Map Unit Properties Table: Congaree National Park

Colored map units are mapped within Congaree National Park. **Bold text** refers to report sections.

Age	Map Unit (Symbol)	Geologic Description	Geologic Features and Processes	Geologic Issues	Geologic History
QUATERNARY (Holocene)	Moved earth (Qme)	Man-made construction material. Includes dams, causeways, embankments, dikes, roads, railroads, and other fill.	Man-made (not geologic) features related to agriculture, urbanization, logging, and other earth moving activities.	**Moved Earth** Construction projects modify the flow of surface water.	**Phase VII: Holocene Anthropogenic Impacts** Human alterations to the landscape.
QUATERNARY (Holocene)	Freshwater marsh and swamp deposits (Qfw)	Black, silty clay and peat deposited in stream valleys. Includes silty, clayey, and organic-rich deposits accumulating in man-made drainage ditches. Likely present in the park, although at extents too limited to map at the source map scale.	None documented.	None documented.	**Phase VI: Pleistocene–Holocene Landscape** Development of marsh and swamp deposits. Sand deposited in lakebeds and savannahs.
QUATERNARY (Pleistocene–Holocene)	Sandhills lakebed deposits (Qslk)	White to light-gray quartz sand and gray to black quartz sand in lakebeds or savannahs. Contains clay. Deposits are surrounded by aeolian sand.			
QUATERNARY (Pleistocene–Holocene)	Carolina bay deposits (Qcb)	Light-gray to black quartz sand and organic-rich peat deposits. Contains clay. Coarser sand and granules rim the bays. Agriculture masks many bays, but their form is recognizable by their topographic depression, orientation, and soil-moisture conditions.	**Carolina Bays** Shallow, elliptical depressions.	Bays are important seasonal depressional wetlands, but the vast majority of bays have been erased by land development. This unit is not mapped in the park, and thus poses no significant resource management issue for park staff.	**Phase VI: Pleistocene–Holocene Landscape** Charcoal fragments indicate the occurrence of fire events during dry periods, whereas peat formed under wet conditions. Most bays began to form during the Wisconsin glaciation (85,000–11,000 years ago), but some may have started to form 100,000–200,000 years ago.
QUATERNARY (Pleistocene–Holocene)	Eolian sand (Qe)	White to light-tan, moderately sorted, fine- to very coarse-grained quartz sand with negligible clay. In central Fort Motte quadrangle.	None documented.	None documented.	**Phase VI: Pleistocene–Holocene Landscape** Aeolian sand was deposited on the Coastal Plain.
QUATERNARY (Pleistocene–Holocene)	Eolian sand of East Bethel (Qeeb)	Same lithology as **Qe**. Overlies the Duplin Formation (**Td**). Up to 6 m (20 ft) thick.			
QUATERNARY (Pleistocene–Holocene)	Eolian sand of Manchester State Forest (Qem)	Same lithology as **Qe**. Overlies **Td** and is overlain by modern alluvium and **Qfw**. Up to 11 m (35 ft) thick. Ranges from 3 to 6 m (10–20 ft) thick in southeastern Poinsett Park quadrangle.			
QUATERNARY (Pleistocene–Holocene)	Alluvium, Congaree River floodplain (Qacf)	Light-tan to dark-brown, fine- to very coarse-grained sand, silt, clay, and organic-rich peat deposits. Similar in composition and texture to **Qasf** and **Qawf**.	**Congaree River Floodplain Complex** Consists of a complex array of intra-floodplain terraces, meander belts, alluvial fans, dune fields, and rimswamps. Floodplain may also contain infilled abandoned channels, floodplain streams, natural levee deposits, and back swamps. **Congaree River Channel** The Congaree River meanders across **Qacf**, forming sinuous loops and curves. **Tributary Channel Features** Tributaries to the Congaree River flow across **Qacf**. Fluvial processes and features are similar to those associated with the Congaree River. **Rimswamps** Seepage wetlands found in units **Qacf** and **Qawf**. **Oxbow Lakes** Cutoff meander loop that fills with water and sediment. Weston Lake and Devils Elbow are oxbow lakes.	**Flooding** About 10 floods occur annually in the park. Floods may inundate boardwalks, but they also provide necessary nutrients and water to floodplain habitats. **Climate Change** Global climate change is expected to increase the frequency and intensity of drought in South Carolina, which may impact groundwater flow. Flooding may increase due to increased hurricane activity. **Groundwater Hydrology** Groundwater is critical for maintaining the park's wetlands, oxbow lakes, and rimswamps. **Hurricanes** Hurricanes are potential threats to the landscape, sediment, vegetation, and infrastructure of the park. **Earthquakes** The floodplain lies in an area with a low potential for earthquake-caused liquefaction.	**Phase VI: Pleistocene–Holocene Landscape** Landforms in these floodplains represent varied environmental conditions that existed from the Late Pleistocene to the present.
