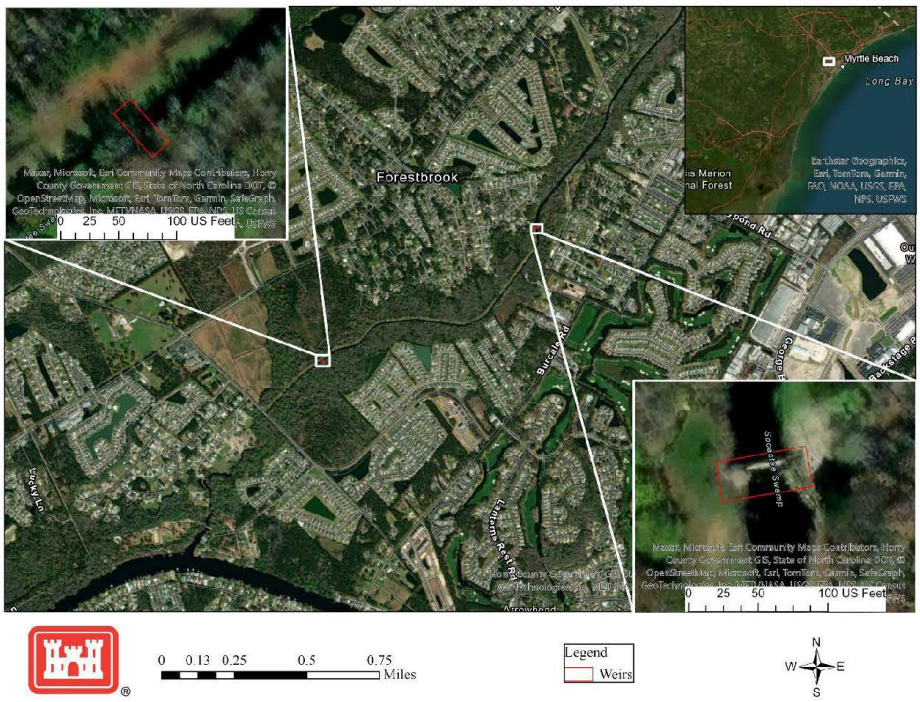


Figure 2. Location of weir removals on Socastee Creek (Swamp)

Species Assessment and Effect Determination

On 25 April 2024, USACE obtained a comprehensive list of threatened and endangered species occurring in the project area from USFWS. The list includes 15 species and no critical habitat designations (Table 1).

Table 1 List of federally designated threatened and endangered species under ESA present in project area as determined by USFWS IPaC Tool

Common Name	Scientific Name	Listing[1]	Species Determination[2]
Tricolored Bat	*Perimyotis subflavus*	PE	MANLAA
West Indian Manatee	*Trichechus manatus*	T	MANLAA
Piping Plover	*Charadrius melodus*	T	NE
Red-cockaded Woodpecker	*Picoides borealis*	E	NE
Rufa Red Knot	*Calidris canutus rufa*	T	NE
Wood Stork	*Mycteria americana*	T	NE
Green Sea Turtle	*Chelonia mydas*	T	NE
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E	NE
Leatherback Sea Turtle	*Dermochelys coriacea*	E	NE
American Chaffseed	*Schwalbea americana*	E	NE
Canby's Dropwort	*Oxypolis canbyi*	E	NE
Pondberry	*Lindera melissifolia*	E	NE

[1]Species are designated as either "T" if listed threatened, "E" if listed as endangered or "PE" if listed as proposed endangered
[2]Determinations are designated as either "NE" for *no effect* or "MANLAA" for *may affect, not likely to adversely affect*

Upon review, USACE made a determination of *may affect, but not likely to adversely affect* for the tricolored bat and West Indian manatee. A *no effect* determination was made for all other listed species under consideration.

General Impacts to Aquatic Habitat

Relief Bridges

Relief bridges and culverts both functionally have similar impacts on riverine systems and impacts are generally more severe the narrower a waterway is constrained by such hardened structures. Culverts are known for reducing the movement of fish and other aquatic organisms through the creation of high velocity flows (Mahlum et al. 2014), high hanging heights (Burford et al. 2009), and when culverts are obstructed by built-up debris and sediment (Wellman et al. 2000). Culverts can also create novel habitats at a local scale when pools form downstream of the structures with scouring created by the displacement of flows (Wellman et al. 2000). The accumulation of fine sediments within and downstream of culverts can also occur, creating changes to benthic habitat for fish and invertebrates (Quigley and Harper 2000). All of these factors can contribute to changes in the biodiversity and community compositions of streams intersected by culverts and relief bridges.

Weir Removal

Effects immediately proximal to weir removal include induced erosion and sedimentation of finer particles (Thomas et al. 2015) upstream and downstream and an increase in flow velocity upstream (Im et al. 2011). Impacts are expected from initial redistribution of fine sediment downstream of weir removal; however, rapid evacuation of fine sediments is likely to result in impacts being temporary and a general coarsening of the area would occur over longer periods. Weir removal research has shown several instream changes may occur which improve habitat heterogeneity as the channelizing effect of weirs is remediated and bed zones reflect changes in water level, velocity ranges, and sediment distribution (Im et al. 2011; Thomas et al. 2015; Kim and Choi 2019). Impacts related to mobilization of sediment would be minimized downstream through temporary installation of turbidity curtains during removal of the structures. Overall, it is

expected that potential improvements in habitat connectivity, lower trophic level biodiversity and increased populations provides for conditions of higher ecosystem function (Lefcheck et al. 2015; Thompson et al. 2017).

Tricolored Bat

Direct effects to this species would be limited to those associated with construction-related noise disturbance and potential removal of some trees which may be suitable for roosting. Tree removal activities will be restricted to outside of the pupping period (May 1st - July 15th) and the winter torpor (Dec. 15th - Feb. 15th). Additionally fewer than 0.1 acres of tree removal is anticipated at each of the relief bridges and none during weir removal. Indirect effects which may result due to shifts in hydrology are continuing to be evaluated for mitigation needs. Potential mitigation would offset any notable indirect effects for the species and its habitat.

West Indian Manatee

During warm summer months, manatees migrate into South Carolina's rivers, bays and estuaries such as the Waccamaw River, Atlantic Intracoastal Waterway (AIWW) and nearby waters. Of the two actions proposed here, only weir removal has potential to directly or indirectly affect manatee, as relief bridges are situated in seasonal or semi-permanently flooded wetlands which would not be occupied by manatee. Weirs to be removed are currently located in Socastee Creek which feeds into the AIWW, the latter of which is known to be used by manatee during warmer months. Primary potential impacts to manatees would be indirect, as manatee are not documented using Socastee Creek and thus no direct harm would be expected through physical interaction or obstruction of movement. Indirect effects may include those related to sedimentation of the waterway and changes to the physical qualities (e.g., temperature, freshwater inflow, dissolved oxygen, suspended nutrients and particles, etc.) at the mouth of the creek in the AIWW, and potential shifts in the hydrography of the creek and connected waterways commensurate with the influence on hydrology of the weirs. The weir most closely situated to the AIWW is about 0.8 miles upstream of the mouth of the creek along the AIWW.

The size of the weirs to be removed and their condition provide important context that may inform the potential limits for impacts downstream. Each weir is relatively small when compared to many for which dam removal studies have been performed (Major et al. 2017). For instance, each weir is 50 feet in length with a 30-ft long spillway set 6" below the weird crest and the weir crest elevations were set equal to the adjacent top of bank at each weir. As noted by Tullos et al. (2016), downstream suspended sediment and turbidity can be of a lesser magnitude and duration of that experienced during flooding events for smaller dam removals. Further, geomorphic and ecological effects of many small dam removals are minor (Skalak et al., 2011; Sawaske and Freyberg, 2012; Tulloset al., 2014). The small scale of the proposed removals should also be taken into consideration with the conditions of the weirs and their intended function. At both weirs, bankside erosion has opened waterways which go around the weirs, allowing unimpeded flow of suspended sediments, nutrients, and a continuation of physical parameters of upstream water. Given these circumstances, there is a small likelihood that removal of these weirs, in combination with sediment control BMPs (e.g., turbidity curtains) to be implemented, will have anything more than minor impacts to downstream reaches and the mouth of the creek with he AIWW.

Given the small-scale impacts anticipated to downstream reaches and the mobile and low-frequency habitation of manatee in the AIWW, no more than minor impacts to manatee which are not expected to result in any take are expected.

Summary

USACE has made a determination of *may affect, not likely to adversely affect* for tricolored bat and West Indian Manatee from the implementation of the proposed action. The proposed Federal action will have no effect on the remaining species in Table 1.

In accordance with Section 7 of the ESA, USACE requests concurrence with the above determinations. Please provide your response and/or comments within 60 calendar days of receipt of this letter.

Literature Cited

Burford DD, and McMahon TE (2009) Assessment of Trout Passage through Culverts in a Large Montana Drainage during Summer Low Flow. North American Journal of Fisheries Management 29:739–752.

Im D, Kang H, Kim K-H, and Choi S-U (2011) Changes of river morphology and physical fish habitat following weir removal. Ecological Engineering 37:883–892.

Kim SK, and Choi S-U (2019) Ecological evaluation of weir removal based on physical habitat simulations for macroinvertebrate community. Ecological Engineering 138:362–373.

Lefcheck JS, Byrnes JEK, Isbell F, Gamfeldt L, Griffin JN, Eisenhauer N, Hensel MJS, Hector A, Cardinale BJ, and Duffy JE (2015) Biodiversity enhances ecosystem multifunctionality across trophic levels and habitats. Nature Communications 6:6936.

Mahlum S, Cote D, Wiersma YF, Kehler D, and Clarke KD (2014) Evaluating the Barrier Assessment Technique Derived from FishXing Software and the Upstream Movement of Brook Trout through Road Culverts. Transactions of the American Fisheries Society 143:39–48.

Major JJ, East AE, O'Connor JE, Grant GE, Wilcox AC, Magirl CS, Collins MJ, and Tullos DD (2017) Geomorphic response to U.S. Dam Removals—A two-decade perspective, in Gravel-Bed Rivers: Processes and Disasters, edited by D. Tsutsumi and J. Laronne. Wiley and Son 355–383.

Quigley JT, and Harper DJ (2000) No Net Loss of Fish Habitat: An Audit of Forest Road Crossings of Fish-Bearing Streams in British Columbia, 1996-1999. Habitat and Enhancement Branch, Fisheries and Oceans Canada.

Sawaske SR, and Freyberg DL (2012) A comparison of past small dam removals in highly sediment-impacted systems in the U.S.Geo-morphology151:152–, 50–58.

Skalak K, Pizzuto J, Egan J, and Allmendinger N (2011) The geomorphic effects of existing dams and historic dam removals in the mid-Atlantic region, USA. In Sediment Dynamics Upon Dam Removal, edited by Papanicolaou AN and Barkdoll BD, Am. Soc. of Civ. Eng.

Thomas RJ, Constantine JA, Gough P, and Fussell B (2015) Rapid Channel Widening Following Weir Removal Due to Bed-Material Wave Dispersion on the River Monnow, Wales. River Research and Applications 31:1017–1027.

Tullos DD, Collins MJ, Bellmore JR, Bountry JA, Connolly PJ, Shafroth PB, and Wilcox AC (2016) Synthesis of common manage-ment concerns associated with dam removal. J. Am. Water Resour. Assoc. 52:1179–1206.

