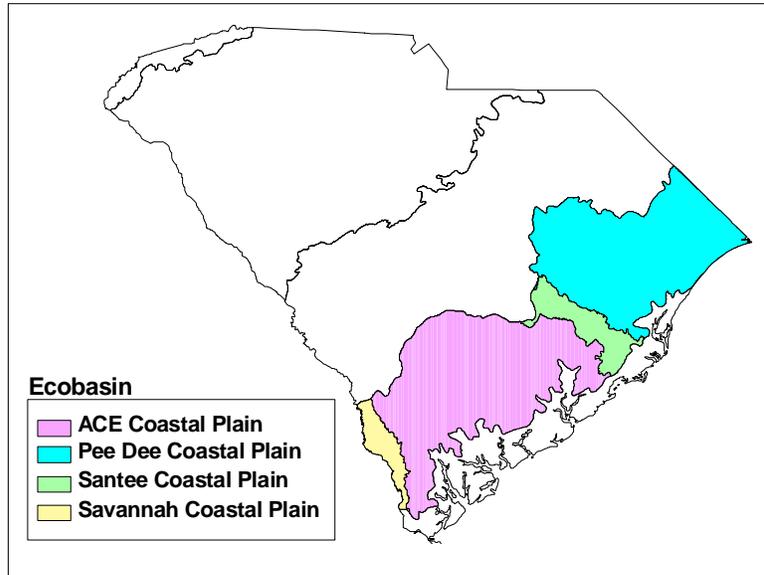


Coastal Plain Ecoregion Aquatic Habitats

Description and Location

The Coastal Plain is situated directly below the Southeastern Plains ecoregion and terminates at the Coastal Marsh. In South Carolina it extends northwest from the Savannah River to the North Carolina state line. The Coastal Plain intersects 19 counties and covers approximately 8,555 square miles. The Coastal Plain is nearly level with elevations ranging from 25 to 125 feet. The major aquatic habitats within the ecoregion include lazy meandering streams, swamps, marshes, and estuaries. Pocosins and Carolina Bays are abundant in some areas.



Savannah–Coastal Plain Ecobasin

The Savannah-Coastal Plain Ecobasin is located in the extreme southwest corner of the state extending from southern Allendale County through Hampton and Jasper Counties before terminating at the coastal zone marsh. The ecobasin includes 45 miles of the Savannah River as it meanders toward the coast. Primary tributaries to the Savannah River in this ecobasin include Brier Creek and Boggy Branch. The ecobasin intersects 10 watersheds and covers 350 square miles. Approximately 26 square miles of land are protected by federal and state entities within the ecobasin. The largest protected areas are the Palachucola Wildlife Management Area (11.1 square miles) and the James W. Webb Wildlife Center (8.6 square miles), both managed by the South Carolina Department of Natural Resources. Other protected areas include a small portion of the Savannah National Wildlife Refuge (5.3 square miles) and the Tillman Sand Ridge Heritage preserve (1.3 square miles). The ecobasin contains approximately 277 miles of lotic habitat and 620 acres of lentic habitat. There are no major reservoirs within the ecobasin; the largest lentic habitat is only 62 acres.

Primary conservation targets within the ecobasin include the mainstem of the Savannah River throughout the ecobasin and the Brier Creek/Boggy Gut Creek system in Allendale County (Smith et al. 2000). The mainstem of the Savannah River contains several aquatic animals that are on South Carolina's Priority Species List including fish (shortnose sturgeon and robust redhorse) and mussels (pod lance and Savannah lilliput). The Brier Creek/Boggy Gut Creek system is home to one of the few known populations of bluebarred pygmy sunfish.

