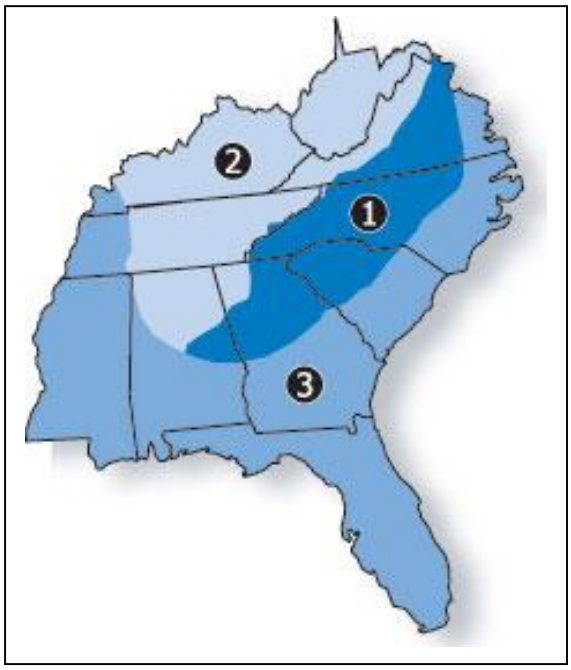
Learning Series: Rocks of the Southeastern U. S. – The BIG Picture



Region 1: Blue Ridge & Piedmont

Exposed in the Blue Ridge and Piedmont region are the remains of ancient mountains that preceded the Appalachians (the Taconic, Acadian and underlying Grenville Mountains), and igneous and metamorphic rocks formed during the Paleozoic mountain building events. In the Piedmont, Triassic-Jurassic rift basin deposits of sedimentary rock and interlayered basalt and diabase are exposed.

Region 2: Inland Basins

Sedimentary rocks are very abundant in the Inland Basins Region. For much of the Paleozoic this area was a shallow inland sea, the perfect environment for the deposition of thick layers of sand, silt, and clay to form sandstone, siltstone, and shale. The shells of abundant sea life were also deposited to form limestone. Sediment eroded from the Taconic and Acadian Mountains and was deposited in the inland sea basins. The rocks of the Inland Basins Region record the rise and fall of the Paleozoic inland ocean.

Region 3: Coastal Plain

Loose sediment that has not solidified to become rock dominates the geology of the Coastal Plain, although in older Cretaceous units there are some sedimentary rocks. Gravel, sand, silt, clay and carbonate sediment recording Cretaceous-Quaternary sea level rise and fall, form a wedge that thickens oceanward toward the Atlantic Ocean and Gulf of Mexico. Carbonate sediment is still being deposited in Southern Florida today.

