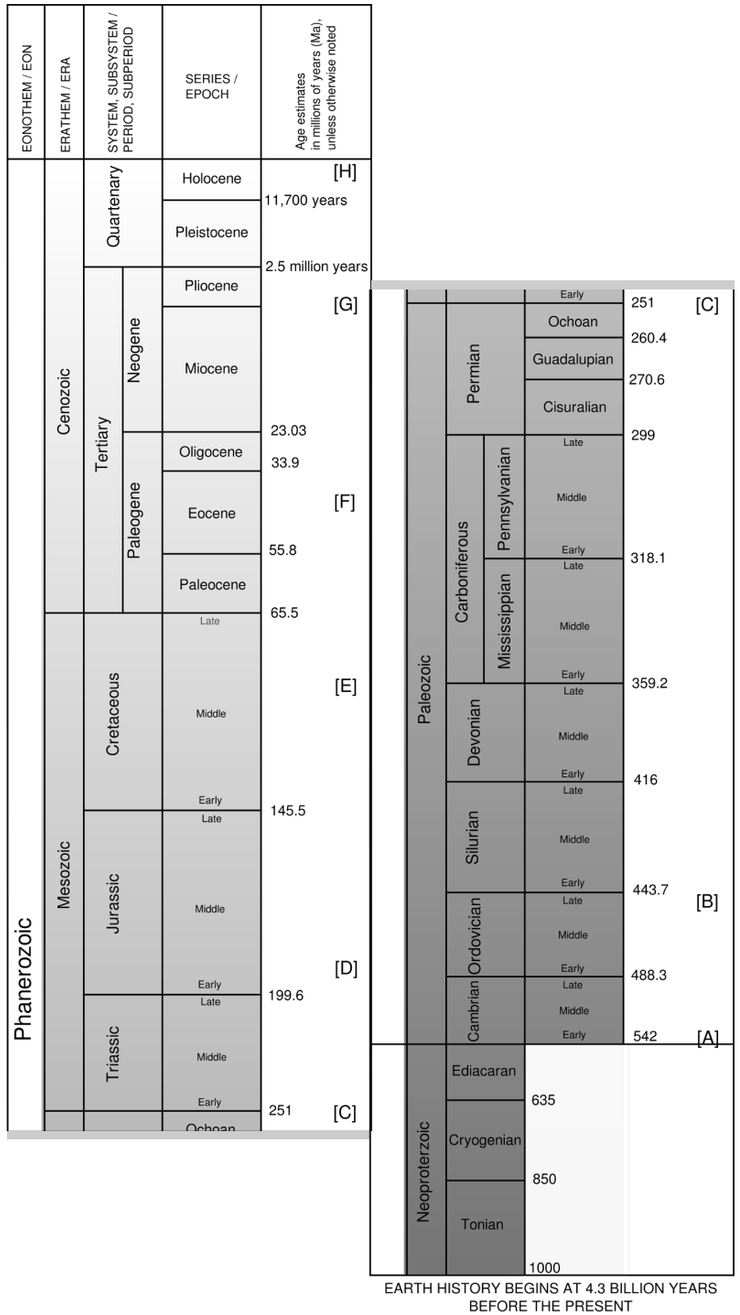
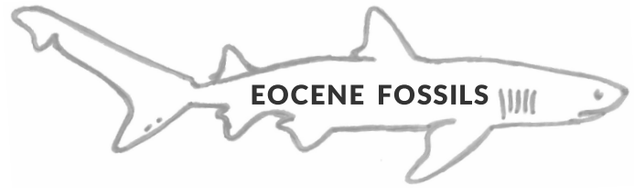
FIG. 4 - GEOLOGIC TIME SCALE



EARTH HISTORY BEGINS AT 4.3 BILLION YEARS BEFORE THE PRESENT

FIG. 5



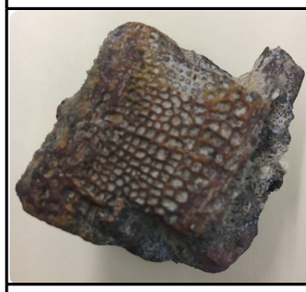
Fossil specimens from the Sandhills

Shark tooth, *Abdounia* *Pecten* Fish vertebrae

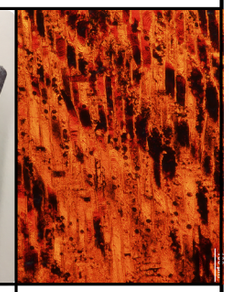
Reference Eocene fossils for comparison

CRETACEOUS FOSSILS

Petrified Conifer Wood found in the Sandhills
Possibly *Cupressaceae* (an ancient juniper)



Hand sample 2x3"