ACE–Coastal Plain Ecobasin

The northern extreme of the ACE-Coastal Plain Ecobasin is situated in central Bamberg and Orangeburg Counties. The ecobasin encompasses parts of Allendale, Hampton, Colleton, Dorchester, Jasper, Beaufort, Berkeley and Charleston Counties before terminating at the coastal zone marsh. Coastal rivers in the ecobasin include the Coosawhatchie, Salkehatchie Combahee, Ashepoo, Ashley, Edisto and Cooper. The Coosawhatchie River originates just north (6 miles) of the coastal plain in the southeastern plains and flows for about 47 miles through the coastal plain before merging with Tulifiny River to form the Broad River, which ultimately is deposited into the Atlantic Ocean at Port Royal Sound. The Salkehatchie River originates in the southeastern plains and flows for about 27 miles through the coastal plain before merging with the Little Salkehatchie River to form the Combahee River, which flows for 51 miles through the coastal plain before terminating in the Atlantic Ocean at St. Helena Sound. The Ashepoo River originates in the coastal plain and flows for about 57 miles, picking up inputs from Horseshoe Creek and Deer Creek before terminating at the Atlantic Ocean in St. Helena Sound. The Edisto River is formed at the confluence of the North Fork Edisto River and South Fork Edisto River. Each fork originates in the southeastern plains and flows for about 19 miles through the coastal plain before merging and forming the Edisto River. The Edisto River flows for about 122 miles through the coastal plain before entering St. Helena Sound and the Atlantic Ocean. As the Edisto flows through the coastal plain, it picks up inputs from Field Swamp, Four Hole Swamp and Penny Creek. The Ashley River originates entirely in the coastal plain. Its headwater, Great Cypress Swamp, flows for about 25 miles until it merges with Captains Creek to form the Ashley River. The Ashley River flows for about 40 miles through the coastal plain until terminating at Charleston Harbor and the Atlantic Ocean. The Cooper River is formed at the confluence of the East Branch and West Branch Cooper River. Once a self-contained drainage, the Cooper River now receives inputs from the Santee River via a diversion canal that diverts water from Lake Marion to Lake Moultrie. The West Branch Cooper River originates at the tailrace of Lake Moultrie and flows through the coastal plain for about 18 miles before merging with the East Branch Cooper River to form the Cooper River. The Cooper River flows through the coastal plain for about 30 miles, picking up inputs from the Back River, Goose Creek and Filbin Creek along its western shore and Flag Creek and Yellow House Creek along the eastern shore before being deposited in Charleston Harbor and the Atlantic Ocean.

The ecobasin intersects 72 watersheds and encompasses 4,093 square miles. There are 277 square miles of land protected by state, federal and private entities within the ecobasin. The largest tracts of protected land include the Francis Marion National Forest (198 square miles) and the Francis Beidler Forest (17 square miles), an Audubon Society Preserve. Other significant protected lands include the Nemours Plantation (7.7 square miles), the Medway Plantation (7.1 square miles), the Santee National Wildlife Refuge (6.9 square miles) and the Donnelley Wildlife Management Area (6.2 square miles). There are approximately 3,678 miles of lotic habitat and 108 square miles of lentic habitat within the ecobasin. The majority (89 square miles) of lentic habitat is represented by Lake Moultrie, the only major reservoir in the coastal plain.

Primary areas of conservation concern in the ACE-Coastal Plain Ecobasin include the Jasper County wetlands in Jasper County; the Cypress/Beaver Dam Creek systems in Jasper and Hampton Counties; the Sandy Run system in Colleton County; the lower North Fork Edisto and

mainstem Edisto Rivers throughout the ecobasin; and the Cooper River in Berkeley and Charleston Counties. The Jasper County wetlands, Cypress/Beaver Dam Creek and the Sandy Run systems all contain populations of bluebarred pygmy sunfish and other fishes that are on South Carolina's Priority Species List. The North Fork and mainstem Edisto River contain several fish species on the priority species list ("broadtail" madtom, shortnose sturgeon, bannerfin shiner and striped bass). The Cooper River and its backwaters contain populations of bluefin killifish, striped bass and the federally endangered shortnose sturgeon.

Santee-Coastal Plain Ecobasin

The Santee-Coastal Plain Ecobasin originates in southeastern Clarendon County and encompasses portions of Williamsburg, Berkeley, Georgetown and Charleston Counties before terminating at the coast. The only major river within the ecobasin is the Santee River. The headwaters of the Santee originate in the Blue Ridge and Piedmont Ecoregions. The Santee River flows for approximately 81 miles through the coastal plain, receiving inputs from Echaw Creek and Wambaw Creek, until terminating at the Atlantic Ocean.

The ecobasin intersects 19 watersheds and encompasses 620 square miles. A large portion (169 square miles, 27 percent) of the land is protected by federal, state and private entities. The largest areas (147 square miles) of protected land are the Francis Marion National Forest and the Francis Marion National Forest Wilderness Area (18 square miles). Other significant protected areas include the Francis Marion National Forest Botanical and Zoological Area (1.5 square miles) and the Bennett's Bay Heritage Preserve (1 square mile). There are 572 miles of lotic habitat and 4.4 square miles of lentic habitats. There are no large impoundments within the ecobasin.