QUATERNARY (Pleistocene–Holocene)	Alluvium, Wateree River floodplain (Qawf)	Fine- to very coarse-grained, light-tan to dark-brown sand, silt, clay, and organic-rich peat deposits. Alluvium is 20 m (66 ft) thick in drill hole 43-167 and overlies a stiff gray Cretaceous clay.			
QUATERNARY (Pleistocene–Holocene)	Alluvium, Santee River floodplain (Qasf)	Lithology similar to **Qacf** and **Qawf**. The Santee River floodplain begins at the confluence of the Congaree and Wateree rivers, which shifts with flooding events.	None documented.	None documented.	**Phase VI: Pleistocene–Holocene Landscape** Late Pleistocene dates for similar tributaries in the Savannah River Valley are assumed to be applicable in the Congaree River Valley.

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Age	Map Unit (Symbol)	Geologic Description	Geologic Features and Processes	Geologic Issues	Geologic History
QUATERNARY (Pleistocene–Holocene)	Alluvium, tributary valleys (Qatv)	Small stream valleys containing saturated brown, red, and black sand and clay. Active streambeds contain sand, gravel, and cobbles. May include a series of 2–3 moderately preserved fluvial terraces.	**Tributary Channel Features** Tributaries to the Congaree River flow across **Qacf**. Fluvial processes and features are similar to those associated with the Congaree River. Tributary channel beds primarily contain coarse, recycled Pliocene–Pleistocene sand transported from the terrace complex.	**Flooding** About 10 floods occur annually in the park. During floods events the lower portions of tributary channels may receive water, sediment, and coarse woody debris from the Congaree River. Floods may inundate microterraces. **Climate Change** Global climate change is expected to increase drought in South Carolina, which may impact groundwater flow. Flooding may increase due to increased hurricane activity. **Groundwater Hydrology** Groundwater is critical for maintaining the park's wetlands, oxbow lakes, and rimswamps. **Hurricanes** Hurricanes are potential threats to the landscape, sediment, vegetation, and infrastructure of the park.	**Phase VI: Pleistocene–Holocene Landscape** Late Pleistocene dates for similar tributaries in the Savannah River Valley are assumed to be applicable in the Congaree River Valley.
	Alluvium, tributary valley microterraces (Qatt)	Blonde to red-brown quartz sand with abundant heavy minerals.	**Congaree River Floodplain Complex** Transition from the Congaree River Floodplain Complex to the Congaree River Valley Terrace Complex. Small, scattered, fragmentary steps between active, swampy tributary valleys and the true upland terrace surface.		**Phase VI: Pleistocene–Holocene Landscape** These features may reflect post–18th century changes in hydrology and sediment supply due to land use, Holocene climate changes, or abandoned, erosional benches, rather than constructional terraces.
	Alluvial fan deposits (Qaf, Qaf1, Qaf2) **Qaf2** is mapped in the park.	**Qaf**: Varicolored, poorly sorted, fine- to very coarse-grained speckled sand with local red, micaceous, silty clay lenses. Up to 5 m (17 ft) thick. **Qaf1**: Fan deposits.	**Alluvial Fans** In the Saylors Lake quadrangle, at least two fining-upward sequences suggest lobe switching.	**Flooding** Floods may inundate subtle alluvial fans. **Climate Change** Flooding may increase due to increased hurricane activity resulting from global climate change. **Hurricanes** Hurricanes are potential threats to the landscape, sediment, vegetation, and infrastructure of the park.	**Phase VI: Pleistocene–Holocene Landscape** These fan deposits are similar to robust fans in the lower Mississippi River Valley.