Microscope slide of wood structure

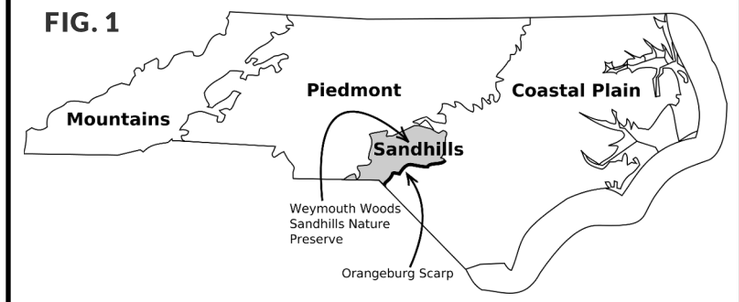
Ancient juniper needles like these were likely eaten by herbivorous dinosaurs in this area

PREPARED BY BOB GANIS & EMILY ROLLAND, JULY 2018
WITH ASSISTANCE FROM HANNAH ROLLAND & NANCY WILLIAMSON
FUNDED BY THE SANDHILLS NATURAL HISTORY SOCIETY

GEOLOGY & FOSSILS OF WEYMOUTH WOODS & THE SANDHILLS

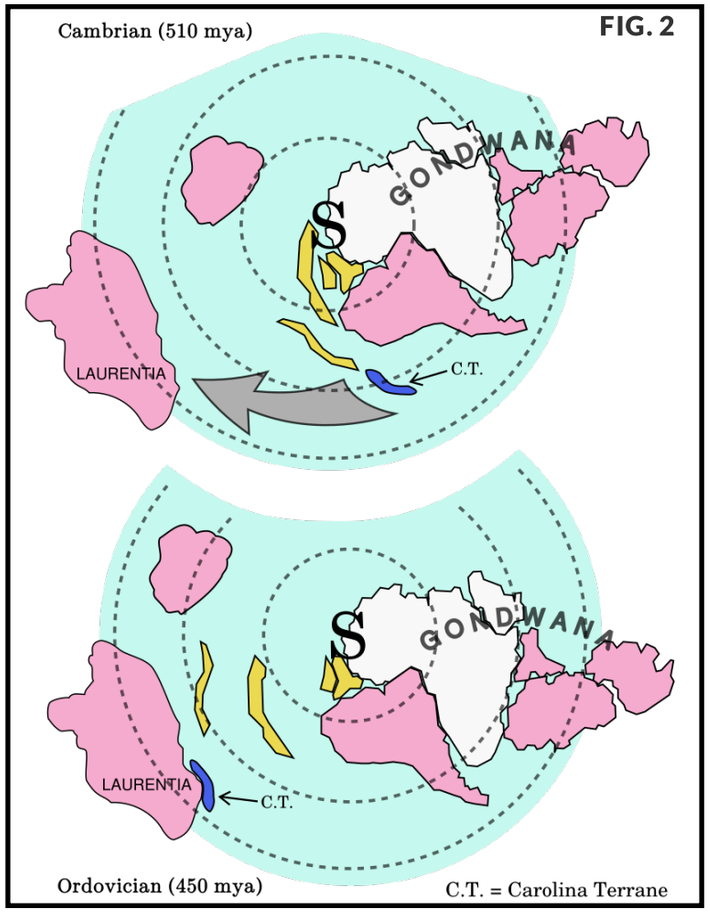
As you stroll about the park, you will notice low rolling hills covered with loose sand that defines the Sandhills region. Beneath the sand is an orange to yellow-reddish compact clayey-sand strata (layer) that underpins the hilly topography. This brochure will discuss the 650 million year geologic history of the park, from its oldest bedrock buried at depth to the geologically young sand layers at the surface. Time events discussed in the text are indicated with a capital letter in brackets, which can be referenced to the Geologic Time Scale (Fig. 4). A cross-section illustrates the geologic formations at the park (Fig. 3).

FIG. 1



Bedrock

The geologic story of the park begins with the bedrock that lies several hundred feet below the loose sand at the surface. This bedrock is composed of volcanic and sedimentary formations of the Carolina Terrane, which formed during the Precambrian and earliest Cambrian Periods, about 650 to 530 million years ago (mya) [A], at the margin of the super-continent Gondwana. From there, it moved to proto-North America (Laurentia) via plate tectonic movement, about 450 mya, during the Ordovician Period [B] (Fig. 2). This formed a vast mountain range. The



modified after Pollock J. et al., 2011, A paleogeographical review of the peri-Gondwannan realm of the Appalachian orogen, Canadian Journal of Earth Sciences, v.49, p. 259-288, fig. 6

Carolina Terrane was again subjected to uplift and mountain building during the plate tectonics collision of Gondwana and proto-North America. That formed the Super-continent Pangea and the Appalachian Mountains at about 252 mya, at the end of the Paleozoic Era [C]. All of this tectonic activity left the bedrock in a highly deformed and metamorphic condition from great heat and pressure.

Pangea eventually split apart in several stages, as the Carolina Terrane eroded down [D]. Eventually, Gondwana (now parts of Africa, South America and Euro–Asia) split away, forming the Atlantic Ocean. Today the remnants of the once Alpine-scale mountains of the Carolina Terrane are the much reduced Uwharrie 'Mountains' in the Piedmont Province of North Carolina west of the Sandhills.