Wellman JC, Combs DL, and Cook SB (2000) Long-Term Impacts of Bridge and Culvert Construction or Replacement on Fish Communities and Sediment Characteristics of Streams. Journal of Freshwater Ecology 15:317–328.

From:	Charleston Regulatory, FW4
To:	Brown, Niko R CIV USARMY CESAC (USA)
Cc:	Parrish, Nancy A CIV USARMY CESAC (USA); JohnsonHughes, Christy
Subject:	[Non-DoD Source] Re: [EXTERNAL] Informal Consult Request - Project Name: Waccamaw River Flood Risk Management Feasibility Study - Project Code: 2024-0111771
Date:	Monday, December 16, 2024 10:42:22 AM

FWS Project Code: 2024-0111771

Niko,

The U.S. Fish and Wildlife Service has reviewed the relief bridges (cross drains) project associated with the Waccamaw River Flood Risk Management Feasibility Study in Horry County, South Carolina. You have requested that the Service provide concurrence or comments regarding potential impacts to federally listed species in accordance with requirements set forth under section 7 of the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 *et seq*. (ESA).

Your agency has made a determination of *may affect, but is not likely to adversely affect* for West Indian manatee (*Trichechus manatus*). Based on the justification provided, the Service concurs with your determination. The tricolored bat is currently proposed for listing and does not have the full protection of a listed species under the ESA, therefore there is no need for concurrence on your effects determination. If potential project impacts (i.e., tree clearing) will occur prior to the effective date of a listing determination, if it is warranted for listing, you will **not** need to further consult on this species. If potential project impacts are not completed prior to the effective date of a final listing, we recommend you contact our office closer to the effective date to further consult on the species.

Please note that obligations under section 7 of the ESA should be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner, which was not considered in this assessment; or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

The Service recommends that you contact the South Carolina Department of Natural Resources regarding potential impacts to State protected species. This email will serve as our official response. Please let me know if you have any questions.

Melanie

From: Brown, Niko R CIV USARMY CESAC (USA) <Niko.R.Brown@usace.army.mil>
Sent: Friday, November 22, 2024 1:52 PM
To: Charleston Regulatory, FW4 <charleston_regulatory@fws.gov>
Cc: Parrish, Nancy A CIV USARMY CESAC (USA) <Nancy.A.Parrish@usace.army.mil>
Subject: [EXTERNAL] Informal Consult Request - Project Name: Waccamaw River Flood Risk Management Feasibility Study - Project Code: 2024-0111771

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Good afternoon,

The U.S. Army Corps of Engineers (USACE), Charleston District, is proposing to construct relief bridges (cross drains) in Conway, SC and to remove two existing weirs in Socastee, SC. The actions have been identified as components of the tentatively selected plan in the draft Waccamaw River, Horry County, South Carolina Flood Risk Management Integrated Feasibility Study and Environmental Assessment (authorized under Section 445 of WRDA 1999 [P.L. 106-53]) released for public comment on September 9, 2024.

USACE has reviewed the proposed project for its potential effects to ESA-listed species and their critical habitat. Based on the attached analysis, USACE has made a determination of *may affect, not likely to adversely affect* for the tricolored bat and West Indian manatee. We request your concurrence with this determination.

Please let me know if you have any questions or require additional information.

Thank you,

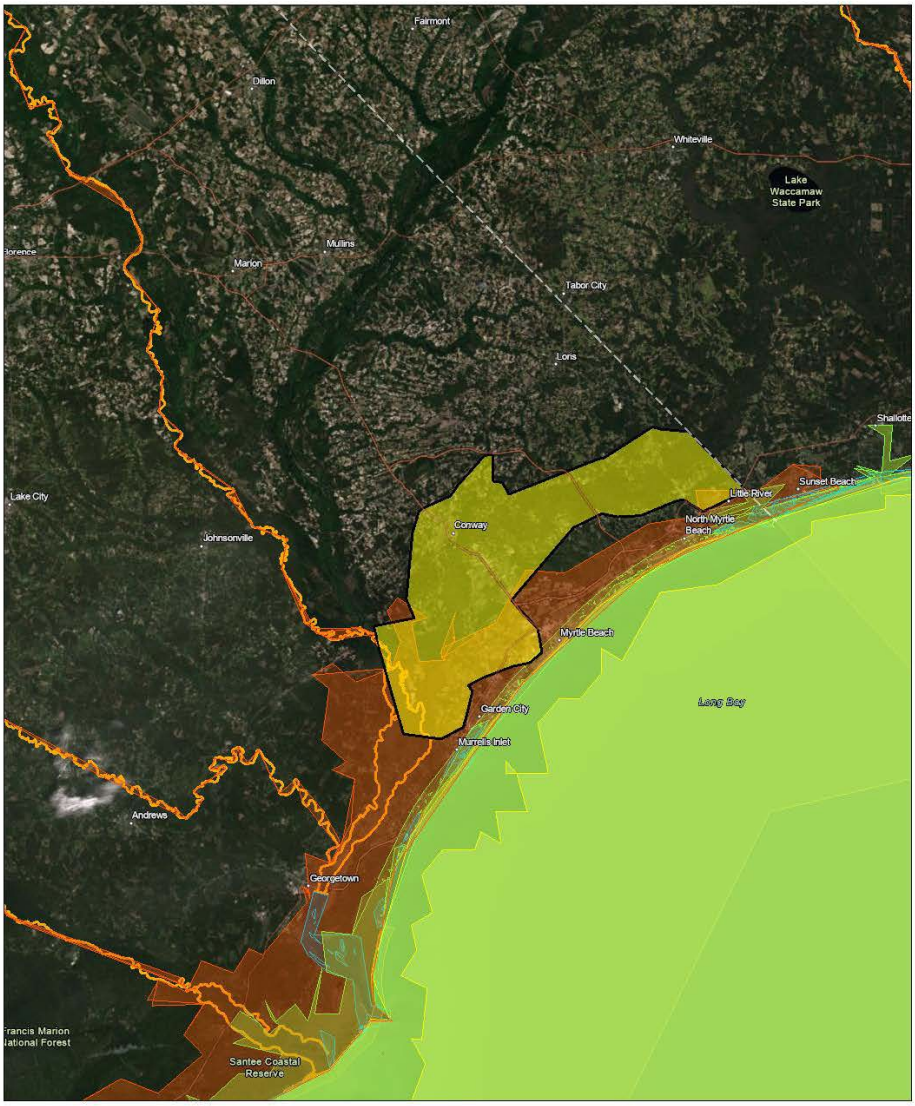
Niko Brown
Biologist, Planning & Environmental Branch
USACE – Charleston District
(603) 258-8589

Drawn Action Area & Overlapping S7 Consultation Areas

Area of Interest (AOI) Information

Area : 9,632,475,181.08 ft^2

Nov 29 2023 15:52:21 Eastern Standard Time



Consultation Area Summary
- Sea Turtles
- Sea Turtles
- Sea Turtles
- Sea Turtles
- Sharks, Rays, Sawfish
- Grouper and Sturgeon
- Grouper and Sturgeon
- Whales
- Whales
- Whales
- Critical Habitat (lines)
- Critical Habitat (polygons)

1:577,791

0 5 10 20 mi

0 5 10 20 km

Horry County Government GIS, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Summary

Name	Count	Area(ft²)	Length(ft)
Conchs	0	0	N/A
Corals	0	0	N/A
Sea Turtles	6	26,096,765.95	N/A
Sharks, Rays, Sawfish	0	0	N/A
Grouper and Sturgeons	48	11,738,163,426.41	N/A
Whales	0	0	N/A
Critical Habitat (linear)	1	N/A	38,063.32
Critical Habitat (area)	0	0	N/A
Miscellaneous	0	0	N/A

Sea Turtles

#	Species	Status	Life Stage	Behavior	Zone
1	Green Sea Turtle	Threatened	Adults	Migrating & Foraging	Atlantic South Tidally-Influenced Inshore
2	Green Sea Turtle	Threatened	Neritic Juveniles	Migrating & Foraging	Atlantic South Tidally-Influenced Inshore
3	Green Sea Turtle	Threatened	Adults	Nesting	South Carolina Coastal Countie
4	Kemp's Ridley Sea Turtle	Endangered	Adults and Neritic Juveniles	Migrating & Foraging	Atlantic South Tidally-Influenced Inshore
5	Loggerhead Sea Turtle	Threatened	Adults and Neritic Juveniles	Migrating & Foraging	Atlantic South Tidally-Influenced Inshore
6	Loggerhead Sea Turtle	Threatened	Adults	Nesting	South Carolina Coastal Countie

#	Sub-zone	Date From	Until	Date From (2)	Until (2)
1	*No Data*	01/01	12/31	*No Data*	*No Data*
2	*No Data*	01/01	12/31	*No Data*	*No Data*
3	Charleston, Colleton, Horry, Beaufort, Georgetown	1/1	12/31	*No Data*	*No Data*
4	*No Data*	01/01	12/31	*No Data*	*No Data*
5	*No Data*	01/01	12/31	*No Data*	*No Data*
6	Beaufort, Charleston, Horry, Georgetown, Colleton	01/01	12/31	*No Data*	*No Data*

#	Notes	Feature ID	Area(ft²)
1	The mapped boundary for inshore areas includes some areas (e.g., saltmarsh, uplands) that are not habitat for this species. Please consider various factors such as habitat type, sighting information, and project details when determining whether to consult on this species in this area.	GRN_ATD_ADU_MAF	148,438.13
2	The mapped boundary for inshore areas includes some areas (e.g., saltmarsh, uplands) that are not habitat for this species. Please consider various factors such as habitat type, sighting information, and project details when determining whether to consult on this species in this area.	GRN_ATD_NJV_MAF	148,438.13
3	Nesting beaches for this species occur in this county. The U.S. Fish and Wildlife Service (USFWS) has jurisdiction for sea turtles on the beach and NOAA Fisheries has jurisdiction for sea turtles in the marine environment. Please contact the USFWS if a project may affect sea turtles or nests on the beach.	GRN_SCC_ADU_NST	12,751,632.41
4	The mapped boundary for inshore areas includes some areas (e.g., saltmarsh, uplands) that are not habitat for this species. Please consider various factors such as habitat type, sighting information, and project details when determining whether to consult on this species in this area.	KMP_ATD_ANJ_MAF	148,438.13
5	The mapped boundary for inshore areas includes some areas (e.g., saltmarsh, uplands) that are not habitat for this species. Please consider various factors such as habitat type, sighting information, and project details when determining whether to consult on this species in this area.	LOG_ATD_ANJ_MAF	148,438.13
6	Nesting beaches for this species occur in this county. The U.S. Fish and Wildlife Service (USFWS) has jurisdiction for sea turtles on the beach and NOAA Fisheries has jurisdiction for sea turtles in the marine environment. Please contact the USFWS if a project may affect sea turtles or nests on the beach.	LOG_SCC_ADU_NST	12,751,381.02