		Qaf2: Fan deposits adjacent to McKenzie Creek in Wateree quadrangle. Up to 1.2 m (4 ft) thick	**Alluvial Fans** Upper fans on Griffin's and McKenzie creeks.		**Phase VI: Pleistocene–Holocene Landscape** Approximately 8,500–8,000 years ago, the generally dry conditions of the Coastal Plain began to shift toward a wetter landscape. Wetlands expanded and shallow depressions flooded. The alluvial fan complex in the Congaree River floodplain (**Qaf**) may have formed at this time.
QUATERNARY (Upper Pleistocene)	Dune complexes (Qd)	Brown, well-sorted sand with locally abundant heavy minerals and very little clay. Consists of three sand dune complexes (Green Hill Mound, Muller's Barn Ridge, and Solomon Island) within **Qacf**.	Vegetated mounds of sand, <9 m (<30 ft) high. The dunes tower above the swampy floodplain.	None documented.	**Phase VI: Pleistocene–Holocene Landscape** Dunes probably formed 15,000–30,000 years ago, although some may be as old as 80,000 years.
	Packs Landing beds (Qpl)	Tannish-orange to light-gray, medium-grained quartz sand and pebbles. Subordinate brown to gray cohesive clay matrix. Beds are 5–11 m (16–37 ft) thick in the subsurface. Unconformably overlie **Ksl** and **Tls** in the Lone Star quadrangle.	None documented.		**Phase VI: Pleistocene–Holocene Landscape** Alluvium of an ancient Santee River terrace was deposited approximately 29,720–23,390 years before present.
QUATERNARY (Pleistocene)	Congaree River Valley Terrace Complex: terraces 1–11b (Qt1–Qt11b)	Series of estuarine to fluvial deposits that are Pliocene (**Tt12**–**Tt13**) to recent (**Qt1**–**Qt11b**) in age. Multiple sequences of white to pink, massive, poorly to moderately sorted, medium- to very coarse-grained sand with interstitial clay grading upward into red clay and sandy clay. Gravel is common at the base, followed by a sheet of sand. Local relief is up to 4.6 m (15 ft). Many younger terraces are concentrated in the lowermost valley. **Qt2**, **Qt3**, **Qt6**, and **Qt8** have been mapped in the park.	**Congaree River Valley Terrace Complex** Fourteen terrace surfaces (the current floodplain is terrace 0). Alluvial, colluvial, aeolian, and groundwater processes have modified terrace surfaces and scarps. Terraces are complex features of various sizes that developed at different times.	**Hurricanes** Hurricanes are potential threats to the landscape, sediment, vegetation, and infrastructure of the park. **Climate Change** Destructive potential of Atlantic hurricanes is expected to increase.	**Phase VI: Pleistocene–Holocene Landscape** Tectonic tilting of the Coastal Plain caused the deflection of rivers to the southeast, generating asymmetrical valleys. The Congaree River incised the Congaree River Valley to produce the terrace complex.
	Wateree River Valley Terrace Complex: terrace 1 (Qtw1, Qtw2)	At least two fragmentary terraces in Wateree River Valley. **Qtw2**: younger Wateree River Valley terraces. **Qtw1**: older Wateree River Valley terraces.	General character and architecture of individual terrace deposits are similar to those in the Congaree River Valley.	None documented.	**Phase VI: Pleistocene–Holocene Landscape** Tilting of the Coastal Plain caused the deflection of rivers to the southeast, generating asymmetrical valleys. The Wateree River incised the Wateree River Valley to produce the terrace complex.
QUATERNARY (Lower Pleistocene)	Wicomico Formation Toney Bay Member (Qwtb)	Varicolored, mottled, partly laminated, medium- to coarse-grained quartz sand in a silt to clay matrix. Layer of coarse-grained quartz sand and pebbles at the base. Unconformably overlies **Tls**, and abuts and unconformably terminates **Qm**. Unconformably overlain by **Qpl**, modern alluvium, and **Qfw**.	None documented.		**Phase V: Pliocene–Pleistocene Formation of the Orangeburg Scarp and Middle Coastal Plain Terraces** The Pleistocene Coastal Plain was cooler and drier than it is today. A braided stream system dominated the Coastal Plain during the Pleistocene. Terraces formed.