Pee Dee-Coastal Plain Ecobasin

The Pee Dee-Coastal Plain ecobasin is located in the northeast corner of the state and encompasses portions of Dillon, Lee, Horry, Florence, Marion, Sumter, Clarendon, Williamsburg, and Georgetown Counties. Several coastal rivers are located within the ecobasin, including the Black River, Lynches River, Pee Dee River, Little Pee Dee River, and Waccamaw River. The headwaters of the Black River originate in the southeastern plains. The Black River flows unimpounded through approximately 123 miles of the coastal plain before merging with the Pee Dee River at the coast. As the Black River flows through the coastal plain it picks up inputs from several major tributaries including Black Mingo Creek, Peters Creek, Cottage Creek, Lanes Creek and Six-mile Creek. The headwaters of the Lynches River originate in the piedmont of South Carolina and North Carolina. The Lynches flows unimpounded through approximately 77 miles of the coastal plain before merging with the Pee Dee River near Gilbert Crossroads, South Carolina. Major tributaries to the Lynches River in the coastal plain include Sparrow Swamp and Lake Swamp. The Pee Dee River originates in the southern portion of the North Carolina piedmont and southeastern plains and flows through about 89 miles of South Carolina's coastal plain before terminating at Winyah Bay. As the Pee Dee flows through the coastal plain, it picks up inputs from several significant tributaries, including Catfish Creek, Lynches River, Little Pee Dee River, Conch Creek and the Black River. The Little Pee Dee River originates in the southeastern plains of North Carolina and flows through approximately 74

miles of the South Carolina's southeastern plains before entering the coastal plain. Within the coastal plain, the Little Pee Dee River flows for about 65 miles, receiving input from the Lumber River before merging with the Pee Dee River. The Waccamaw River originates in the coastal plain of North Carolina and flows through approximately 104 miles of South Carolina's coastal plain before terminating at Winyah Bay. Within the ecobasin, the Waccamaw River picks up significant inputs from Buck Creek, Simpson Creek and Kingston Swamp.

The ecobasin intersects 50 watersheds and encompasses 3,492 square miles. Approximately 2.7 percent (95 square miles) of the ecobasin is protected by state, federal and private entities. A large portion (42.4 square miles) of this land is protected by the state and managed by the SCDNR as Natural Heritage Preserves. The preserves include the Little Pee Dee River Heritage Preserve (15.9 square miles), the Lewis Ocean Bay Heritage Preserve (14.4 square miles) and the Waccamaw River Heritage Preserve (8.7 square miles) as well as five smaller heritage preserves encompassing 3.3 square miles. Other significant protected areas include the Sandy Island Mitigation Site (12.3 square miles) and the Bucksport and Oliver Mitigation Site (11.5 square miles), managed by the South Carolina Department of Transportation as State Wildlife Reserves, and the Waccamaw National Wildlife Refuge (10.3 square miles) managed by the US Fish and Wildlife Service. Within the ecobasin, there are approximately 3,745 miles of lotic habitat and 18.3 square miles of lentic habitats. There are no major impoundments within the ecobasin.

Areas of primary conservation concern in the Pee Dee-Coastal Plain Ecobasin include the Lynches River and its tributaries in Lee, Florence and Sumter Counties; the Pee Dee River from its confluence with the Lynches River to Winyah Bay; and the upper Waccamaw River in Horry County. The Lynches River contains populations of "broadtail" madtom as well as several mussel species on South Carolina's Priority Species List (brook floater, creeper and notched rainbow). The Pee Dee River and its backwaters contain several fishes on the priority list including the "broadtail" madtom, robust redhorse, Carolina pygmy sunfish and federally endangered shortnose sturgeon. Several mussel species on the priority list are in the Pee Dee River, including the Waccamaw spike, yellow lampmussel, Roanoke slabshell and rayed pink fatmucket. The upper Waccamaw contains populations of Carolina pygmy sunfish and "broadtail" madtom and mussel species (Waccamaw spike and yellow lampmussel).

General Condition

Savannah–Coastal Plain Ecobasin

Water quality was impaired at seven of ten sites sampled by the SCDHEC. Aquatic life uses were not supported at two sites due to a lack of invertebrate diversity and low dissolved oxygen levels. Fish consumption advisories were listed for five sites due to mercury contamination. Fish consumption advisories have been issued for the Savannah River and Cypress Creek. None of the streams within the ecobasin is considered an outstanding resource water by SCDHEC.