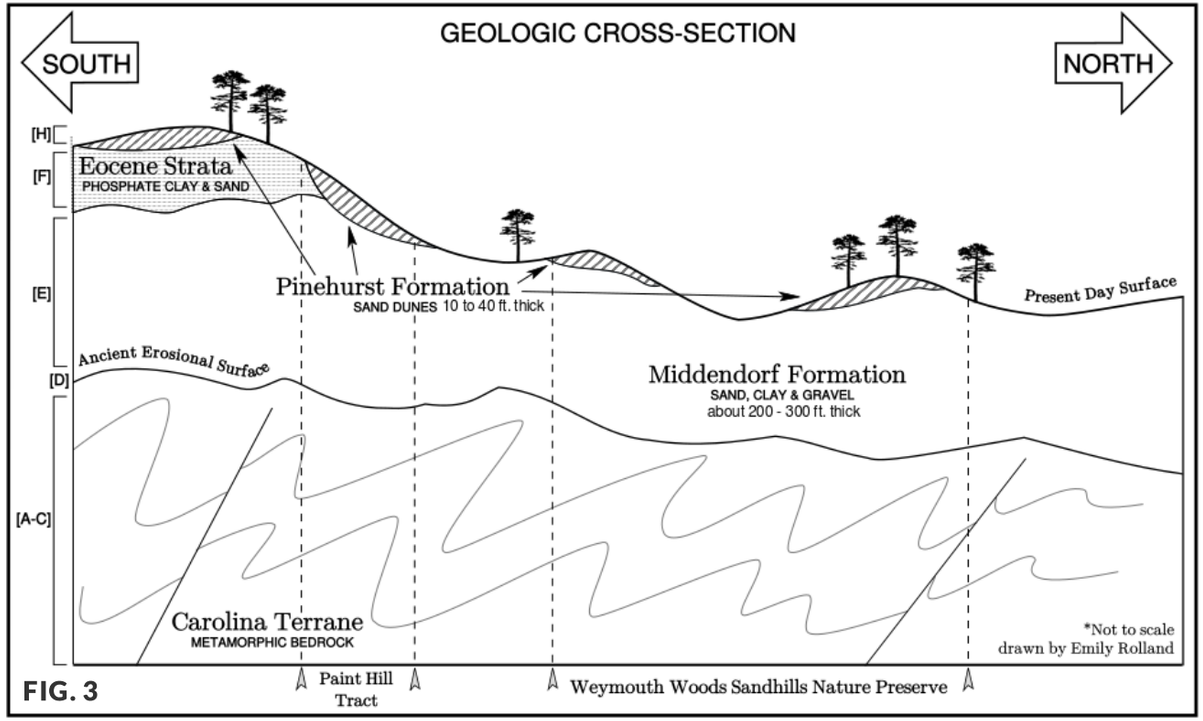


FIG. 3

Sedimentary Strata (Layers)

Here at the Park, the Carolina Terrane bedrock found at depth is covered with sedimentary strata deposited during a past marine invasion. This is part of what is called the Coastal Plain Province, and the strata is called the Middendorf Formation, composed of fluvial (formed in steams or rivers) sedimentary layers. It was deposited during the Late Cretaceous Period, about 100 mya [E] near an ancient sea that invaded inland. On the bare parts of the park trails, you can see whitish clay balls in the Middendorf Formation, composed of weathered rock fragments derived from erosion of the Carolina Terrane, and iron-oxide concretions ("paint pots"), which formed from groundwater precipitation. Small fragments of fossil petrified wood (Fig. 5) and rare particles of amber have been found in the Middendorf strata.

There were several additional marine invasions after the Cretaceous Period. One occurred in the Eocene Epoch about 40 mya [F], which deposited younger marine sedimentary strata on top of the Middendorf, but this is only preserved on the higher elevations in the region (such as south of the Paint Hill Tract - Fig. 3). Fossils of shark's teeth, scallops, bryozoans, and fish bone have been found in the Eocene strata.

Another marine invasion occurred during the Miocene Epoch (25-5.3 mya) [G], but it did not transgress as far inland as the Park area. This marine invasion left a sea cliff, called the Orangeburg scarp, which can be seen about 20 miles to the southeast (Fig. 1). The rolling Sandhills lie northwest of the Orangeburg Scarp, and southeast of the scarp, the coastal plain is very flat.

The Sand of the Sandhills

There was much erosion and down-cutting of the older sedimentary layers (Middendorf Formation and the Eocene strata) before they were covered with the loose sand of the Pinehurst Formation (Fig. 3). The source of the sand was the sandy layers of the Middendorf Formation, released by erosion. These loose sands, the upper geologic layer in the park, formed as inland (not coastal) sand dunes from about 200,000 to 6,000 years ago, mostly during cold, dry and very windy episodes of the Pleistocene Epoch [H]. Erosion continued (and continues) to modify the landscape, slowly removing the dune sand, and cutting deep stream drainages.