Grouper and Sturgeons

#	Species	Status	Life Stage	Behavior	Zone
1	Atlantic sturgeon	Endangered	Adults and Subadults	Overwintering	Hydrologic Unit Subregion 0304
2	Atlantic sturgeon	Endangered	Juveniles	Overwintering	Hydrologic Unit Subregion 0304
3	Atlantic sturgeon	Threatened/Endangered	Juveniles	Migrating & Foraging	Atlantic South Tidally-Influenced Inshore
4	Atlantic sturgeon	Threatened/Endangered	Juveniles	Overwintering	Atlantic South Tidally-Influenced Inshore
5	Atlantic sturgeon	Endangered	Adults	Spawning-Related Migration	Great Pee Dee River, SC
6	Atlantic sturgeon	Threatened/Endangered	Adults and Subadults	Migrating & Foraging	Great Pee Dee River, SC
7	Atlantic sturgeon	Threatened/Endangered	Adults and Subadults	Maturing & Holding	Great Pee Dee River, SC
8	Atlantic sturgeon	Endangered	Juveniles	Migrating & Foraging	Great Pee Dee River, SC
9	Atlantic sturgeon	Endangered	Juveniles	Maturing & Holding	Great Pee Dee River, SC
10	Atlantic sturgeon	Endangered	YOY	Migrating & Foraging	Great Pee Dee River, SC
11	Atlantic sturgeon	Endangered	YOY	Maturing & Holding	Great Pee Dee River, SC
12	Atlantic sturgeon	Endangered	Adults	Spawning-Related Migration	Great Pee Dee - Waccamaw Int River Braid Complex
13	Atlantic sturgeon	Endangered	Adults and Subadults	Migrating & Foraging	Great Pee Dee - Waccamaw Int River Braid Complex
14	Atlantic sturgeon	Endangered	Adults and Subadults	Maturing & Holding	Great Pee Dee - Waccamaw Int River Braid Complex
15	Atlantic sturgeon	Endangered	Juveniles	Migrating & Foraging	Great Pee Dee - Waccamaw Int River Braid Complex
16	Atlantic sturgeon	Endangered	Juveniles	Maturing & Holding	Great Pee Dee - Waccamaw Int River Braid Complex
17	Atlantic sturgeon	Endangered	YOY	Migrating & Foraging	Great Pee Dee - Waccamaw Int River Braid Complex
18	Atlantic sturgeon	Endangered	YOY	Maturing & Holding	Great Pee Dee - Waccamaw Int River Braid Complex
19	Atlantic sturgeon	Endangered	Adults	Spawning-Related Migration	Waccamaw River, SC
20	Atlantic sturgeon	Threatened/Endangered	Adults and Subadults	Migrating & Foraging	Waccamaw River, SC
21	Atlantic sturgeon	Threatened/Endangered	Adults and Subadults	Maturing & Holding	Waccamaw River, SC
22	Atlantic sturgeon	Endangered	Juveniles	Migrating & Foraging	Waccamaw River, SC
23	Atlantic sturgeon	Endangered	Juveniles	Maturing & Holding	Waccamaw River, SC
24	Atlantic sturgeon	Endangered	YOY	Migrating & Foraging	Waccamaw River, SC
25	Atlantic sturgeon	Endangered	YOY	Maturing & Holding	Waccamaw River, SC
26	Shortnose sturgeon	Endangered	Adults	Overwintering	Hydrologic Unit Subregion 0304
27	Shortnose sturgeon	Endangered	Juveniles	Overwintering	Hydrologic Unit Subregion 0304
28	Shortnose sturgeon	Endangered	Adults	Migrating & Foraging	Great Pee Dee River, SC
29	Shortnose sturgeon	Endangered	Adults	Maturing & Holding	Great Pee Dee River, SC
30	Shortnose sturgeon	Endangered	Adults	Spawning	Great Pee Dee River, SC
31	Shortnose sturgeon	Endangered	Adults	Spawning-Related Migration	Great Pee Dee River, SC
32	Shortnose sturgeon	Endangered	Adults	Overwintering	Great Pee Dee River, SC
33	Shortnose sturgeon	Endangered	Eggs and Larvae	Hatching & Maturing	Great Pee Dee River, SC
34	Shortnose sturgeon	Endangered	Juveniles	Migrating & Foraging	Great Pee Dee River, SC
35	Shortnose sturgeon	Endangered	Juveniles	Maturing & Holding	Great Pee Dee River, SC
36	Shortnose sturgeon	Endangered	YOY	Migrating & Foraging	Great Pee Dee River, SC
37	Shortnose sturgeon	Endangered	YOY	Maturing & Holding	Great Pee Dee River, SC
38	Shortnose sturgeon	Endangered	Adults	Migrating & Foraging	Waccamaw River, SC
39	Shortnose sturgeon	Endangered	Adults	Maturing & Holding	Waccamaw River, SC
40	Shortnose sturgeon	Endangered	Adults	Spawning-Related Migration	Waccamaw River, SC
41	Shortnose sturgeon	Endangered	Juveniles	Migrating & Foraging	Waccamaw River, SC
42	Shortnose sturgeon	Endangered	Juveniles	Maturing & Holding	Waccamaw River, SC
43	Shortnose sturgeon	Endangered	YOY	Migrating & Foraging	Waccamaw River, SC
44	Shortnose sturgeon	Endangered	YOY	Maturing & Holding	Waccamaw River, SC

#	Sub-zone	Date From	Until	Date From (2)	Until (2)
1	27 nearshore subwatersheds (12-digit hydrologic units) between Sunset Beach, NC and Winyah Bay, SC	12/01	04/30	*No Data*	*No Data*
2	27 nearshore subwatersheds (12-digit hydrologic units) between Sunset Beach, NC and Winyah Bay, SC	12/01	04/30	*No Data*	*No Data*
3	*No Data*	12/01	04/30	*No Data*	*No Data*
4	*No Data*	12/01	04/30	*No Data*	*No Data*
5	*No Data*	08/01	10/30	04/01	05/31
6	*No Data*	01/01	12/31	*No Data*	*No Data*
7	*No Data*	01/01	12/31	*No Data*	*No Data*
8	*No Data*	01/01	12/31	*No Data*	*No Data*
9	*No Data*	01/01	12/31	*No Data*	*No Data*
10	*No Data*	01/01	12/31	*No Data*	*No Data*
11	*No Data*	01/01	12/31	*No Data*	*No Data*
12	*No Data*	04/01	05/31	*No Data*	*No Data*
13	*No Data*	01/01	12/30	*No Data*	*No Data*
14	*No Data*	01/01	12/30	*No Data*	*No Data*
15	*No Data*	01/01	12/30	*No Data*	*No Data*
16	*No Data*	01/01	12/30	*No Data*	*No Data*
17	*No Data*	01/01	12/30	*No Data*	*No Data*
18	*No Data*	01/01	12/30	*No Data*	*No Data*
19	*No Data*	04/01	05/31	*No Data*	*No Data*
20	*No Data*	01/01	12/30	*No Data*	*No Data*
21	*No Data*	01/01	12/30	*No Data*	*No Data*
22	*No Data*	01/01	12/30	*No Data*	*No Data*
23	*No Data*	01/01	12/30	*No Data*	*No Data*
24	*No Data*	01/01	12/30	*No Data*	*No Data*
25	*No Data*	01/01	12/30	*No Data*	*No Data*
26	27 nearshore subwatersheds (12-digit hydrologic units) between Sunset Beach, NC and Winyah Bay, SC	09/01	06/01	*No Data*	*No Data*
27	27 nearshore subwatersheds (12-digit hydrologic units) between Sunset Beach, NC and Winyah Bay, SC	09/01	06/01	*No Data*	*No Data*
28	*No Data*	01/01	11/30	*No Data*	*No Data*
29	*No Data*	01/01	11/30	*No Data*	*No Data*
30	*No Data*	12/01	03/31	*No Data*	*No Data*
31	*No Data*	12/01	03/31	*No Data*	*No Data*
32	*No Data*	01/01	11/30	*No Data*	*No Data*
33	*No Data*	12/01	03/31	*No Data*	*No Data*
34	*No Data*	01/01	11/30	*No Data*	*No Data*
35	*No Data*	01/01	11/30	*No Data*	*No Data*
36	*No Data*	01/01	11/30	*No Data*	*No Data*
37	*No Data*	01/01	11/30	*No Data*	*No Data*
38	*No Data*	01/01	12/31	*No Data*	*No Data*
39	*No Data*	01/01	12/31	*No Data*	*No Data*
40	*No Data*	04/02	12/01	*No Data*	*No Data*
41	*No Data*	01/01	12/31	*No Data*	*No Data*
42	*No Data*	01/01	12/31	*No Data*	*No Data*
43	*No Data*	01/01	12/31	*No Data*	*No Data*
44	*No Data*	01/01	12/31	*No Data*	*No Data*

#	Notes	Feature ID	Area(ft²)
1	Hydrologic Unit Subregions are defined by the Watershed Boundary Dataset. These subregions have been included due to the complex braiding/channeling of near-coast waterways. As a result, proposed action areas may report the presence of sturgeon on land; sturgeon will never be present on land. Consider the location of your project area when reviewing the results. Please ensure a clear route of effect to in-water species exists from your proposed action before consulting.	ANS_304_ASA_WIN	2,699,448,852.72
2	Hydrologic Unit Subregions are defined by the Watershed Boundary Dataset. These subregions have been included due to the complex braiding/channeling of near-coast waterways. As a result, proposed action areas may report the presence of sturgeon on land; sturgeon will never be present on land. Consider the location of your project area when reviewing the results. Please ensure a clear route of effect to in-water species exists from your proposed action before consulting.	ANS_304_JUV_WIN	2,699,448,852.72
3	The mapped boundary for inshore areas includes some areas (e.g., saltmarsh, uplands) that are not habitat for this species. Please consider various factors such as habitat type, sighting information, and project details when determining whether to consult on this species in this area.	ANS_ATD_JUV_MAF	148,438.13
4	The mapped boundary for inshore areas includes some areas (e.g., saltmarsh, uplands) that are not habitat for this species. Please consider various factors such as habitat type, sighting information, and project details when determining whether to consult on this species in this area.	ANS_ATD_JUV_WIN	148,438.13
5	Designated critical habitat	ANS_GPD_ADU_SRM	9,802,346.06
6	Designated critical habitat	ANS_GPD_ASA_MAF	9,802,346.06
7	Designated critical habitat	ANS_GPD_ASA_MHO	9,802,346.06
8	Designated critical habitat	ANS_GPD_JUV_MAF	9,802,346.06
9	Designated critical habitat	ANS_GPD_JUV_MHO	9,802,346.06
10	Designated critical habitat	ANS_GPD_YOY_MAF	9,802,346.06
11	Designated critical habitat	ANS_GPD_YOY_MHO	9,802,346.06
12	*No Data*	ANS_GWC_ADU_SRM	41,021,106.48
13	*No Data*	ANS_GWC_ASA_MAF	41,021,106.48
14	*No Data*	ANS_GWC_ASA_MHO	41,021,106.48
15	*No Data*	ANS_GWC_JUV_MAF	41,021,106.48
16	*No Data*	ANS_GWC_JUV_MHO	41,021,106.48
17	*No Data*	ANS_GWC_YOY_MAF	41,021,106.48
18	*No Data*	ANS_GWC_YOY_MHO	41,021,106.48
19	Designated critical habitat	ANS_WCM_ADU_SRM	39,211,628.34
20	Designated critical habitat	ANS_WCM_ASA_MAF	39,211,628.34
21	Designated critical habitat	ANS_WCM_ASA_MHO	39,211,628.34
22	Designated critical habitat	ANS_WCM_JUV_MAF	39,211,628.34
23	Designated critical habitat	ANS_WCM_JUV_MHO	39,211,628.34
24	Designated critical habitat	ANS_WCM_YOY_MAF	39,211,628.34
25	Designated critical habitat	ANS_WCM_YOY_MHO	39,211,628.34
26	*No Data*	SNS_304_ADU_WIN	2,699,448,852.72
27	*No Data*	SNS_304_JUV_WIN	2,699,448,852.72
28	*No Data*	SNS_GPD_ADU_MAF	9,802,346.06
29	*No Data*	SNS_GPD_ADU_MHO	9,802,346.06
30	*No Data*	SNS_GPD_ADU_SPN	9,802,346.06
31	*No Data*	SNS_GPD_ADU_SRM	9,802,346.06
32	*No Data*	SNS_GPD_ADU_WIN	9,802,346.06
33	*No Data*	SNS_GPD_ELV_HAM	9,802,346.06
34	*No Data*	SNS_GPD_JUV_MAF	9,802,346.06
35	*No Data*	SNS_GPD_JUV_MHO	9,802,346.06
36	*No Data*	SNS_GPD_YOY_MAF	9,802,346.06
37	*No Data*	SNS_GPD_YOY_MHO	9,802,346.06
38	*No Data*	SNS_WCM_ADU_MAF	30,257,444.64
39	*No Data*	SNS_WCM_ADU_MHO	30,257,444.64
40	*No Data*	SNS_WCM_ADU_SRM	30,257,444.64
41	*No Data*	SNS_WCM_JUV_MAF	30,257,444.64