Rocks of the Inland Basins: Region 2

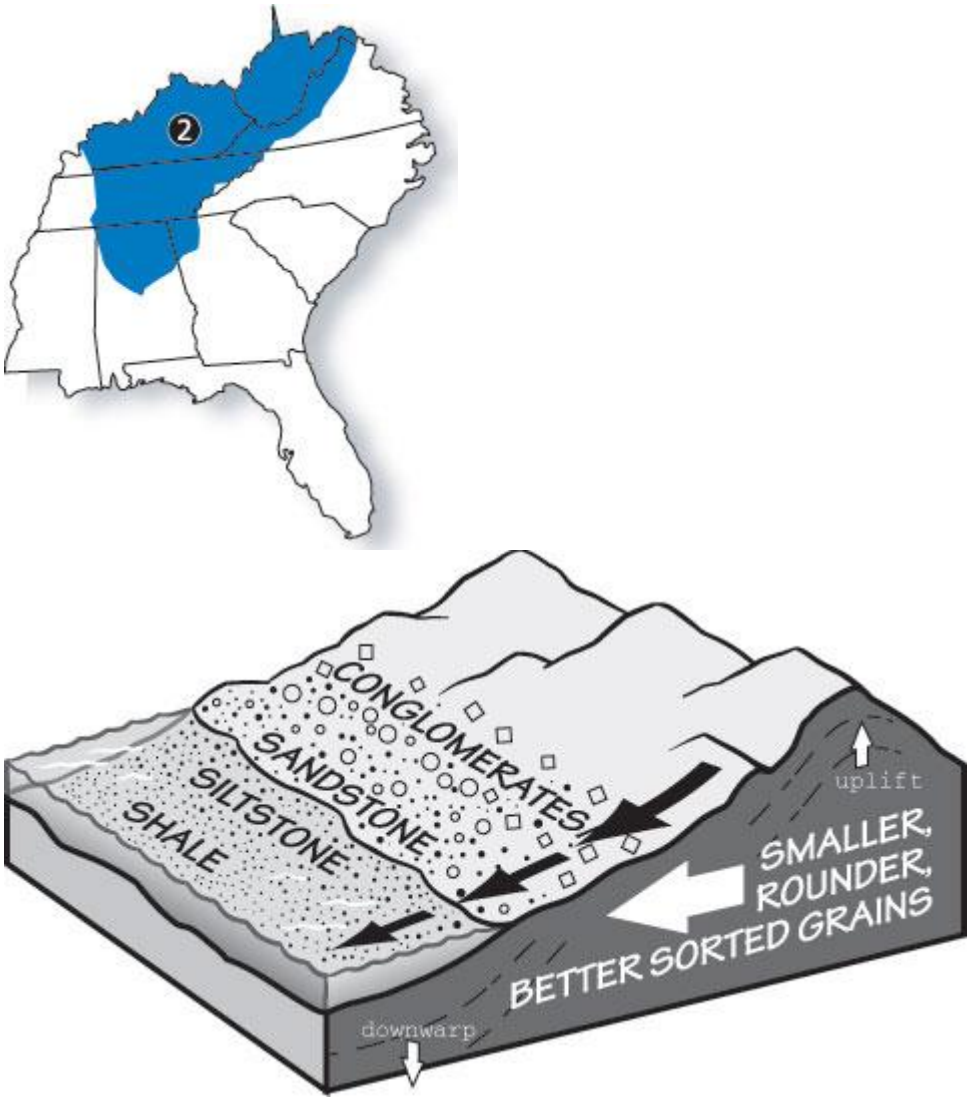


Figure 2.24: The typical sequence of rocks formed across a shallow continental basin at any given time may begin with conglomerate near the source, then sandstone, siltstone, shale, and limestone farther from the source. Limestones (including reefs) may give way to shales further out in deeper water.

Sedimentary rock dominates the Inland Basins region because an ocean covered the area for hundreds of millions of years and this area was inland from the pressures of continental collisions. Conglomerate, sandstone, siltstone, shale, limestone and dolostone are common rocks formed in an ocean and the bordering environments such as deltas, swamps, mud flats and tidal areas. One of the most important things to keep in mind as you read about the rocks of the Inland Basins region is that at any given time, different types of sediment were deposited in different parts of the inland ocean, and the ocean retreated and advanced many times (Figure 2.24). When

it drained from the continent, coastal environments advanced. Sandy sediment deposited by streams as coastal environments advanced, later became sandstone. When the seas advanced, mud was deposited in deeper waters and later became shale. The type of rock you see reflects a particular environment in which sediment accumulated. Just as there are different types of sedimentary environments (rivers, beaches, swamps, etc.) in the Southeast today, many different types of environments coexisted throughout geologic time. The challenge in understanding sedimentary rocks is to put all of the environments in which the rocks were formed together to understand what was happening in the region as a whole, and why certain types of sediment were deposited in particular places.

Different rocks forming in different environments

...but all at the same time!