ACE–Coastal Plain Ecobasin

Water quality was impaired at 72 of 115 sites (62 percent) sampled by SCDHEC. Aquatic life uses were not supported at 30 sites due to a lack of invertebrate diversity (13 sites), low

dissolved oxygen concentrations (7 sites), zinc excursions (5 sites), abnormal pH values (3 sites), high turbidity (1 site) and chromium excursions (1 site). Recreational uses were not supported at 23 sites primarily due to high concentrations of fecal coliform bacteria. Mercury excursions were found in the tissue of fish at 19 sites. Fish consumption advisories have been issued for nearly every major water body in the ecobasin including the North Fork Edisto River, South Fork Edisto River, mainstem Edisto River, Cooper River, East Fork Cooper River, Ashepoo River, Salkehatchie River, Little Salkehatchie River, Combahee River, Coosawhatchie River, New River, Black River, Ashley River, Four Hole Swamp, Wadboo Creek, Chessie Creek, Horseshoe Creek, Lake Moultrie and Goose Creek Reservoir.

Santee–Coastal Plain Ecobasin

Ten of 16 sites (62.5 percent) sampled by SCDHEC within the ecobasin were impaired. Aquatic life uses were not supported at two sites due to a lack of invertebrate diversity. Recreational uses were impaired at two sites due to the presence of high fecal coliform concentrations. Fish consumption advisories due to mercury contamination have been issued for the Diversion and Rediversion Canals, Santee River, South Santee River, North Santee River, Wambaw Creek and Wadmacon Creek.

Pee Dee–Coastal Plain Ecobasin

Water quality was impaired at 70 of 110 sites (64 percent) sampled by SCDHEC. Aquatic life uses were not supported at 23 sites due to low dissolved oxygen levels (11 sites), abnormal pH values (5 sites), copper contamination (3 sites), lack of invertebrate diversity (3 sites) and zinc contamination (1 site). Recreational uses were not supported at three sites due to the presence of high concentrations of fecal coliform bacteria. Due to high levels of mercury in fish tissue, SCDHEC has issued a fish consumption advisory for the entire length of every major river (Pocotaligo River, Black River, Black Mingo Creek, Lynches River, Pee Dee River, Little Pee Dee River, Lumber River, Waccamaw River) in the ecobasin.

Major Classifications

Wadeable Streams

Wadeable streams, as with the other ecoregions, are the dominant aquatic habitat in the coastal plain and provide a large portion of the habitat for aquatic animals on the priority species list. Wadeable streams are those with Strahler stream orders of 0 to 3; these are generally streams that can be waded comfortably throughout most of the year. These streams are often bordered with pond-like backwaters and swamps. Wadeable streams in the coastal plain are low gradient with sluggish flows. Although some of the larger streams may have moderate currents, they lack whitewater. In the moderate flowing areas, the substrate is chiefly clean shifting sand. With the absence of rocks in most streams, logs and debris jams provide habitat for aquatic fauna. In slow-flowing areas substrate is comprised of finer materials such as mud, clay, silt and fine detritus. Most coastal plain streams that receive ample sunlight are well vegetated with aquatic macrophytes. Coastal plain streams can contain turbid or clear water (whether stained or not). Generally those streams that originate in the piedmont and flow through the coastal plain are

turbid due to the heavy sediment load they carry and are termed “brownwater.” Streams that originate in the southeastern plains and/or coastal plain and are not turbid as a result of anthropogenic impacts are termed “blackwater” due to their tannin-stained waters.

Navigable Streams

Navigable streams are less common in the coastal plain, but provide habitat for many species on the priority list. These streams are generally defined as large enough to operate watercraft, if only a canoe and are usually too deep to be waded throughout most of the year. The Pee Dee River, Lynches River and Edisto River are examples of navigable streams in the coastal plain. These lazy meandering streams have substrates of mostly shifting sand in the flowing areas while finer materials (silt, clay and detritus) are deposited in the pools. As with the smaller streams in the ecobasin, the navigable streams that originate in the southeastern plains and/or coastal plain are also “blackwater,” stained by the decomposition of organic materials.