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Age	Map Unit (Symbol)	Geologic Description	Geologic Features and Processes	Geologic Issues	Geologic History
QUATERNARY (Lower Pleistocene)	Fluvial terrace deposits of Halfway Swamp (Qhs)	Varicolored quartz sand; reddish-orange, orange, and tan sandy conglomerate; and brown and gray, sandy clay matrix. Conglomerate is at or near the bases of the deposits. Maximum known thickness is 8.5 m (28 ft). The deposits unconformably overlie **Twh** and **Tc** and are truncated by modern alluvium.	None documented.	None documented.	**Phase V: Pliocene–Pleistocene Formation of the Orangeburg Scarp and Middle Coastal Plain Terraces** The Pleistocene Coastal Plain was cooler and drier than it is today. A braided stream system dominated the Coastal Plain during the Pleistocene. Terraces formed.
QUATERNARY (Lower Pleistocene)	Terrace sediments of Low Falls Landing (Qlf)	Varicolored, cohesive quartz sand, mixed quartz sand and clay, quartz-pebble to feldspar-pebble conglomerate, and minor stiff clay. Unit is more than 3 m (10 ft) thick by the parking lot at Low Falls Landing. The terrace sediments unconformably overlie **Tls**, abut and unconformably terminate **Td**, and are overlain by modern alluvium and **Qfw**.	The Low Falls terrace is a fluvial terrace deposited by Santee River.		
QUATERNARY (Lower Pleistocene)	Marietta unit (Qm)	Varicolored, medium- to very coarse-grained quartz sand with minor amounts of heavy minerals and clay matrix. Abuts **Td** and overlies **Twh** and **Tls**. **Qm** is exposed in a narrow terrace in southeastern Lone Star quadrangle.	None documented.		**Phase V: Pliocene–Pleistocene Formation of the Orangeburg Scarp and Middle Coastal Plain Terraces** Sea level fluctuated throughout the Neogene, causing the shoreline to advance (transgress) and retreat (regress) onto the Coastal Plain. When sea level fell, rivers incised the Coastal Plain, developing the Congaree River Valley Terrace Complex. **Qm** was deposited during a marine transgression.
NEOGENE (Pliocene)	Congaree River Valley Terrace Complex: terraces 12, 13 (Tt12, Tt13)	Terraces 12 and 13 of the Congaree River Valley Terrace Complex are the same as those described above (**Qt1**–**Qt11b**).	**Congaree River Valley Terrace Complex** Fourteen terrace surfaces (the current floodplain is terrace 0). Alluvial, colluvial, aeolian, and groundwater processes have modified terrace surfaces and scarps. Terraces are complex features of various sizes that developed at different times.		
NEOGENE (Pliocene)	Duplin Formation: Duplin Formation (Td)	Directly correlated with **Tt12** and **Tt13**, and bounded upsection by the Orangeburg Scarp, one of the best-preserved scarps in the Coastal Plain and the inland limit of the Middle Coastal Plain.	**Paleontological Resources** Outside of the park, fossils of foraminifera, corals, bryozoans, gastropods, bivalves, scaphopods, chitons, barnacles, ostracodes, echinoids, sharks, reptiles, whales, and terrestrial mammals have been discovered in the Duplin Formation.		**Phase V: Pliocene–Pleistocene Formation of the Orangeburg Scarp and Middle Coastal Plain Terraces** Sea level rose in the early Pliocene, and estuaries formed at the mouths of rivers. **Td** represents deposition in an estuary that formed at an oblique angle to the northeast–southwest-trending Orangeburg Scarp.
NEOGENE (Pliocene)	Duplin Formation: Upper part (Tdu)	Red, orange, brown, and yellow, medium-grained quartz sand, quartz granules, and local interstitial clay. Contact with beds of **Tdl** is gradational. Upper contact is abrupt. Overlain by **Qe**, **Qfw**, **Qcb**, **Qm**, or **Qlf**.			