42	*No Data*	SNS_WCM_JUV_MHO	30,257,444.64
43	*No Data*	SNS_WCM_YOY_MAF	30,257,444.64
44	*No Data*	SNS_WCM_YOY_MHO	30,257,444.64

Critical Habitat (linear)

#	Species	CH Status	CH Unit	Length(ft)
1	Sturgeon, Atlantic (Atlantic subspecies) [Carolina DPS]	Final	Unit 5 Pee Dee River, Waccamaw River, and Bull Creek	38,063.32

DISCLAIMER: Use of this App does NOT replace the Endangered Species Act (ESA) Section 7 consultation process; it is a first step in determining if a proposed Federal action overlaps with listed species or critical habitat presence. Because the data provided through this App are updated regularly, reporting results must include the date they were generated. The report outputs (map/tables) depend on the options picked by the user, including the shape and size of the action area drawn, the layers marked as visible or selectable, and the buffer distance specified when using the "Draw your Action Area" function. Area calculations represent the size of overlap between the user-drawn Area of Interest (with buffer) and the specified S7 Consultation Area. Summary table areas represent the sum of these overlapping areas for each species group.

H CZMA COMPLIANCE RECORD

SC DEPARTMENT of ENVIRONMENTAL SERVICES

November 4, 2024

Niko Brown
69A Hagood Ave
Charleston, SC 29403

RE: Waccamaw River, Horry County, South Carolina Flood Risk Management Study
HQ6-K60K-QTY8T
Horry County

Dear Niko Brown:

This Coastal Zone Consistency Determination Conditional Concurrence is in response to the U.S. Department of Defense Army Corps of Engineers (USACE) Coastal Zone Consistency Determination submitted to South Carolina Department of Environmental Services Bureau of Coastal Management (SCDES BCM) on September 9, 2024. SCDES BCM's review began on September 9, 2024.

The proposed federal action by USACE include the two following projects:

1. Conway Relief Bridges

a. Add three relief bridges/cross drain culverts at 501 Business, 501 Bypass, and 905 to increase conveyance through these areas where potential bottlenecking is occurring. Exact location and length of the bridges along these roadways is still being determined and will depend on the amount of additional flow needed.
b. Each of the three relief bridges was designed at 48 inches. Culverts with a headwall, with the length spanning across the width of the state roads. In accordance with SCDOT regulations, the design would require the pipes to be a minimum distance (>500ft) away from any existing bridges. SCDOT requires bore and jack for the pipe install, assuming Geotech shows that is feasible. O&M includes culvert cleanout annually and post major storm events.

2. Socastee Barrier Removal

a. Remove two existing weirs and associated riprap along Socastee Creek by improving flow consistency and overall channel performance.
b. Each weir is 40ft wide and 10ft high – constructed from concrete and sheet pile. They are protected by a layer of rip-rap 2 ft thick and 50 ft wide on both the upstream and downstream sides. Removal would include excavation of rip rap and employing geo-textile materials to provide additional stabilization and support for channel. banks and beds.

info@des.sc.gov | des.sc.gov | 803.898.3432

SC DEPARTMENT *of* ENVIRONMENTAL SERVICES

Pursuant to 15 C.F.R. § 930.4, SCDES ***conditionally concurs*** with the determination that the project is consistent to the maximum extent practicable with the following conditions below.

Applicable Enforceable Policies of the SCCZMP: **The project is consistent with the Guidelines for Evaluation of All Projects** as well as the Transportation Facilities *(Roads and Highways),* Activities in Areas of Special Resource Significance *(Public Open Spaces and Wetlands),* Stormwater Management *(Runoff)* policies contained in the S.C. Coastal Zone Management Program provided the following conditions are included in the permits and adhered to by the applicant.

1. In the event that any historic or cultural resources and/or archaeological materials are found during the course of work, the applicant must notify the State Historic Preservation Office and the South Carolina Institute of Archaeology and Anthropology. Historic or cultural resources consist of those sites listed in the National Register of Historic Places and those sites that are eligible for the National Register. Archaeological materials consist of any items, fifty years old or older, which were made or used by man. These items include, but are not limited to, stone projectile points (arrowheads), ceramic sherds, bricks, worked wood, bone and stone, metal and glass objects, and human skeletal materials.

2. As USACE plans continue to develop, if those plans result in proposals or operations different than those described above, then SCDES BCM will be provided an opportunity to review those changes for consistency with the enforceable policies of the SCCZMP.

This letter does not alleviate the applicant's responsibility to obtain other required local, state or federal approvals for the work described above. Please do not hesitate to contact me should you have any questions.

Sincerely,

Cory S. Campanizzi

South Carolina Department of Environmental Services
Cory.Campanizzi@des.sc.gov

I MSA COMPLIANCE RECORD

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, CHARLESTON DISTRICT
69A HAGOOD AVE
CHALRESTON, SC 29403-5107

September 9, 2024

Planning and Environmental Branch

Pace Wilber
Branch Chief
National Marine Fisheries Service
Southeast Regional Office
Habitat Conservation Division
263 13th Ave South
St. Petersburg, FL 33701

Dear Mr. Wilber,

Pursuant to the National Environmental Policy Act of 1969, as amended, (NEPA) and the U.S. Army Corps of Engineers (USACE) Regulation (33 CFR 230.11), this letter constitutes the USACE, Charleston District Notice of Availability of the proposed Finding of No Significant Impact (FONSI) and draft Integrated Feasibility Report and Environmental Assessment (FREA) for the *Waccamaw River, Horry County, South Carolina Flood Risk Management Study*. This letter also serves to convey the Essential Fish Habitat (EFH) Assessment incorporated in the draft SEA.

USACE is initiating coordination with National Marine Fisheries Service (NMFS) under the EFH provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Per the October 2, 2019 EFH Finding between NMFS' Southeast Regional Office and Corps' South Atlantic Division, the EFH Assessment for the project is integrated within the draft FR/EA. Per the 2019 Finding, the February 2004 "*Preparing Essential Fish Habitat Assessments: A Guide for Federal Action Agencies*" document, and 50 CFR 600.920(e)(3), an EFH Assessment must include specific items. Each item will be addressed in the table below with a reference to where the information is located in the draft SEA.

EFH Required Item	Draft EA Location(s)
Description of the Proposed Action	What is the action? *Section 1.3 Project Location* *Section 3.1.2 Alternative 2 (Preferred Alternative)* What is the purpose of the action? *Section 1.6 Purpose and Need* How, when and where will it be undertaken? *Section 1.3 Study Area*

	Section 6.1. Plan Components What will be the result of the action? *Section 4.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES*
Analysis of the potential adverse effects (individual and cumulative) of the action on EFH and the management species	What EFH will be affected by the action? *Section 4.6.4.1 C3* and *Section 4.6.5.3 S3* What are the adverse effects to EFH that could occur as a result of this action?/ How would they impact managed species?/What would be the magnitude of effects?/What would the duration be? *Section 4.6.4.1 C3* and *Section 4.6.5.3 S3*
Proposed Compensatory Mitigation	*None required* *Section 7.2 Mitigation, Monitoring and Adaptive Management*
Avoidance and Minimization	*Section 6.9 Environmental Commitments*

USACE has determined that the selected actions would have minimal adverse effects on EFH and no adverse effects on federally managed fish species. The magnitude of the impacts are minor and insignificant. Details on the proposed action are contained in the draft FREA, which is available for your review on the Charleston District's Environmental Planning website, under Horry County: https://www.saj.usace.army.mil/About/Divisions-Offices/Planning/Environmental- Branch/Environmental-Documents/

USACE respectfully requests all comments under NEPA and the MSA for the draft FREA within 30 days of the date of this letter. Questions, requests for additional information, or comments should be submitted to the USACE Environmental Branch at the letterhead address or via email to niko.r.brown@usace.army.mil. Thank you for your assistance.

Sincerely,

Nancy Parrish
Chief, Planning and Environmental Branch

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
https://www.fisheries.noaa.gov/region/southeast

September 27, 2024 F/SER47:KM/pw

(Sent via Electronic Mail)

Ms. Nancy Parrish
U.S. Army Corps of Engineers
69 A Hagood Avenue
Charleston, South Carolina 29403-5107

Attention: Niko Brown

Dear Ms. Parrish:

NOAA's National Marine Fisheries Service (NMFS) received your letter dated September 9, 2024, regarding the Integrated Feasibility Report and Environmental Assessment (FR/EA) for the *Waccamaw River, Horry County, South Carolina Flood Risk Management Study* (Waccamaw FRM) and the corresponding draft Finding of No Significant Impact (FONSI). The FR/EA examines options for addressing existing and future riverine flood and life safety risks to communities and transportation routes in the Waccamaw River Basin. The FR/EA included an Essential Fish Habitat (EFH) Assessment. The Charleston District's initial determination is the proposed project would have minimal adverse effects on EFH or associated fisheries managed by the South Atlantic Fishery Management Council (SAFMC), Mid-Atlantic Fishery Management Council (MAFMC), or the NMFS. As the nation's federal trustee for the conservation and management of marine, estuarine, and diadromous fishery resources, the NMFS provides the following comments pursuant to authorities of the Fish and Wildlife Coordination Act and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

The draft FR/EA evaluated the final array of alternatives, and the Tentatively Selected Plan (TSP) is the Conway Relief Bridges and the Socastee Barrier Removal. The former would construct relief bridges, cross drains, and/or culverts at three existing roadways in Conway, Highway 501 Business, Highway 501 Bypass, and Highway 905. Provided the culvert standard designs follow best practices and are maintained properly, NMFS agrees adverse effects to aquatic resources from these works would be limited and temporary and may ultimately be beneficial by restoring habitat connectivity. The latter component of the TSP would remove two existing weirs impounding Socastee Creek in Socastee. NMFS supports these removals and agrees with the summary of beneficial effects discussed in the draft FR/EA.