Carolina Bays

Carolina bays are common in the coastal plain. These shallow elliptical depressions of unknown origin, many of which contain water throughout the year. The waters contained in Carolina bays are highly acidic which limits the number of fish species. However, some sunfish, minnow, killifish and livebearer species may populate Carolina bays. These depressions may be important habitat for some rare crayfish species, as several have been observed in these formations. However, data on the crayfishes of Carolina bays is particularly lacking and more surveys are needed in order to determine the importance of these depressions as crayfish habitat.

Priority Species Associations

Common Name	Scientific Name	Ecobasin			
		ACE	Pee Dee	Santee	Savannah
Highest Priority					
Fishes					
Robust redhorse	<i>Moxostoma robustum</i>		X		X
Carolina pygmy sunfish	<i>Elassoma boehlkei</i>		X	X	
Bluebarred pygmy sunfish	<i>Elassoma okatie</i>				X
Savannah darter	<i>Etheostoma fricksium</i>	X			
Broadtail” madtom	<i>Noturus spp. (c.f. insignis)</i>	X	X		
Mussels					
Barrel floater	<i>Anodonta couperiana</i>	X			X
Waccamaw spike	<i>Elliptio waccamawensis</i>		X		
Yellow lampmussel	<i>Lampsilis cariosa</i>	X	X		X
Southern rainbow	<i>Villosa vibex</i>	X	X		
Crayfish					
A crayfish	<i>Procambarus echinatus</i>	X			

A crayfish	<i>Procambarus reflexus</i>				X
High Priority					

Fishes

Bannerfin shiner	<i>Notropis leedsi</i>	X			X
Blackbanded sunfish	<i>Enneacanthus chaetodon</i>	X	X	X	X

Mussels

Rayed pink fatmucket/ Eastern lampmussel	<i>Lampsilis splendida/radiata</i>	X	X		X
Roanoke slabshell	<i>Elliptio roanokensis</i>		X		
Eastern pondmussel	<i>Ligumia nasuta</i>		X		
Tidewater mucket	<i>Leptodea ochracea</i>		X		

Crayfish

Waccamaw crayfish	<i>Procambarus braswelli</i>		X		
Pee Dee Lotic crayfish	<i>Procambarus lepidodactylus</i>	X	X	X	
Sandhills crayfish	<i>Procambarus pearsei</i>		X		

Snails

Ridged lioplax	<i>Lioplax subcarinata</i>		X		
Buffalo pebblesnail	<i>Gillia altilis</i>		X		

Moderate Priority					
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Fishes

Florida gar	<i>Lepisosteus platyrhinchus</i>				X
Lowland shiner	<i>Pteronotropis stonei</i>	X	X	X	X
White catfish	<i>Ameiurus catus</i>	X	X	X	X
Flat bullhead	<i>Ameiurus platycephalus</i>	X	X	X	X
Bluefin killifish	<i>Lucania goodei</i>			X	
Banded killifish	<i>Fundulus diaphanus</i>		X		
Striped bass	<i>Morone saxatilis</i>	X	X	X	X
Pugnose minnow	<i>Opsopoeodus emiliae</i>	X			X
Mud sunfish	<i>Acantharchus pomotis</i>	X	X	X	X

Mussels

Eastern creekshell	<i>Villosa delumbis</i>	X	X		X
Carolina lance	<i>Elliptio angustata</i>	X	X		
Eastern elliptio	<i>Elliptio complanata</i>	X	X		X
Carolina slabshell	<i>Elliptio congaraea</i>	X	X		X
Variable spike	<i>Elliptio icterinacomplex</i>	X	X		X
Pod lance	<i>Elliptio folliculata</i>		X		
Atlantic spike	<i>Elliptio producta</i>		X		

Crayfish

Edisto crayfish	<i>Procambarus ancylus</i>	X	X	X	
A crayfish	<i>Procambarus barbatus</i>				X
Santee crayfish	<i>Procambarus blandingii</i>		X	X	
A crayfish	<i>Procambarus lunzi</i>			X	X
A crayfish	<i>Procambarus chacei</i>	X		X	X

A crayfish	<i>Procambarus enoplosternum</i>		X	X
A crayfish	<i>Procambarus hirsutus</i>	X		X
A crayfish	<i>Procambarus pubescens</i>			X
Snails				
An undescribed snail	<i>Physa</i> spp. "A"	X	X	

Region-wide Challenges

Challenges to conservation of aquatic fauna in the Coastal Plain Ecoregion are similar to other ecoregions in the state and primarily include impacts associated with impoundments, nonpoint source pollution, point source pollution, poorly planned development and introductions of non-native species. Increased population growth and the accompanying uncontrolled residential, commercial and industrial growth may be the greatest challenge to species and their habitats in this ecoregion, especially near the coast.