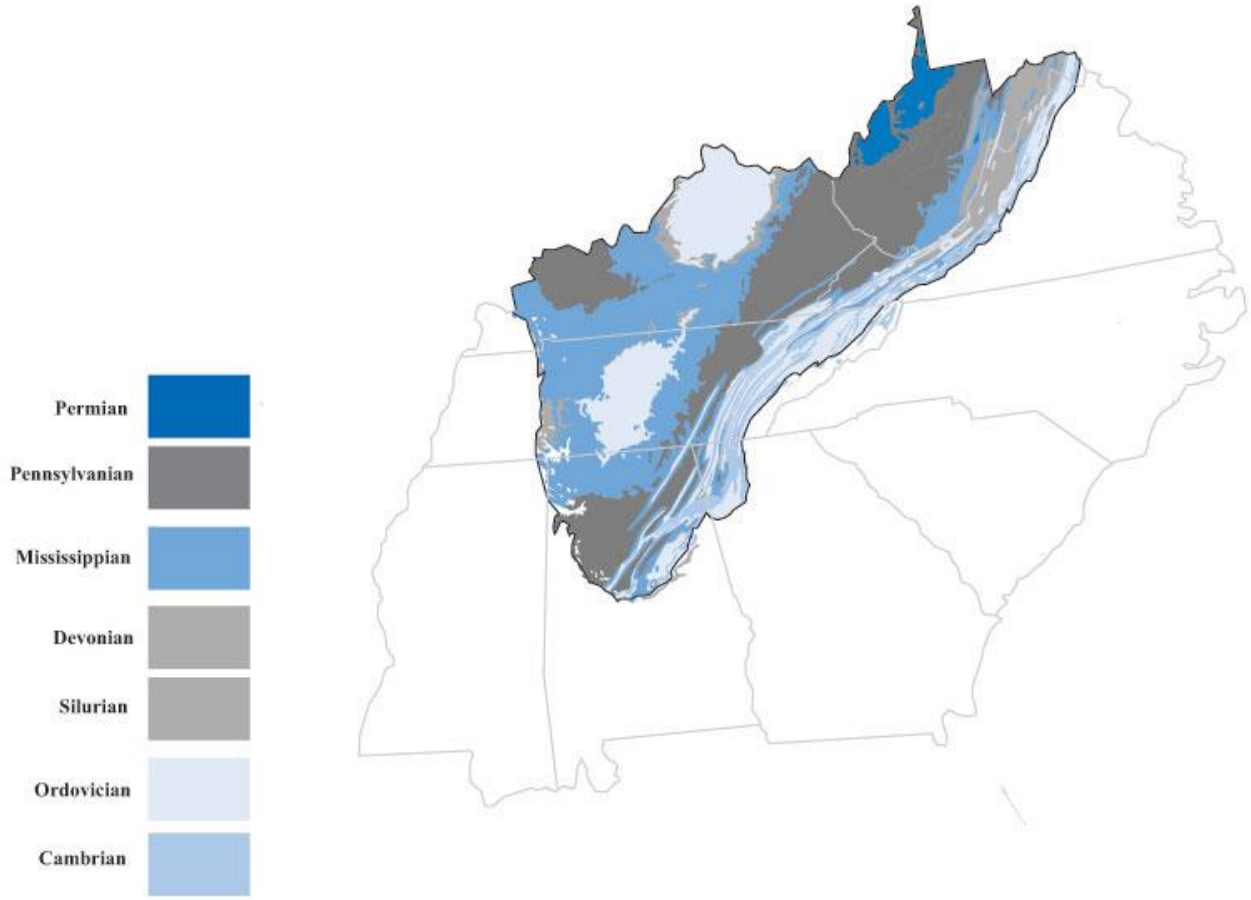


Figure 2.25: Physiographic divisions of the Inland Basins region.

As mountainous highlands erode, sediment is transported down the mountain by gravity and streams. Debris that has been transported a short distance and has not undergone very much weathering, forms coarse rocks like conglomerate when compacted and cemented.

Conglomerate is generally made of poorly sorted sediment, containing large pebbles, as well as finer material in between. If the sediment is transported a bit farther before being deposited it may undergo more wearing down along the way. Individual sediment grains are broken into more rounded, smaller grains, and the deposit becomes better sorted. Farther downstream from where conglomerate would form, sand is deposited, which later becomes sandstone. Sand also is deposited along coastlines on beaches and in estuaries. If you examine the sediment from the beach out to deep ocean, you will notice that beach deposits are mainly sandy, whereas finer grained silt is laid down in deeper water, and very fine-grained clay settles out of the deepest water, where currents are slow.

Limestone can accumulate in a slightly different way. Limestone accumulates in warm water where the rate of sediment being eroded from the highlands is low enough not to dilute accumulation of calcium carbonate, the material. In warm shallow waters, far from rivers, carbonate deposition is rapid because many organisms secrete calcium carbonate shells. These organisms tend to thrive in clear, warm, sunlit water. When the organisms died their shells became part of the limey sediment, which became limestone.

Since the Inland Basins Region was not at the center of the tectonic collisions during the Paleozoic, there are almost no igneous intrusions exposed at the surface and the rocks were not metamorphosed as they were in the Blue Ridge and Piedmont Region. The easternmost section of this region, however, called the Valley and Ridge, was squeezed into tight folds during the Taconic, Acadian, and Alleghanian mountain building events (Figure 2.25). Cambrian and Ordovician sandstone, carbonate and shale dominate the Valley and Ridge section. The Appalachian Plateau, the center section of the Inland Basins region, was broadly folded, as the effects of the mountain building events decreased to the west away from the collision. Pennsylvanian age sandstone, conglomerate, shale and coal dominate the Appalachian Plateau. The westernmost section of the Inland Basins is known as the Interior Lowlands Plateau. This section was minimally affected by the Paleozoic mountain building events and includes Ordovician to Pennsylvanian sedimentary rock.

Picconi, J. E. 2003. The Teacher-Friendly Guide to the Geology of the Southeastern U.S. Paleontological Research Institution, Ithaca, NY.

Source: http://geology.teacherfriendlyguide.org/index.php/how-to-use-the-guide-se