NMFs agrees with the draft FONSI that the proposed actions would have no significant adverse effects on aquatic resources, including EFH. We appreciate that the FR/EA reflects the comments and recommendations we provided during interagency coordination. NMFS is encouraged to see alternatives involving hardening the landscape or impounding water, such as levees, detention ponds, floodwalls or floodgates, are not among the recommended alternatives.

The FR/EA states the exact design of the cross drain structures has not yet been determined, and

the draft FONSI notes the final design will include features beneficial to passage of aquatic organisms. NMFS recommends the final designs and operations manuals incorporate best practices and guidance developed by U.S. Department of Transportation's Federal Highway Administration[1, 2, 3, 4]. NMFS also would welcome the opportunity to assist the Charleston District and non-federal sponsor with development of final designs and best management practices during Preconstruction Engineering and Design.

The NMFS appreciates the opportunity to provide these comments and recommendations. Please direct related questions or comments to the attention of Mr. Kevin Mack at our Charleston Field Office, 331 Ft Johnson Road, Charleston, SC 29412, or at Kevin.Mack@noaa.gov.

Sincerely,

WILBER.THOMAS.PAYSON.1365820186 Digitally signed by WILBER.THOMAS.PAYSON.1365820186 Date: 2024.09.27 15:48:40 -04'00'

/ for

Virginia M. Croom
Assistant Regional Administrator
Habitat Conservation Division

cc: USACE: Niko.R.Brown@usace.army.mil, Erica.L.Stone@usace.army.mil, Amy.M.Schwartz@usace.army.mil
USFWS, Julia_Plasynski@fws.gov
SCDNR, RigginL@dnr.sc.gov, CroweS@dnr.sc.gov
F/SER3, Andrew.Herndon@noaa.gov
F/SER47, Kevin.Mack@noaa.gov, Fritz.Rohde@noaa.gov

[1] Design for Fish Passage at Roadway-Stream Crossings: Synthesis Report (June, 2007)
[2] Culvert Design for Aquatic Organism Passage (October, 2010)
[3] Hydraulic Design of Highway Culverts (3rd edition) (April, 2012)
[4] Aquatic Organism Passage at Highway Crossings: An Implementation Guide (July, 2024)

J FPPA COMPLIANCE RECORD

From: Ryan, Kristine - FPAC-NRCS, SC
To: Brown, Niko R CIV USARMY CESAC (USA)
Cc: Kelly, Terry - FPAC-NRCS, SC
Subject: [Non-DoD Source] RE: Quick Question
Date: Thursday, August 1, 2024 11:15:59 AM

Good morning,

Thanks or reach out and providing some context. Sylvia Harris left the agency in March of this year to work in the private sector. I have copied Terry, her previous supervisor, to let him decide if he wants anyone else from his staff to attend these meetings. I'm not sure who is handing the CPA52 forms on his staff. I don't need to be added but thank you for asking me.

For culvert installations in existing roadways, you would not need to send me an AD1006 form. But if you would like a letter from me confirming the exemption you can certainly send it to me.

Thanks~

Kristine Ryan, CPSC, MPH
South Carolina State Soil Scientist
USDA - NRCS
1835 Assembly St. Rm 950
Columbia, SC 29201
Office: 803-253-3896
Cell: 803-767-7496

https://casoilresource.lawr.ucdavis.edu/soilweb-apps
Web Soil Survey
Soil Climate Analysis Network

Soils is part of the National Cooperative Soil Survey, an effort of Federal and State agencies, universities, and professional societies to deliver science-based soil information.

From: Brown, Niko R CIV USARMY CESAC (USA) <Niko.R.Brown@usace.army.mil>
Sent: Thursday, August 1, 2024 10:30 AM
To: Ryan, Kristine - FPAC-NRCS, SC <kristine.ryan@usda.gov>
Subject: Quick Question

Hi Kristine!

I wanted to ask you a quick question on FPPA compliance that I am not too sure on.

First some context: I am environmental lead on a flood risk management (FRM) project along the Waccamaw River here with the Charleston District of USACE. I believe we invited Sylvia Harris with NRCS to join our interagency coordination team (ICT) a while back, but have not had any attendance from her. We generally host team meetings with agencies to discuss

environmental and compliance concerns. I can add you to the team on this project if you like.

The question: Our FRM project will involve some very basic measures like installation of some culverts in existing roadways and removal of a couple low-head dams (weirs) in a creek… these measures are expected to increase conveyance in the respective waterways and alleviate flooding. However, there is also a small likelihood flooding may be worsened or induced in a small portion of the area. Does this sound like something we would typically consult with NRCS on and submit an AD 1006 for?

Thank you!!

Niko Brown
Biologist, Planning & Environmental Branch
USACE – Charleston District
(603) 258-8589

From: Ryan, Kristine - FPAC-NRCS, SC
To: Brown, Niko R CIV USARMY CESAC (USA)
Subject: [Non-DoD Source] RE: FPPA Coordination – Request for Concurrence on Weir Removal Action – Waccamaw River Flood Risk Management Feasibility Study, Horry County, SC
Date: Friday, June 20, 2025 2:44:31 PM
Attachments: image001.png

Good afternoon,

This project area occurs within an urban area so FPPA does not apply, per FPPA policy. You should be good to go!

For additional information:
Web Soil Survey
SoilWeb Apps
The National Cooperative Soil Survey (NCSS) is a nationwide partnership of Federal, regional, State, and local agencies and private entities and institutions.

Kristine Ryan, CPSC, MPH
State Soil Scientist
NRCS South Carolina

Natural Resources Conservation Service
1835 Assembly St., Rm. 950
Columbia, SC 29201
p: (803) 253-3896 | c: (803) 767-7496

From: Brown, Niko R CIV USARMY CESAC (USA) <Niko.R.Brown@usace.army.mil>
Sent: Wednesday, June 18, 2025 3:58 PM
To: Ryan, Kristine - FPAC-NRCS, SC <kristine.ryan@usda.gov>
Subject: RE: FPPA Coordination – Request for Concurrence on Weir Removal Action – Waccamaw River Flood Risk Management Feasibility Study, Horry County, SC

Kristine,

Thanks for the quick response. I am not sure how helpful this is, but it is the most user-friendly approach I could think of. You can see the Future With Project (FWP) modeled 50%-AEP extent is almost indistinguishable for the Future Without Project layer. I only highlighted the Prime Farmland and Statewide/Unique Importance Farmland boundaries. Hopefully, it is transparent enough you can make out the basemap information as well.

I am not sure of a better way to convey this information without a series of more zoomed in images.

Let me know how I can facilitate.

Thanks!

Best,

Niko Brown
Biologist—Planning and Environmental Branch
USACE Charleston District
(603) 258-8589

From: Ryan, Kristine - FPAC-NRCS, SC <kristine.ryan@usda.gov>
Sent: Wednesday, June 18, 2025 3:08 PM
To: Brown, Niko R CIV USARMY CESAC (USA) <Niko.R.Brown@usace.army.mil>
Cc: Ward, Bethney P CIV USARMY CESAC (USA) <Bethney.P.Ward@usace.army.mil>; LaRocque, Lindsey CIV USARMY CESAC (USA) <Lindsey.Larocque@usace.army.mil>
Subject: [Non-DoD Source] RE: FPPA Coordination – Request for Concurrence on Weir Removal Action – Waccamaw River Flood Risk Management Feasibility Study, Horry County, SC

Good afternoon,

Please sent me the GIS overlays and I'll take a look. Thanks!

For additional information:
Web Soil Survey
SoilWeb Apps
The National Cooperative Soil Survey (NCSS) is a nationwide partnership of Federal, regional, State, and local agencies and private entities and institutions.

Kristine Ryan, CPSC, MPH
State Soil Scientist
NRCS South Carolina

Natural Resources Conservation Service
1835 Assembly St., Rm. 950
Columbia, SC 29201
p: (803) 253-3896 | c: (803) 767-7496

From: Brown, Niko R CIV USARMY CESAC (USA) <Niko.R.Brown@usace.army.mil>
Sent: Wednesday, June 18, 2025 3:02 PM
To: Ryan, Kristine - FPAC-NRCS, SC <kristine.ryan@usda.gov>; Kelly, Terry - FPAC-NRCS, SC <terry.kelly@usda.gov>; Kjelgaard, Jim - FPAC-NRCS, NC <jim.kjelgaard@usda.gov>
Cc: Ward, Bethney P CIV USARMY CESAC (USA) <Bethney.P.Ward@usace.army.mil>; LaRocque, Lindsey CIV USARMY CESAC (USA) <Lindsey.Larocque@usace.army.mil>
Subject: FPPA Coordination – Request for Concurrence on Weir Removal Action – Waccamaw River

Flood Risk Management Feasibility Study, Horry County, SC

Dear Kristine,

The U.S. Army Corps of Engineers, Charleston District is coordinating with NRCS in accordance with the Farmland Protection Policy Act (FPPA) for a proposed federal action in Horry County, South Carolina. This action involves the removal of two existing low-head weirs on Socastee Creek to improve flood risks in the area. The action is part of the Recommended Plan under our Waccamaw River Flood Risk Management Feasibility Study and Integrated Environmental Assessment (https://www.sac.usace.army.mil/Missions/Civil-Works/Waccamaw-River-Flood-Risk-Management-Study/).

Soils designated as prime farmland or farmland of statewide importance are present within the 50% Annual Exceedance Probability (AEP) area around the creek where weirs are proposed for removal, but most are located within forested floodplain areas not currently in agricultural use, while the minimal classified soils not in forested floodplain are in residential development. The project would not involve land clearing, fill, or permanent construction on farmland soils.

Hydrologic modeling performed for the study simulated flood events from 50% AEP or higher order events and show some limited potential for induced flooding during such events, but these would not be expected to contribute to permanent conversion of farmland given their irregularity. No modeling was performed for baseflow or frequent storm conditions (<50% AEP), but no farmland currently in agricultural use exists within the existing 50% AEP floodplain. Therefore, we believe the action will not result in permanent conversion of farmland under FPPA, and we are requesting your written concurrence with this determination.

We are happy to provide GIS overlays, soil maps, or additional documentation as needed.

Please let us know if you concur with this determination, or if further coordination (e.g., AD-1006 or NRCS-CPA-106) is needed by July 18.

Thank you for your continued partnership.

Best,

Niko Brown
Biologist—Planning and Environmental Branch
USACE Charleston District
(603) 258-8589

K PUBLIC COMMENT PERIOD RECORD

This record contains a compilation of all substantive public comments received during the formal public comment period for the Waccamaw River Flood Risk Management Study Draft Environmental Assessment, which extended from September 9, 2024, to October 9, 2024. All comments received have been carefully reviewed and considered by USACE in the preparation of the Final EA. Comments deemed unsubstantial have been omitted from this appendix.

Substantive comments are presented chronologically by the date of submission. Each comment is followed by the agency's response. For comments submitted as larger files or attachments, a summary of the comment will be provided, and the full submission will be maintained in the administrative record and available upon request.