There is only one major impoundment (Lake Moultrie) in the coastal plain; however, dams still have a significant impact on aquatic resources within the ecoregion. There are roughly 176 dams permitted by SCDHEC, although numerous other unpermitted dams, such as those associated with farm ponds, also exist, impounding 152 miles of stream. The presence of dams results in a loss of connectivity and negatively affects aquatic biota both above and below the impoundment (Doeg and Koehn 1994; Kanehl et al. 1997; Tiemann et al. 2004). Impoundments negatively affect native aquatic fauna by direct loss of habitat through the conversion of lotic habitat to lentic habitat, which favors competitive and often predacious species like largemouth bass and other centrarchids. In addition, impoundments often negatively impact unimpounded reaches downstream by altering hydrologic and thermal regimes (Cushman 1985), modifying stream channel morphology, increasing erosion and sedimentation (Waters 1995), ultimately reducing suitable habitat for native aquatic fauna (Helfrich et al. 1999; Tiemann et al. 2004). Dams in the coastal plain like Pinopolis Dam also hinder the migrations of native anadromous fish including shad, striped bass and sturgeon to their historic spawning grounds in the piedmont.

Siltation resulting from clearing forests, tilling soils and channelization of coastal plain streams has altered stream morphology. Modern soil conservation practices and reduced channelization have reduced those impacts, but sedimentation from nonpoint and point sources remains a significant detriment to streams today. Ground disturbance from development, agriculture and silviculture are primary sources of erosion that lead to sedimentation in streams. When timber managers fail to follow best management practices (BMPs), significant siltation occurs. Stream bank erosion due to loss of riparian areas, livestock grazing and altered hydrology also contribute to sedimentation in streams. During the past century, many streams in the coastal plain were channelized to improve drainage of croplands. Channelized streams lead to increased erosion of cropland and increased sedimentation of the receiving streams (Etnier and Starnes 1993). The result of channelization changed many streams into straight shallow ditches with severely depressed populations of aquatic fauna.

Clearing hardwoods from bottomland and cypress swamps also threatens aquatic habitat in the coastal plain. In addition to increasing sedimentation and erosion, the loss of canopy results in increased water temperatures that will limit the amount of available habitat for some species like

striped bass. Timber companies, which have been proven to be good stewards of the land, are selling off large tracts of land, making floodplain timber more vulnerable to harvest by other owners.

Excessive contamination from nutrients and chemicals also negatively affect water quality within the ecoregion. Point source discharges from industrial, municipal and commercial sources add a variety of pollutants to receiving streams, rivers and lakes. In addition, contamination from nonpoint sources also negatively impacts water quality. Nationwide, pollution from agricultural sources is the greatest cause of impairment to streams and lakes (SCDHEC 2003). Statewide, the coastal plain has a modest amount of permitted discharges and concentrated animal feeding operations (CAFOs), 2.3 and 1.9 per 100 square miles respectively. However, those discharges and CAFOs are a significant threat to aquatic habitats. Water quality in the coastal plain was impaired at 63percent of the sites sampled by the SCDHEC, which is the highest impairment rate of the four ecoregions in the state. Recreational uses were impaired at nearly 11 percent of the sites sampled due to the presence of high concentrations of fecal coliform bacteria. Fecal coliform bacteria are present in the digestive tract of warm-blooded animals. Although the bacteria themselves are not generally harmful to humans, they do indicate that surface waters may contain disease-causing pathogens (SCDHEC). Twenty-three percent of streams sampled by SCDHEC within the ecoregion did not support aquatic life uses, indicating the streams do not possess sufficient water quality to maintain a balanced aquatic community of plants and animals. Mercury contamination is abundant in the coastal plain; this contamination indicates a serious threat not only to aquatic fauna but also to human health and recreational uses. Fish consumption advisories have been issued for nearly every major water body in the Coastal Plain. Nearly 30 percent of the sites sampled by SCDHEC were impaired due to mercury contamination in fish tissue, which is the highest impairment rate in the state.

Water quantity is also a problem in coastal plain streams. Water withdrawal for irrigation is a common practice in the ecoregion. During summer months, some streams are completely dewatered due to uncontrolled irrigation of croplands. Furthermore, many pond owners will close their drain structures during dry periods in an attempt to maintain esthetic water levels, thereby dewatering the stream below. With the rapidly increasing populations along the coast, demand for freshwater will increase dramatically and water withdrawal from streams and rivers as well as interbasin water transfers will be a serious threat to aquatic habitats and their natural communities.

