

d33 Atlantic and Gulf coastal plains < morvan >

... the tide went out all of a sudden ... 'Mummy, we must get off the beach now!'
—Tilly Smith, age 10, Boxing Day, 2004.¹

During the Neogene, rivers have debouched from the Appalachians (mistakenly named after the now vanished Apalachee tribe that ca. 1600 yet dwelt on the northwest Florida coastal plain)² delivering silicic sediments to the Atlantic coast where to the present these accumulate as deposits in marine embayments. Conveniently exposed for field study are the Chesapeake Group of soft Miocene sediments that crop out in the rapidly eroding intricate cliffed-shoreline of Chesapeake Bay, MD. In addition to marine shells, these contain bones of whales, sharks teeth, and land-mammal bones.³ Below these, Late Oligocene Old Church fm, fills, surprize! an atypical embayment (named the Salisbury Embayment) now known to be a 56-mile wide impact crater.⁴ Also during the Paleogene the coastal plain was elsewhere shallowly submergent. Along its Atlantic coast, silty silicic clastics accumulated that record a hinterland of low relief. Along its Gulf coast, the shore environment accumulated silicic sand. At the bend between these two stretches of coast, silicic sand accumulated (now northern Florida) and to the south seaward of this a limestone bank, with a coral-reef seaward edge, continued to accumulate carbonate evaporites (now southern Florida)

Atlantic coastal-plain scenery

Post-Miocene Appalachian uparching tilted Atlantic Coastal Plain sedimentary strata up toward the interior. Subsequent erosion has carved cuestas with a west facing escarpments in the coastal plain scenery. One such cuesta is at the intersection of two peneplains. Erosion that carved this cuesta's steep slope also exposed the surface of the older peneplain (**Figure d33.1**).⁵ Wm. M. Davis in 1912 called such an exhumed peneplain surface a *morvan* (the name refers to the Morvan region of central France where two intersecting peneplains were first described).⁶

The Schooley Peneplain (of early Cenozoic age) rises westward from sealevel at the New York City, NY, Atlantic coast. Going west from there, it is physically the crest elevations of Manhattan and the Bronx, NYC, NY, the Palisades, NJ, the Reading Prong upland, NJ, the Kittatinny Mountain ridge, NJ, and the Allegheny Plateau, PA.

Long Island Sound, NY, is the flooded the stripped surface of a Cretaceous peneplain called the *Fall-Zone* peneplain. The north shore of Long Island Sound is a morvan. Cretaceous clays with land plant fossils crop out in the Sound's south shore cuesta (north coast cliffs of Long Island).

The Hudson River estuary submerges the stripped surface of a pre-Triassic peneplain, The New York City side of the Hudson River estuary is a morvan (**Figure d33.2**).

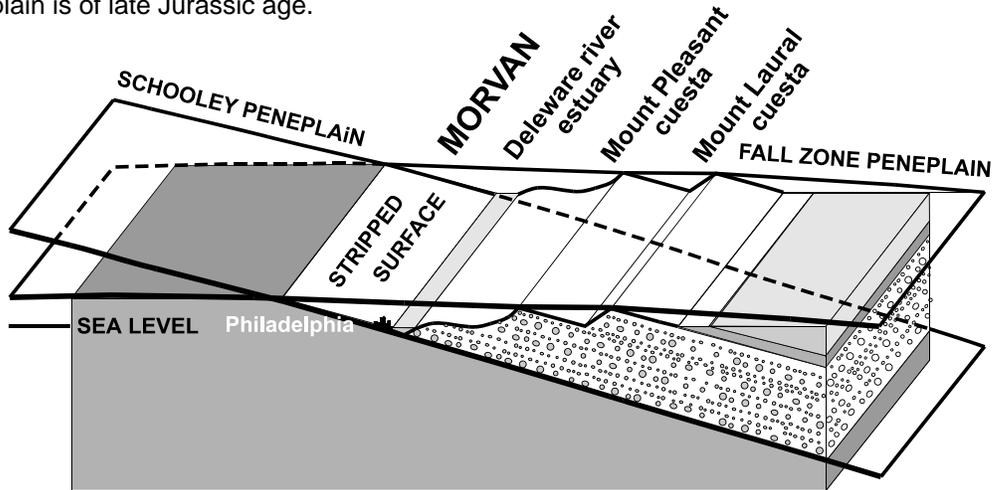
Gulf

The Gulf of Mexico Coastal Plain is the exposed part of a southward prograding delta, once rich in oil⁷ and still so in coal.⁸ Gulfward tilted bedding in the delta records a progressive downwarpage-weighting of the underlying oceanic floor as the delta progrades.⁹

In Louisiana, Quaternary deltaic sediments cover an erosion surface cut across Gulfward tilted Tertiary deltaic strata. These Tertiary strata can be seen in outcrop in the Ouachita Mountains and the Ozark Plateau.

Across Alabama, shallowly south dipping Tertiary and Cretaceous (K) shelf sediments of the Gulf Coastal Plain are expressed in geologic maps by east-west strike of wide outcrop belts. The profound unconformity between them and Paleozoic rocks of the Appalachian Mobile Belt has dramatic map expression where it emerges as the "Fall Line," north of which, the strike of formations is northeast.¹⁰ 

Figure d33.1 Diagrammatic map of Atlantic Coastal Plain in the vicinity of Philadelphia. Uplift has allowed subsequent river erosion to exhume the Fall Zone (or Harrisburg) Peneplain and shape the cuestas from the relatively easily eroded Cretaceous sedimentary rocks of the coastal plain. The Fall Zone (or Harrisburg) Peneplain is of late Tertiary age. The older, now upwarped, Schooley Peneplain is of late Jurassic age.



Boat navigation is interrupted as was noted by William Byrd II (1674-1744)¹¹ and William Mayo (1684-1744)¹² of Virginia, where the major rivers traverse the exhumed Fall Zone Peneplain. Philadelphia is called a *fall-line city*. Partial drowning of the inner lowland between the coastal plain cuestas and the morvan has created bays such as Chesapeake Bay, Delaware Bay, Long Island Sound, and Buzzard’s Bay. Fall-line cities with harbors are Petersburg, Richmond, Fredericksburg, Washington, Baltimore, Philadelphia, Trenton, and Troy. In the Carolinas and Georgia, submergence was less and fall-line cities are far inland towns. Off the Maine coast, drowning has completely submerged the coastal plain and there the cuestas are submerged banks, such as Georges Bank.

Figure d33.2 The lower Hudson River estuary (in geological cross section and view looking to north of the pier sites on which George Washington Bridge was later built).¹³ The Schooley and pre-Triassic peneplains intersect on the east side. The steepness of the Palisades columnar-jointed diabase cliff is due to collapse following erosion of the weathered-to-clay outcrop (“rotten zone”) of dunite (magmatic-differentiation olivine cumulate) on the bottom-chilled margin of the Palisades sill.