Public Comments and Corresponding Responses

Commenter Name/Affiliation: Public Commenter

Date Submitted: September 17, 2024

Method of Submission: Hand-written / Email

Comment:

"Please do something about Buck Creek, especially where it tries to flow into the Waccamaw just before one of the Route 9 bridges, but can't, so it backs up. Very fast growing area. Population will double or triple. Hello Mr. Wilkes, I had the pleasure of meeting you at Wednesday's valuable and informative community meeting in Longs / Little River concerning the four-year study of flood mitigation efforts. I believe the miles-long Buck Creek, with its own tributaries feeding it, is our problem, specifically where it ends at the Waccamaw River, I believe just a fraction of a mile south of us, and the Waccamaw's refusal to let Buck Creek water in, causing flooding in our area. Can the Waccamaw be deepened and/or widened for a distance to allow Buck Creek in? Can Buck Creek be dammed or a reservoir for temporary storage be added at a certain point or points? I have begun to read the draft report online and was encouraged to see ideas of what could be done and the benefits it would bring (I do like the idea of a floodwall around Aberdeen), but I was discouraged to see such low weight / net negative benefit given to them for Longs. The population of Longs is projected to double and triple in the coming years and decades with all the residential and commercial structures sure to be added. While it may seem sparsely populated now (it isn't), it will not remain this way. We need to stay ahead of the curve. I have no hope our County will undertake anything for the Route 9 Corridor in Longs on its own. Thank you kindly for your and the Corps' interest and help."

Agency Response:

Backwater effects near Buck Creek's confluence with the Waccamaw River were recognized in the study but large-scale channel modifications were found infeasible due to cost and potential environmental impacts. Reservoir or dam concepts were not feasible due to land and topographic constraints. Population growth is acknowledged; local reassessment may support future mitigation opportunities.

Commenter Name/Affiliation: Public Commenter

Date Submitted: September 19, 2024

Method of Submission: Email

Comment:

"Good luck convincing anyone that dredging the ICW will cause saltwater intrusion. The USACOE has never done any maintenance work on the basin, which is why the river banks are severely eroded and littered with tree debris. Until the water actually moves at Conway when its low tide at Georgetown there's more dredging and debris removal required. Today, the water doesn't move at Georgetown when it's low tide at Georgetown causing a perched water table year round, which negatively impacts the operation of septic tanks inland. It's the Waccamaw River-not an enlargement of Lake Waccamaw. Good luck trying to BS your way out of this one."

Agency Response:

Deepening of a tidal river such as the Waccamaw River would not increase its storage capacity to reduce flood waters. With deepening, total water levels would equilibrate over a tidal cycle that would not allow for additional rainfall and overland flow to stay in the river. Deepening also raises saltwater intrusion concerns related to potential long-term changes in salinity gradients and groundwater levels, which can vary with dredging location, depth, and connectivity. Dredging of the AIWW by USACE is for navigation purposes, not flood control. Concerns about sedimentation and tidal dynamics on septic impacts are noted for coordination with relevant agencies.

Commenter Name/Affiliation: Public Commenter

Date Submitted: September 19, 2024

Method of Submission: Public Comment

Comment:

"There are 2 issues. Approving sub-standard rain water remediation in new developments and flood control due to rising rivers. These cheap builders have no care for their buyers after they get their money...and are leaving them in horrific conditions due to inadequate retention ponds and poor grading. This rain issue needs to be address as much as river flooding does."

Agency Response:

While this study focuses on large-scale river flooding, stormwater and floodplain management standards for new development are under local and state jurisdiction. Horry County has strengthened its local requirements by implementing recommendations from their 2022 Flood Resilience Master Plan including supplemental flood zones, increased freeboard, and compensatory storage requirements. USACE continues to encourage our local and state partners to utilize a comprehensive approach to flood risk management.

Commenter Name/Affiliation: Public Commenter

Date Submitted: September 19, 2024

Method of Submission: Public Comment

Comment:

"I live in the Little Lamb community which is about 1/2 mile from the Bucksport community. The Big Bull landing road that you are allowing Horry County to dam up is going to divert all of the flood waters that used to go into the Bucksport community to now go into our community. Our community is sometimes referred to as the Little Lamb community and the only thing that separates the two communities is the Big Bull Landing Road that you are daming up and hwy. 701. We believe that daming that dirt road up is not only unethical but that it is also unlawful according to state and federal laws because it will divert the natural flow of storm waters from their community into ours. The daming up of this road was done without any kind of permits which was also against the law . We have tried numerous times to bring this to the attention of the Army Corp of Engineers , DHEC, Horry County Council, the Horry County Emergency Management and others which was all to no avail."

Agency Response:

The Big Bull Landing Road project that is referred to is not a product of the current Waccamaw River Flood Risk Management Study. The Big Bull Landing Road project is a Horry County project that was planned prior to the start of this joint USACE and Horry County feasibility study and has since been completed. The current study did not result in justification for any additional flood risk reduction measures for investment by the Federal Government. However, a recommendation for consideration by Horry County and other partners for restoration of natural flow and ecosystem functions in Cowford Swamp could benefit the Little Lamb community area.

Commenter Name/Affiliation: Public Commenter

Date Submitted: September 20, 2024

Method of Submission: Public Comment

Comment:

"The overdevelopment in Horry County will continue to exacerbate the flooding problems along the Waccamaw River, causing more costly damage in the future. Nature-based solutions must be a part of the conversation if we are serious about sustainable flood risk management. The Waccamaw River Flood Risk Management Study brings much-needed attention to flood mitigation, but a critical aspect missing from the study is the emphasis on natural solutions like wetlands and floodplain protections. Wetlands act as nature’s flood control system, absorbing and storing excess water during heavy rainfall, while floodplains provide a necessary space for rivers to overflow safely. Unfortunately, Horry County has been experiencing rampant overdevelopment, which is putting more pressure on these natural flood defenses. Allowing unchecked development in wetlands and flood-prone areas only increases the risk of flooding and worsens its impact on communities. There should be no development in wetlands, and stronger buffer zones must be established as a necessity to protect both the environment and people’s property. Without these protections, the overdevelopment in Horry County will continue to exacerbate the flooding problems along the Waccamaw River."

Agency Response:

USACE acknowledges the comments regarding overdevelopment in Horry County and the role of nature-based solutions, such as wetlands and floodplain protection, in flood risk management. The importance of protecting natural flood defenses is understood.

USACE evaluates a range of alternatives, including nature-based solutions, within its flood risk management studies. In this study, specific nature-based solutions were considered during the initial formulation of alternatives. "Water farming" was evaluated in both the Longs/Red Bluff and Bucksport areas. These measures were screened out due to incompatibilities with existing land uses. In Longs/Red Bluff, the proposed measure overlapped with state-owned conservation land, which would conflict with existing land restrictions. In Bucksport, the measure overlapped with a Wastewater Treatment Plant, posing potential environmental risks.

Concepts such as channel benching, which can provide localized flood risk reduction, were also studied. While considered, channel benching was not recommended for federal investment because it did not demonstrate sufficient flood risk reduction benefits to justify the federal cost under current economic criteria.

While some nature-based solutions may not meet the federal economic justification criteria for large-scale federal projects, they can be effective at a localized level. Local entities, such as Horry County and community groups, are encouraged to consider and implement such solutions, including channel benching, wetland restoration, and establishing buffer zones, as part of their flood risk management efforts.

The study focuses on identifying federally justifiable solutions. Comprehensive flood risk management requires a multi-faceted approach involving local planning, land-use policies, and investment in various solutions, both structural and nature-based.

Commenter Name/Affiliation: Public Commenter

Date Submitted: September 21, 2024

Method of Submission: Public Comment

Comment:

"Why can't Duke Energy be responsible for their own flood water instead of releasing it to the Waccamaw River?"

Agency Response:

The Waccamaw Flood Risk Management Study focuses on understanding and mitigating flood risks in the Waccamaw River Basin, especially in Horry County and surrounding communities. While concerns about upstream water releases, such as those from Duke Energy facilities, are understandable, it’s important to clarify that:

1. Horry County maintains communication with Duke Energy to understand the timing and volume of intended releases, and these discussions are taken into account when modeling river responses and evaluating potential flood risk scenarios. However, controlling or altering Duke Energy's release operations is outside the scope and authority of this study.

2. It’s also important to note that releases from upstream reservoirs do not necessarily equate to increased flood risk in the Waccamaw. The Waccamaw River is a naturally slow-draining system with a large floodplain, and much of its flood behavior is influenced by local rainfall and backwater effects not just upstream inflows.

Ultimately, the purpose of the FRM study is to identify feasible, locally-supported solutions to reduce flood risk in the Waccamaw Basin.

Commenter Name/Affiliation: Public Commenter

Date Submitted: September 22, 2024

Method of Submission: Public Comment

Comment:

"I do not have a solution but the water released from the NC dams needs to be converted to other areas instead of to the Pee Dee River, then into the Waccamaw, then into the ICW, for Socastee (which I live in Rosewood), the Waccamaw runs into the ICW right past Enterprise Landing, then we get the water running down from Little River,& @ high tide tide the Atlantic Ocean backs us into the ICW flooding out Rosewood & some other development in Socastee. There has to be a solution instead of constantly letting Rosewood flood. Build a wall along the ICW in the lower parts of Socastee & close off the boat ramp, that might help, since almost every area & development plus Myrtle Beach runs their water into the ICW. There has to be a solution, for we are tired of the constantly flooding of our homes."

Agency Response:

USACE acknowledges the hardship repetitive flooding from major storm events causes in the Socastee area. The study considered several structural options both on a large scale and more specifically in the Socastee area. The recommended plan includes targeted improvements to reduce backwater flooding in the Waccamaw River and Socastee Creek.

Commenter Name/Affiliation: Public Commenter

Date Submitted: September 27, 2024

Method of Submission: Public Comment

Comment:

"I have lived in the Bucksport section of Horry County for over 30 years and I am very strongly opposed to the damming up of the Big Bull Landing Road project. This dam will definitely fix the flooding problem for one part of the Bucksport Community but will overwhelm the western section of the Bucksport Community with additional flood waters. During a major flood my house, property and road has 3 feet of flood water and is up to the edge of the door of my house and with the additional water that this dam will divert into my community it will be knee deep in my living room. You all have not done a legitimate study or else y'all would already know this. It is against the law to divert flood water from one area of the Bucksport Community onto other people's property that live in the other part of the Bucksport Community but that is exactly what you all are doing with this dam."

Agency Response:

Numerous comments were received regarding the Big Bull Landing Road project and concerns related to potential flooding in the Little Lamb community. The Big Bull Landing Road project that is referred to is not a product of the current Waccamaw River Flood Risk Management Study. The Big Bull Landing Road project is a Horry County project that was planned prior to the start of this joint USACE and Horry County feasibility study and has since been completed. The current study did not result in justification for any additional flood risk reduction measures for investment by the Federal Government. However, a recommendation for consideration by Horry County and other partners for restoration of natural flow and ecosystem functions in Cowford Swamp as a whole could benefit the Little Lamb community area.

Commenter Name/Affiliation: Organization Commenter (Horry County Rising, Inc.)

Date Submitted: October 08, 2024

Method of Submission: File Submission

Comment:

Please note: The following is a summary of comments submitted by President and Founder of Horry County Rising, Inc. The full document is available in the administrative record.

Horry County Rising, Inc. submitted comments emphasizing the need for compassion, equity, and a broader perspective in the Waccamaw River Flood Risk Management Study's benefit-cost analysis (BCA). The comments argue that the USACE should consider non-monetary benefits, such as human safety, mental health, and community resilience, which are often overlooked in traditional BCAs.