Introductions of non-native species have had a significant impact on native aquatic fauna in the Coastal Plain Ecoregion. Buffalo (fish), common carp, flathead catfish and blue catfish are established in several drainages. Flathead catfish and blue catfish introductions probably pose the greatest direct risks to native fauna. Flathead catfish have been shown to prey on bullheads, darters, shad, suckers and sunfish. Severe declines in native species, particularly bullheads and sunfish, have been observed after the introductions of flathead catfish (Guire et al. 1984; Jenkins and Burkhead 1994; Bart et al. 1994). It is not well known what effects buffalo have on the native community, but it has been suggested that they may be a factor in the decline of some catostomids in the Pee Dee River (Wayne Starnes, pers. comm.). Common carp occur in every South Carolina drainage and are considered a pest, but their impact on native fauna is not well known. Common carp disrupt aquatic habitats by rooting around in the substrate, which uproots

aquatic plants and increases turbidity and siltation. Common carp have also been shown to prey on the eggs of other fish species.

The Asian clam, *Corbicula fluminea*, has been introduced and has widely spread throughout the United States, including South Carolina. The effects of *Corbicula* on native species are not particularly well understood. According to a review of the literature on interactions between *Corbicula* and native mussels (Dillon 2000), most field studies failed to find any significant negative effects on native mussels, although a few detected reductions in growth. Three invasive snail species (*Viviparus georgianus*, *V. purpureus*, and *Bellamya/Cipangopaludina japonica*) are present in Lakes Marion and Lake Moultrie; however, their impact on native fauna is not known.

The red swamp crayfish has been introduced to South Carolina and has been observed at several locations in the southeastern plains and coastal plain, but it is unclear how widespread it is in the state. The lack of survey work since its introduction and the difficulty distinguishing the red swamp crayfish from a native catfish have made it particularly difficult to determine the extent of its introduced range. In North Carolina, it has become established in all drainages in the coastal plain and eastern piedmont plateau and appears to have extirpated all the native crayfish at one location (Cooper 2003). Introduced crayfish are thought to be the biggest threat to native crayfish species (Lodge et al. 2000 a,b) and the risk to our native species is great if further introductions or extensive spread on non-indigenous crayfish occurs.

Sand mining operations have been initiated or are ongoing in the mainstem or riparian areas of many coastal plain rivers. Instream sand mining is a significant threat to aquatic resources within the ecoregion. Sand mining not only causes bank stability problems and loss of riparian habitat at the mining site but instream impacts as well by changing the physical and chemical habitat. Such impacts can negatively affect biological communities (Nelson 1993) and recreational uses (Hartfield 1993). Physical impacts on instream habitat include increasing bedload materials and turbidity, changing substrate type and stability and altering stream morphology (Nelson 1993). Physical habitat alterations associated with sand mining can adversely affect the biological community by impacting the reproduction and survival of fishes (Stuart 1953; Newport and Moyer 1974) and the distribution, composition and reproduction of other aquatic organisms (Buck 1956; Trautman 1957; Newport and Moyer 1974).

Savannah–Coastal Plain Ecobasin

Approximately 36 miles of stream within the ecobasin have been impounded. There are 15 dams permitted by SCDHEC within the ecobasin, none of which impound navigable streams. Numerous other dams not permitted by SCDHEC also occur in the ecobasin.

Point source pollution from within the ecobasin is not currently a large threat as there are only two active discharges permitted by SCDHEC: one municipal and one industrial. There are no active agricultural operations permitted by SCDHEC within the ecobasin.

There is little expected growth throughout the majority of the ecobasin. One area that may experience moderate growth is the area near the town of Hardeeville.

ACE–Coastal Plain Ecobasin

Approximately 73 miles of stream in the ecobasin have been impounded. There are 77 dams permitted by SCDHEC within the ecobasin. The majority of the impounded area is a result of Pinopolis Dam on the Cooper River that forms Lake Moultrie. The Pinopolis Dam has had a significant negative impact on the Cooper River below the dam. Currently, there is no continuous minimum flow for the Pinopolis Dam tailrace and aquatic habitats are frequently dewatered during low flows.