NEOGENE (Pliocene)	Duplin Formation: Lower part (Tdl)	Moderately cohesive, dark gray-green, fossiliferous, moderately calcareous clay with abundant shell fragments. May also have well-sorted quartz sand. Overlies **Tls**, **Twh**, or **Todb** in drill holes.			
NEOGENE (Miocene)	Altamaha Formation (Tal)	Red to orange, weathered, heterogeneous, poorly sorted, coarse-grained sand and gravel with abundant interstitial clay and local quartz cobbles. Sand-sized white clay clasts are common and locally give this unit a speckled appearance.	None documented.		**Phase IV: Late Eocene to Miocene Landscape** Sea level fluctuated throughout the Neogene, causing the shoreline to advance (transgress) and retreat (regress) onto the Coastal Plain. Sea level fell during deposition of **Tal**, which represents fluvial conglomerates deposited by braided systems on the Coastal Plain.
PALEOGENE (Eocene)	Tobacco Road Sand (Ttr)	Red, orange, brown, moderately to poorly sorted, fine- to medium-grained, dominantly quartz sand. Pebbles are commonly found at the base. Maximum thickness is approximately 4.9 m (16 ft).			**Phase IV: Late Eocene to Miocene Landscape** Sea level fluctuated throughout the Paleogene, causing the shoreline to advance (transgress) and retreat (regress) onto the Coastal Plain. **Ttr**, **Tdb**, and **Todb** were deposited in marginal marine coastal environments. **Ttr**: Deposited in a nearshore to littoral marine environment. **Tdb**: Represents a transgressive, nearshore shelf deposit. **Todb**: Considered to be a shallow marine deposit.
PALEOGENE (Eocene)	Dry Branch Formation (Tdb)	Orange, red, brown, moderately well-sorted, fine- to coarse-grained quartz sand. Rare blue quartz and garnet. Interstitial clay varies from rare to abundant. Very coarse sand and pebbles at the lower contact. Maximum thickness is approximately 4.9 m (16 ft), but thickens to 16 m (52 ft) in Georgia.			
PALEOGENE (Eocene)	Orangeburg District bed (Todb)	Red, orange, yellow sand and clay. Quartz grains in clayey sand beds are poorly sorted with granules and scattered pebbles. Contains dark heavy minerals and muscovite flakes that impart a sheen to the smeared sediment. Molluscan fossils occur locally.			

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Age	Map Unit (Symbol)	Geologic Description	Geologic Features and Processes	Geologic Issues	Geologic History
PALEOGENE (Eocene)	Santee Limestone (Ts)	Cream to light-tan, moderately indurated, microfossiliferous lime mudstone to wackestone and packstone. Contains the fossil oyster *Cubitostrea sellaeformis* and associated fossils.	None documented.	None documented.	**Phase III: Upper Cretaceous to Middle Eocene Growth of the Coastal Plain** Sea level fluctuated throughout the Paleogene, causing the shoreline to advance (transgress) and retreat (regress) onto the Coastal Plain. In the middle Eocene, a transgression spread marine carbonate and clastic sediments across the Coastal Plain. **Ts** accumulated in a shallow marine environment. **Twh** was deposited below low tide. **Tc** was deposited on a marine shelf.
	Warley Hill Formation (Twh)	Olive-green (fresh) to orange, pale-green, red to dark-brown (weathered), stiff, clayey, fine- to coarse-grained quartz sand. Some clay beds. Includes glauconite pellets and rare occurrences of shark teeth. Color differences are due to the weathering of glauconite. Averages 4.0 m (13 ft) thick.	Black, phosphatic shark teeth. Dark-green glauconite pellets (glauconite occurs only in marine environments).		