The submission highlights the significant financial impact of flooding on Horry County households, citing the Horry County Climate Cost Project survey. This survey revealed substantial out-of-pocket expenses, wealth losses, and declines in home values for flood-affected families, even those receiving FEMA aid. The comments urge USACE to incorporate a comprehensive range of economic impacts in its BCA, including lost income, lost wages, emergency expenses, and increased household costs, especially for disadvantaged communities.

The submission stresses the importance of prioritizing public safety and recognizing the emotional impact of flooding on affected families. It argues that USACE's framework should account for the value residents place on safety and well-being, and that decisions should not solely rely on cost-benefit calculations. The comments also advocate for considering non-structural alternatives, such as home elevations and floodplain acquisitions, to enhance community resilience.

The submission calls for enhanced community engagement in flood mitigation efforts and highlights the need for consistency among federal agencies in their approaches to calculating project benefits and costs. It encourages USACE to follow updated federal guidelines for BCA, as outlined in OMB Circulars A-4 and A-94, and to consider a broader set of benefits, including ecosystem services and the potential costs and benefits of water resources investments. Finally, the submission concludes by questioning the moral philosophy underlying cost-benefit analysis, particularly in situations where the safety and well-being of flood-affected families are at stake. It urges USACE to consider ethical and moral dimensions in decision-making and to uphold its responsibility to ensure citizens' rights to live in homes that are safe from flooding.

Agency Response:

USACE acknowledges the comment submitted by Horry County Rising, Inc. regarding the Waccamaw River Flood Risk Management Study. The comment provides valuable insight into the concerns of communities impacted by flooding.

USACE Charleston District follows an established planning process that considers social, environmental, and equity factors in assessing flood risk management solutions. This process is governed by federal laws, policies, regulations, and guidance, including Executive Orders, Engineer Regulations, and Planning Bulletins. The study adhered to federal benefit-cost analysis requirements as outlined in OMB Circular A-94 and USACE guidelines.

While current federal guidance encourages more inclusive evaluation and comprehensive benefits analysis, USACE is actively working to enhance its methodologies for documenting and incorporating a wider range of benefits in decision-making. In this study, comprehensive benefits were evaluated qualitatively, acknowledging the numerous impacts and benefits that are difficult to quantify but affect residents experiencing flooding. Other social effects were also evaluated to assess the comparative benefits and impacts of proposed alternatives against the future without project condition.

The study did consider non-structural and nature-based measures where feasible. The USACE is responsible for identifying effective and efficient solutions to water resource problems through comprehensive analysis.

USACE recognizes that holistic community resilience requires a collaborative effort across government agencies, industry, and public-private partnerships. The comments provided by Horry County Rising, Inc. will be shared with USACE leadership for consideration in future policy development. The suggested expanded framework and deeper community engagement may inform future efforts.

Commenter Name/Affiliation: Public Commenter

Date Submitted: October 09, 2024

Method of Submission: Public Comment

Comment:

"Our biggest disappointment centers around the limited evaluation of the impact of land use on flooding, specifically the destruction of the watershed's floodplain and wetlands and the impact of loss of these functional wetlands on flood protection. Given the ecosystem services that our floodplain and wetlands provide, it is critical that Horry County focuses on their preservation, restoration, and creation.

There is minimal evaluation and identification of natural or nature-based solutions. While we support certain strategies that Horry County has outlined (riparian and wetland buffers, preserving mature tree canopy stands, resilient subdivision design standards, land conservation collaborations), we are disappointed that more nature-based solutions were not identified and evaluated.

The only nature-based measure identified for the Bucksport area (watershed storage) was retained. The focus was on restricting land use in low-lying, undeveloped tracts to temporarily store runoff and control dissipation. There are other nature-based measures, including Regenerative Stormwater Conveyance.

Given its proven technology, we encourage the Study Team to evaluate this nature-based solution. A regenerative stormwater conveyance system in Cowford Swamp would benefit the Bucksport community. With the removal of legacy sediments, introduction of natural materials that enable better infiltration, and add native plant species that enable better uptake of floodwaters, it would reestablish the interconnection between the groundwater and surface water, expand the capacity of the overflow, restore subsurface lateral flow, and reduce flooding for a fraction of the cost of traditional structural and non-structural solutions.

The only nature-based measure identified for the Conway area (watershed storage) were retained. In Conway, the focus was on restricting land use in low-lying, undeveloped tracts to temporarily store runoff and control dissipation when storm events are expected. We believe that there are other nature-based measures that should have been evaluated, including Regenerative Stormwater Conveyance. Given the proven technology of Restorative Stream Conveyance, we strongly encourage the Study Team to evaluate this nature-based solution to reduce the risk of flooding to the communities in the Conway area. This study area would benefit from an evaluation and implementation of a regenerative stormwater conveyance system.

In Socastee there was no nature-based measure identified. We believe that there are nature-based measures that should have been evaluated, including Regenerative Stormwater Conveyance. Given the proven technology of Restorative Stream Conveyance, we encourage the Study Team to evaluate this nature-based solution to reduce the risk of flooding to the communities in the Socastee area. This study area would benefit from an evaluation and implementation of a regenerative stormwater conveyance system.

Both of the Longs/Red Bluff measures identified as nature-based (natural material and watershed storage) were screened out as ineffective. We believe that there are nature-based measures that should have been evaluated, including Regenerative Stormwater Conveyance. Given the proven technology of Restorative Stream Conveyance, we strongly encourage the Study Team to evaluate this nature-based solution to reduce the risk of flooding to the communities in the Longs/Red Bluff areas. These communities would benefit from an evaluation and implementation of a regenerative stormwater conveyance system.

There are many other nature-based measures that should have been evaluated, including regenerative stormwater conveyance, incorporating natural stream channel design techniques and materials while minimizing soil destabilization, vegetation disturbance and establishment of invasive plants while being generally less expensive than conventional stormwater projects."

Agency Response:

While several NNBF concepts—such as watershed storage and channel benching—were evaluated, others like regenerative stormwater conveyance were not considered in this joint Federal and County study because stormwater management is a responsibility of local governments and not the Federal Government. However, local green infrastructure approaches for stormwater management hold promise and may be recommended as a result of this study for Horry County and other local jurisdictions and organizations to explore.

Commenter Name/Affiliation: Agency Commenter (U.S. Environmental Protection Agency)

Date Submitted: October 09, 2024

Method of Submission: Email

Comment:

"1. Water Quantity and Property: It is understood that the addition of relief bridges/cross drains in Conway aims to increase the conveyance of water through these areas where bottlenecking is occurring. This is anticipated to reduce the Water Surface Elevation (WSE) for 684 properties out of 1,684 properties; however, model results also indicate an increase in WSE for 200 properties. Additionally, model results for weir removal in Socastee Creek indicate a slight increase in WSE upstream and downstream of weir 1, which may potentially lead to flooding at some properties. Recommendation: Model outputs for the TSP should be further assessed to ascertain the impacts of increased WSE on properties within the study area. Potentially affected properties for selected alternative should be quantified and identified, and the degree of effect flooding may have on these properties specified in the final EA. Nonstructural measures such as elevating and/or floodproofing homes, businesses, and critical infrastructure may be warranted for properties impacted by increased WSE because of this project.

2. Wetlands: According to Section 4.5.3.1 of the draft EA, "construction of relief bridges would result in three independent and fully functioning structures which would require <0.01 acres of wetland impacts." The EPA acknowledges that the USACE has determined that this action is eligible for authorization under Nationwide Permit 14 – Linear Transportation Projects. The USACE has also determined the barrier removal in Socastee is eligible for authorization under NWP 53. Therefore, these actions would be performed in compliance with Clean Water Act Section 404(e) and the 404(b)(1) guidelines. Additionally, the USACE will consult with the South Carolina Department of Health and Environmental Control, to obtain a Clean Water Act 401 Water Quality Certification for the proposed project."

Agency Response:

The final analysis for the Tentatively Selected Plan (TSP) has undergone further refinement to minimize adverse impacts, including potential increases in Water Surface Elevation (WSE) for properties. Where unavoidable, potential induced flooding impacts will be addressed through appropriate mitigation measures. Regarding wetlands, USACE confirms compliance with Clean Water Act Section 404(e) and 404(b)(1) guidelines for all proposed actions. Coordination with the South Carolina Department of Environmental Services for Section 401 Water Quality Certification has been completed.

Commenter Name/Affiliation: Organization Commenter (Coastal Conservation League)

Date Submitted: October 09, 2024

Method of Submission: Public Comment

Comment:

"On behalf of the Coastal Conservation League, we request to be informed on any decisions made or updates pertaining to this study at trapperf@scccl.org and beckyr@scccl.org. First, we are concerned by the lack of public notification for the October 2024 results/draft report public meetings and resulting low attendance. The Conservation League would be happy to help advertise future meetings with more notice. During the public review and draft report meetings, Ms. Parish stated that in 100 years the floodplain of the Waccamaw River would only change in depth but not in width. Could you please explain this given the natural river swamp floodplain? Why are there no recommendations for Longs/Red Bluff and Bucksport?

Were there considerations made for underserved communities such as Bucksport? If Bucksport were to receive historical status, would the homes be more valuable and worthy of a project? Why were nature-based projects not included in your study as solutions? -see below In Bucksport, the only viable solution just happens to be the Big Bull Landing Road elevation and canal project. Yet, at the prior meeting none of the USACE staffers present knew nothing about this county project nor was it identified on study maps. At what point did USACE decide to incorporate it into their study analysis? In the Conway area, clearing river debris and snags were considered to have low effect on flooding, yet Horry County claimed it would help when they did so north of Conway. Do we not want to slow the flow down and allow the floodplain to do its job? In Socastee, USACE is proposing to remove 2 weirs from a channel, yet the weirs were once a flood mitigation effort of USACE before the floodplain was developed. Why is USACE not helping guide the county to conserve the floodplain to combat flooding issues? (cont from above) Why not recommend a local wetland buffer ordinance to the county? Please consider adding funding for additional predictive forecasting gauges into your study and funding requests. On the Waccamaw, there is a gap between Longs and Conway as well as downstream in Socastee and Bucksport. More predictive forecasting gauges could help save lives and personal property from damage. Finally, were impacts of flooding based on FEMA maps or county supplemental flood zone mapping? Were more frequent and intense flooding events surpassing Hurricane Florence considered?"

Agency Response:

Our study focused on identifying and recommending federally justifiable solutions for flood risk management. This process is guided by USACE policy, which requires alternatives to demonstrate net economic benefits (i.e., monetized benefits exceeding costs) to be recommended for federal action, unless a specific exception is granted. Regarding Longs/Red Bluff and Bucksport, recommended plans were not identified because the evaluated alternatives did not demonstrate economic justification; their monetized benefits were not greater than their costs. While considerations were made for vulnerable or at-risk populations, these factors did not alter the economic justification (Net Economic Benefit, NED) analysis, which focuses on the monetization of benefits compared to costs for each action alternative. Furthermore, the potential for historical status for homes in Bucksport, from an NED perspective, would still base structure value on replacement cost less depreciation, likely yielding a similar economic outcome and an unjustified project under current criteria.

The Big Bull Landing Road project in Bucksport is not a USACE Civil Works project and was not part of this study's scope, though its influence on potential cumulative impacts is noted.