There is a moderate amount of industrial and agricultural activity within this ecobasin. There are 98 active discharges permitted by SCDHEC; of those active discharges 60 are industrial discharges, 26 are municipal discharges and 12 are community discharges. There are 87 CAFOs permitted by SCDHEC; the majority of those facilities are poultry farms (17 small, 21 medium and 10 large). Swine farms also contribute significantly to the total number of agricultural facilities with 21 facilities (11 small, 9 medium and 1 large). CAFOs are not a large threat to aquatic habitats overall, but may pose a significant threat to portions of the ecobasin. The vast majority (70 operations) of the agricultural facilities are located in the north-central portion of the ecobasin in the Edisto River basin, primarily in the Cattle Creek, Indian Field Swamp and Cowcastle Creek watersheds; CAFOs likely pose a significant threat in those watersheds.

There is little expected commercial, residential or industrial development throughout most of the northern portion of the ecobasin, although, a moderate amount of commercial and residential growth can be expected along the I-95 corridor and Lake Moultrie. In the middle and southern portion of this ecobasin, uncontrolled residential, commercial and (potentially) industrial growth is a serious threat to aquatic habitats. Many areas are experiencing high levels of commercial and residential development as spillover from Charleston. The area between Cottageville and Charleston along the US 17 corridor is one of the fastest growing areas in the state. Other areas where large-scale residential and commercial development is expected include the towns of Ridgeland and Bluffton.

Water quantity will likely be a future challenge to the aquatic habitats of the ACE-Coastal Plain Ecobasin. Currently an interbasin water transfer exists on the Edisto River, where water is removed to support the town of Hannah WTP and the large industries along the Cooper River. Increased industrial growth along the Cooper River and the expected large scale residential growth in the town of Hannah and of North Charleston will exacerbate water quantity issues.

Santee–Coastal Plain Ecobasin

There are no large impoundments in this ecobasin; roughly 6.8 miles of stream are impounded. There are 11 dams permitted by SCDHEC within the ecobasin, although numerous unpermitted dams also occur in the ecobasin. Aquatic habitat in the Santee River is negatively influenced by the operation of the Santee Dam upstream.

There are 19 active discharges permitted by SCDHEC within this ecobasin. Of those active discharges, 16 are from industrial sources and three are from municipal sources. There is only one active agricultural operation (medium sized poultry farm) within the ecobasin.

Development in this ecobasin is not a major concern, but moderate growth is expected on the south side of Lake Marion and in the vicinity of the town of St. Stephen.

While much of the Santee River flood plain is public land, a substantial amount is privately held; removal of tree canopy poses a threat to aquatic habitats. The increasing trend towards conversion of upland agrarian land use to smaller home sites has the potential to negatively change hydrology, nutrient loading and sedimentation. A growing beaver population is also likely to affect streams in this ecobasin, changing habitat that favors warm lentic adapted species over those that favor cooler lotic habitats.

Pee Dee–Coastal Plain Ecobasin

Approximately 36.5 miles of streams are impounded within this ecobasin. There are 73 dams permitted by SCDHEC, most of which occur on small tributary streams.

There are a moderate number of point source discharges within the ecobasin with 76 active discharges permitted by SCDHEC. Of those active discharges, 38 are from municipal sources, 31 are from industrial sources and seven are from community sources. There are 71 active agricultural facilities within the ecobasin, the majority (48) of which are swine farms (27 small farms, 14 medium farms and 7 large farms). Poultry and turkey farms are also prevalent within the ecobasin, accounting for 20 operations (2 small farms, 15 medium farms and 3 large farms).

Increased population growth accompanied by unplanned and uncontrolled industrial, residential and commercial development is a serious threat to aquatic resources in the Pee Dee-Coastal Plain Ecobasin. The majority of the growth and the greatest threat to aquatic resources is expected to occur along the eastern portion of the ecobasin near the coast. Increased commercial and residential growth is expected along several highway corridors: US 52 connecting Florence to Charleston and US 378 and US Hwy 501 connecting I-95 to Myrtle Beach. The construction of a proposed new interstate highway (I-73) running from Michigan to Myrtle Beach, South Carolina has the potential significantly impact the aquatic resources of this ecobasin. The final route for I-73 has not been established; therefore, the exact location for impacts is unknown. Residential and resort communities along the “Grand Strand” will strain the already significantly degraded aquatic habitats. When developed, the largest tract of currently undeveloped land (Buist Tract) in Horry County is expected to accommodate 10,000 new residents and 11 new golf courses.