	Congaree Formation (Tc)	Varicolored, loose to moderately cohesive, medium-grained quartz sand with local lenses of glauconitic sand, interstitial clay, granules, and weak silica and carbonate cement. Lower part may have burrowed to laminated green claystone with the molluscan bivalve *Anodontia augustana*. The most obvious lithologic contact in the area is the lower contact with the waxy black clay of **Tls.** Incised channels in **Tc** are several meters deep and contain sand, clay, and small [2–3 mm (0.08–0.1 in)] bivalves.	**Southern Bluffs** Upper unit of the strata exposed in the bluffs along the Congaree River. No fossil is identifiable near the park, but the large molluscan bivalve *Anodontia augustana* occurs in parts of Calhoun County, South Carolina, and Alabama. **Paleontological Resources** Microfossils and shell fragments.	**Erosion of the Southern Bluffs** The Congaree River erodes the southern bluffs at an approximate rate of 2.46 m (8.07 ft)/1,000 years. Bluff erosion is an episodic process that includes hillslope processes, river erosion, and slope movement (mass wasting).	
PALEOGENE (Paleocene)	Lang Syne Formation (Tls)	Extremely variable in color (black, red, orange, gray, white, buff, brown) and lithology. Ranges from thin-bedded clay and sand to massive claystone and iron-oxide cemented sandstone. Local trace fossils and silicified shell fragments ("Buyck's Bluff Chert"). Capped by a distinct, cohesive, plastic, waxy, black clay referred to as the "Tavern Creek bed".	**Southern Bluffs** Exposed in the bluffs along the Congaree River. "Buyck's (pronounced 'bikes') Bluff Chert" contains abundant bivalves and turritellid gastropods and was used for projectile points by prehistoric people. Some sand beds contain clay-lined burrows. **Paleontological Resources** Microfossils (palynomorphs).	**Erosion of the Southern Bluffs** The Congaree River erodes the southern bluffs at an approximate rate of 2.46 m (8.07 ft)/1,000 years. Bluff erosion is an episodic process that includes hillslope processes, river erosion, and slope movement (mass wasting). **Potential Mining Impacts** Fuller's earth was mined from **Tls**. Potential impacts on the park are unknown.	**Phase III: Upper Cretaceous to Middle Eocene Growth of the Coastal Plain** Sea level fluctuated throughout the Paleogene and Neogene, causing the shoreline to advance (transgress) and retreat (regress) onto the Coastal Plain. **Tls** represents a lower delta-plain depositional environment. Palynological analysis of black clay samples indicated Late Paleocene (Thanetian) and Early Paleocene (Danian) ages.
CRETACEOUS (Late)	Sawdust Landing Formation (Ksl)	Gray, cream, and orange interbedded sand, conglomerate, and clay. Capped by a distinct, stiff, cohesive, varicolored clay with abundant granules.	**Southern Bluffs** Exposed in the bluffs along the Congaree River. Cross-bedded sand. The clay is a secondary matrix and consists of pale-green illite and smectite (in the upper part), gray to white kaolin, and abundant accessory minerals. **Paleontological Resources** Microfossils (palynomorphs).	**Erosion of the Southern Bluffs** The Congaree River erodes the southern bluffs at an approximate rate of 2.46 m (8.07 ft)/1,000 years. Bluff erosion is an episodic process that includes hillslope processes, river erosion, and slope movement (mass wasting).	**Phase III: Upper Cretaceous to Middle Eocene Growth of the Coastal Plain** By the Late Cretaceous, the Coastal Plain contained fluvial, deltaic, and open-shelf depositional environments. Episodic transgressions and regressions caused the coastline to fluctuate throughout the Upper Cretaceous and into the Paleogene and Neogene. The Suwannee Trough separates South Carolina and Georgia from the offshore continental shelf. **Ksl**: Interpreted as an upper delta plain deposit. **Kus**: Reflects marginal to shallow marine environments and may be correlative with the Cape Fear Formation or the Black Creek Group.
	Upper Cretaceous, undifferentiated (Kus)	White, purple, and red highly weathered clay, sandy clay, clayey sand, sand, and conglomerates with local iron oxide cement.	**Southern Bluffs** Exposed in the bluffs along the Congaree River. Sedimentary structures include ripple marks, cross beds, parallel laminations, and stream channels. Iron oxide–cemented sandstone forms "pipes" at the base of the bluffs and is attributed to recent groundwater/surface water interactions.		