In Conway, while localized clearing of river debris and snags may offer some beneficial impacts, our studies indicate a limited effect on system-wide flood reduction. Our approach prioritizes maintaining efficient conveyance by allowing relief bridges and channels to function as designed, enabling the river to utilize its natural floodplain for storage and flow rather than creating artificial bottlenecks. This minimizes upstream backwater effects and improves system performance during flood events.

Regarding Socastee, the study's proposed actions, including weir removal, are aimed at optimizing conveyance within the system to improve overall flood risk management. We recognize the importance of floodplain conservation and encourage local jurisdictions to pursue measures such as wetland buffer ordinances, as these are within their purview.

Concerning nature-based solutions, these approaches were considered where practical and feasible within the scope of the study. Regarding the Waccamaw River floodplain, our modeling, based on

topography and future land cover assumptions, indicated that changes in flood extent over a 100-year period would primarily be observed in depth rather than significant changes in width, given the natural river swamp floodplain.

For flood impact assessments, the study utilized county flood zone mapping where available, and its risk framework included the evaluation of events exceeding the magnitude of Hurricane Florence. The suggestion for additional predictive forecasting gauges is valuable and may be considered in future coordination with relevant agencies such as NOAA and USGS.

Commenter Name/Affiliation: Public Commenter

Date Submitted: October 09, 2024

Method of Submission: Public Comment

Comment:

Please note: The following is a summary of comments received. The full document is available in the administrative record.

Comments received critiqued the USACE Waccamaw River Flood Risk Management Study for its limited scope and methodology. The comments emphasized the need for a systems approach incorporating all factors contributing to flooding, not just climate. The commenter argued for modeling the impacts of population growth, development, and land use changes, and for considering non-structural solutions.

The comments criticized the reliance on outdated climate data and called for the use of the Fifth National Climate Assessment and the South Carolina Statewide Resilience Plan. The need for a comprehensive risk framework and a more accurate assessment of social vulnerability, particularly in Bucksport, was highlighted.

Specific concerns included the lack of clear presentation of modeling results, inconsistent evaluation of alternatives, and failure to address the potential for compound flooding. The comments also questioned the exclusion of sensitivity analysis results showing the impact of increased rainfall. The commenter urged a more proactive approach focused on reducing the causes of flooding, not just adapting to its impacts.

Agency Response:

While the current study scope was constrained by available data, time, and feasibility limitations, many of the suggestions—especially related to long-term modeling, land use integration, and equity considerations—align with evolving federal guidance. The study used best-available H&H and climate data at the time of analysis but acknowledges the importance of future scenario modeling, system-wide analysis, and cross-agency collaboration. Recommendations on EJ screening, visual communication, and cumulative impacts will be reviewed for future updates or related studies.

Commenter Name/Affiliation: Public Commenter

Date Submitted: October 10, 2024

Method of Submission: File Submission

Comment:

Please note: The following is a summary of comments submitted by [Commenter Name]. The full document is available in the administrative record.

[Commenter Name], Flood Defenders-Panhandle Technical Advisor Subject Matter Expert, provided comments advocating for the consideration of a combined project approach to flood risk reduction in the City of Conway, particularly concerning the proposed Crabtree Canal benching project. [Commenter Name]'s comments were prompted by a request from Horry County Rising, Inc. to review and comment on the USACE study.

[Commenter Name] suggests that the cost-benefit analysis should consider anticipated losses from future population increases, utilizing future land use categories and zoning designations to forecast potential development trends. He argues that expanding storage capacity within the Crabtree Swamp watershed is a logical engineering solution and proposes a combined project involving buyouts, home elevations, and a larger benching project. Buyout properties could be used to expand detention/retention capacity, and home elevations could remove ground floor structures that restrict flow. He questions whether cost-benefit analyses have accurately considered the potential of such a combined and expanded project.

[Commenter Name] emphasizes that the channelization of Crabtree Swamp in the 1960s and 1980s should be considered a "sin of the past," necessitating a moral responsibility to repair the damage done to the natural ecosystem. He suggests that a complete wetland restoration project, including the expansion of Kingston Lake or converting Crabtree Swamp into another lake, might solve a problem the government originally created. He questions whether the current wetland protection regulations are hindering the exploration of more radical solutions that could enhance ecological efficiency while also providing flood protection.

[Commenter Name] also points to the high numbers of flooded property applicants after recent hurricanes and references an Insurance Journal article highlighting the fact that many flooded properties are outside designated flood hazard areas and are uninsured. He raises concerns about the expected future flood damage and recurring costs in the Crabtree Canal area and suggests that the cost-benefit analysis should consider adjusted future costs, accounting for inflation and the increasing costs of paying out claims for repetitive loss properties.

Finally, [Commenter Name] questions the effectiveness of the completed Crabtree Swamp Sec. 206 Aquatic Ecosystem Restoration project from a flood protection perspective and notes the impaired water quality in Kingston Lake and Crabtree Swamp. He suggests that a volume expansion project could help mitigate both flooding and water quality problems.

Agency Response:

USACE acknowledges the commenter’s concerns and appreciates the suggestions regarding a more holistic flood risk reduction approach. The Crabtree Canal benching project, as evaluated, focuses on cost-effective channel capacity improvements within the current study scope. However, we agree that integrating nonstructural measures such as elevations and voluntary buyouts—especially where repetitive losses occur—could offer increased resilience. The idea of a combined alternative merits further exploration, particularly in light of population growth trends, ecosystem impairment, and evolving flood patterns. While wetland regulations limit certain actions (e.g., large-scale lake conversion), future

planning efforts may benefit from revisiting storage-based solutions in collaboration with federal, state, and local partners.

Commenter Name/Affiliation: Public Commenter

Date Submitted: October 10, 2024

Method of Submission: File Submission

Comment:

Please note: The following is a summary of comments submitted by [Commenter Name]. The full submission, including attached plans and design sheets, is available in the administrative record.

[Commenter Name], a civil engineer and stormwater expert with over two decades of experience in designing, permitting, and building mitigation and restoration projects, submitted comments offering their expertise to the Waccamaw River Flood Risk Management Study. The commenter highlights their experience in Maryland, where their techniques were adopted by the Maryland Department of Environment and implemented into their design law manual.

The commenter proposes a restoration-based approach to flood mitigation, specifically focused on restoring Cowford Creek and its tributaries in the Bucksport area. The submission includes a conceptual plan for Bucksport, designed to increase capacity and account for current development. While the commenter notes that not all elements of the conceptual plan may be feasible due to cost considerations, the designs are intended to handle up to a 500-year flood event, according to HEC-RAS modelling.

Agency Response:

USACE appreciates the commenter's background and submission of a conceptual restoration plan for Cowford Swamp. Nature-based flood mitigation approaches, including floodplain and stream restoration, align with the goals of long-term resilience and ecosystem function. While the proposed approach extends beyond the current scope of the study, USACE will consider the feasibility of nature-based alternatives in future coordination with local partners and regulatory agencies.

L EXECUTIVE ORDER 11988 COMPLIANCE

This section details the U.S. Army Corps of Engineers' compliance with Executive Order 11988, Floodplain Management, following the 8-step process outlined in ER 1165-2-26.

a. Determine if the proposed action is in the base flood plain.

All actions identified as alternatives herein are in the base floodplain as the project considers approaches to reduce riverine flooding problems.

b. If the action is in the base flood plain, identify and evaluate practicable alternatives...

No practicable alternatives beyond those considered herein were identified as flooding in the study area is derived from the riverine environment and its floodplains.

c. If the action must be in the flood plain, advise the general public...

A public scoping period allowed for public input on these actions.

d.-e. Identify beneficial and adverse impacts... determine if a practicable non-flood plain alternative for the development exists...

All alternatives developed induced flooding in some areas while reducing flooding in the project area. Tradeoffs identified nuisance flooding vs. life safety flooding concerns, but no alternative reduced flooding across the board. The actions considered were conceived to alleviate flooding already affecting existing development and would not induce new development.

f. ...determine viable methods to minimize any adverse impacts... and methods to restore and preserve... flood plain values.

Expected loss of natural and beneficial floodplain values are discussed for each alternative in Section 4 of the main report. Net benefits to natural and beneficial floodplain values associated with the Recommended Plan are expected and optimization of design parameters would further improve this outcome. In the case of two of the flood impact areas considered here, the No Action Alternative was the identified plan.

g. If the final determination is made that no practicable alternative exists... advise the general public...

Release of the draft Integrated Feasibility Report and Environmental Assessment on September 9, 2024, relayed this information to the public.

h. Recommend the plan most responsive to the planning objectives...

The recommended plan is consistent with both the planning objectives and the requirements of EO 11988.

M BIOLOGICAL RESOURCE COMPLIANCE AND BEST MANAGEMENT PRACTICES

This appendix details the strategy to ensure project compliance with the Migratory Bird Treaty Act (MBTA), Endangered Species Act (ESA), Clean Water Act (CWA), and other environmental commitments. As analyzed in Section 4, construction activities have the potential to adversely affect environmental resources.

To comply with federal law and policy, the project will incorporate feasible and prudent Best Management Practices (BMPs) into the final plans and specifications to avoid and minimize these impacts. The following sections describe the toolkit of potential BMPs that will be considered. The specific measures required for implementation will be determined during the Pre-construction Engineering and Design (PED) phase based on final project designs, site-specific conditions, and coordination with resource agencies.

General Construction Site Best Management Practices

Where required for Clean Water Act compliance, a Stormwater Pollution Prevention Plan (SWPPP) will be developed and implemented. Measures to be considered for inclusion in the SWPPP and final construction plans include, but are not limited to:

- Erosion and Sediment Control: The use of standard erosion controls such as silt fences, wattles, and temporary seeding on all disturbed upland areas.
- Spill Prevention: The development of a spill prevention and response plan, including the designation of specific upland areas for all equipment refueling and maintenance.
- Waste Management: The containment and regular removal of all construction-related trash and debris from the project site to an approved disposal facility.
- Footprint Minimization: The clear delineation of all approved work limits, staging areas, and access corridors with high-visibility fencing to prevent accidental encroachment into non-impact areas.

Specific Measures for In-Water Work

Where in-water work is required, the following measures will be considered for implementation:

- Turbidity Control: The deployment of turbidity curtains or similar containment structures around the in-water work area to manage sediment plumes.
- Pre-Disturbance Sediment Analysis: The collection and chemical analysis of sediments from behind any structure slated for removal (e.g., weirs) to verify that mobilized sediments will not introduce harmful contaminants downstream.

Species and Habitat-Specific Best Management Practices

Based on final designs and site-specific surveys conducted during PED, the following species and habitat-specific measures will be considered for implementation:

Migratory Birds and Bald Eagles:

- Scheduling initial vegetation clearing outside of the primary migratory bird nesting season (typically April 1 to August 31).
- If work must occur during the nesting season, conducting pre-construction nesting surveys and establishing appropriate "no-work" buffers around any active nests found until the young have fledged.

Federally Listed Bat Species:

- Avoiding tree removal within suitable habitat during the sensitive pup-rearing (May 1 – July 15) and winter torpor (Dec. 15 – Feb. 15) seasons.
- Conducting pre-demolition surveys for any structures that could serve as roosts.

Federally Listed Aquatic Species (Sturgeon, Manatee):

- Adherence to the USFWS "Manatee Protection Measures for South Carolina" for all in-water activities.
- Employing "soft-start" procedures for any pile driving or other noise-intensive in-water work to allow mobile species to leave the immediate area.