

Alabama Physiographic Provinces – Part 2

The Valley and Ridge Province

Northwest of the Piedmont lies the Valley and Ridge Province, an area of low, folded ridges and valleys oriented generally southwest to northeast in direction. This landscape region is drained by the watersheds of the Coosa, Cahaba, and the Black Warrior Rivers. The Alabama Valley and Ridge area is the southernmost portion of a physiographic province that extends to the northeast as far north as southern New England.

The rocks that underlie the Valley and Ridge Province are older sedimentary layers that have been folded upward and downward into a series of narrow ridges separated by more level valley areas. Geologists refer to rock layers that have been folded upward through pressure as **anticlines** and ones that have been folded downward as **synclines**. Many millions of years ago as a portion of Africa was being shoved by geographical forces against North America, a huge wrinkle developed in the Earth's crust here, producing a generally up-folded area, or **anticlinorium**. As the elongated fold was in the process of forming, cracks and faults developed along the peak of the anticline, exposing soft limestones and shales to erosion. Over many millions of years the less resistant rocks eroded away, leaving behind in the center of the fold a valley ("Jones Valley") in which the city of Birmingham sits today.

Millions of years of erosion of the folded rock layers in the Valley and Ridge has exposed rocks that would normally lie deep beneath the surface. A number of industries centered around natural rock materials have arisen in this province. Steel fabricating mills and iron foundries thrived for many decades in both the Birmingham and Gadsden areas. Iron ore, coal, and limestone, the three main ingredients for steelmaking, were found in quantity here, promoting the development of the steel industry.

It has often been said that the Appalachian Mountains begin (or end) in Alabama where the folds of the Valley and Ridge Province plunge beneath younger sedimentary rocks of the Coastal Plain in Tuscaloosa and Bibb Counties. This is true on one level, but not entirely accurate on another. If one were to follow these lines of Appalachian folding underground they would continue to the southwest, then make a northwest turn in the state of Mississippi, where they lie buried under layers of younger rock. These "Appalachian" folds reach the surface again in central Arkansas near Little Rock and continue on into Oklahoma as the Ouachita Mountains. This evidence shows the Appalachians once extended many hundreds of miles farther west than they do today.

Anticlinal and synclinal folding of rock layers is just one of the special geological features of the Valley and Ridge Province. A second characteristic of this part of the state is the presence of **thrust sheets**—places where thick sections of the Earth's crust have been broken loose, shoved sideways and sometimes stacked upon each other. Enormous geological pressure during the ancient collision with Africa that formed Alabama's Appalachians caused slabs of what had once been seafloor rock to be driven landward and piled upon other crustal sections. Some of these mobile sheets of rock were hundreds of square miles in area and at least several miles in thickness.

In measuring the thickness of some of these thrust sheets, geologists have found evidence that at least several miles of rock have been eroded from parts of the Valley and Ridge Province since the Appalachians were formed.

The angle of the rocks also suggests how the anticline was formed. It began with an upward folding of over two miles of sedimentary rocks by enormous compression that came from a southeasterly direction. The anticline's internal structure shows that as the squeeze continued, the southeast part of the fold was broken loose and shoved for some distance up and over the northwestern part. The thickness of the rock layers on either side provides a rough estimate of the minimum amount of rock that has been removed by erosion at the anticline's center through time. By dating the rock layers on either side of the anticline, geologists calculate the land here began to be deformed about 300 million years ago.

The Highland Rim Province

After the Valley and Ridge Province, the next oldest rocks in the state are found in a landscape region bordering the Tennessee River known as the **Highland Rim**. The rocks underlying this area are primarily limestones and cherts, which have eroded through time to produce a land of low, rounded hills and rich, red farmland. Differences in erosion of the sedimentary rocks of the region is the primary force that has guided the course of the Tennessee River as it makes its way southwestward out of Tennessee, and then abruptly back northwestward to pass out of the state again.

The Highland Rim is sometimes included by geographers in a larger physiographic region of the central U.S., referred to as the **Interior Low Plateaus Province**. The term plateau is used to describe an elevated area of land underlain by rock layers that lie more or less horizontally. These Highland Rim rocks, though nearly level, do have a slight upward tilt to the north in the direction of an uplifted area in middle Tennessee known as the **Nashville Dome**. The upward tilt of these rock layers across North Alabama is slight, averaging only about 50 feet per mile.

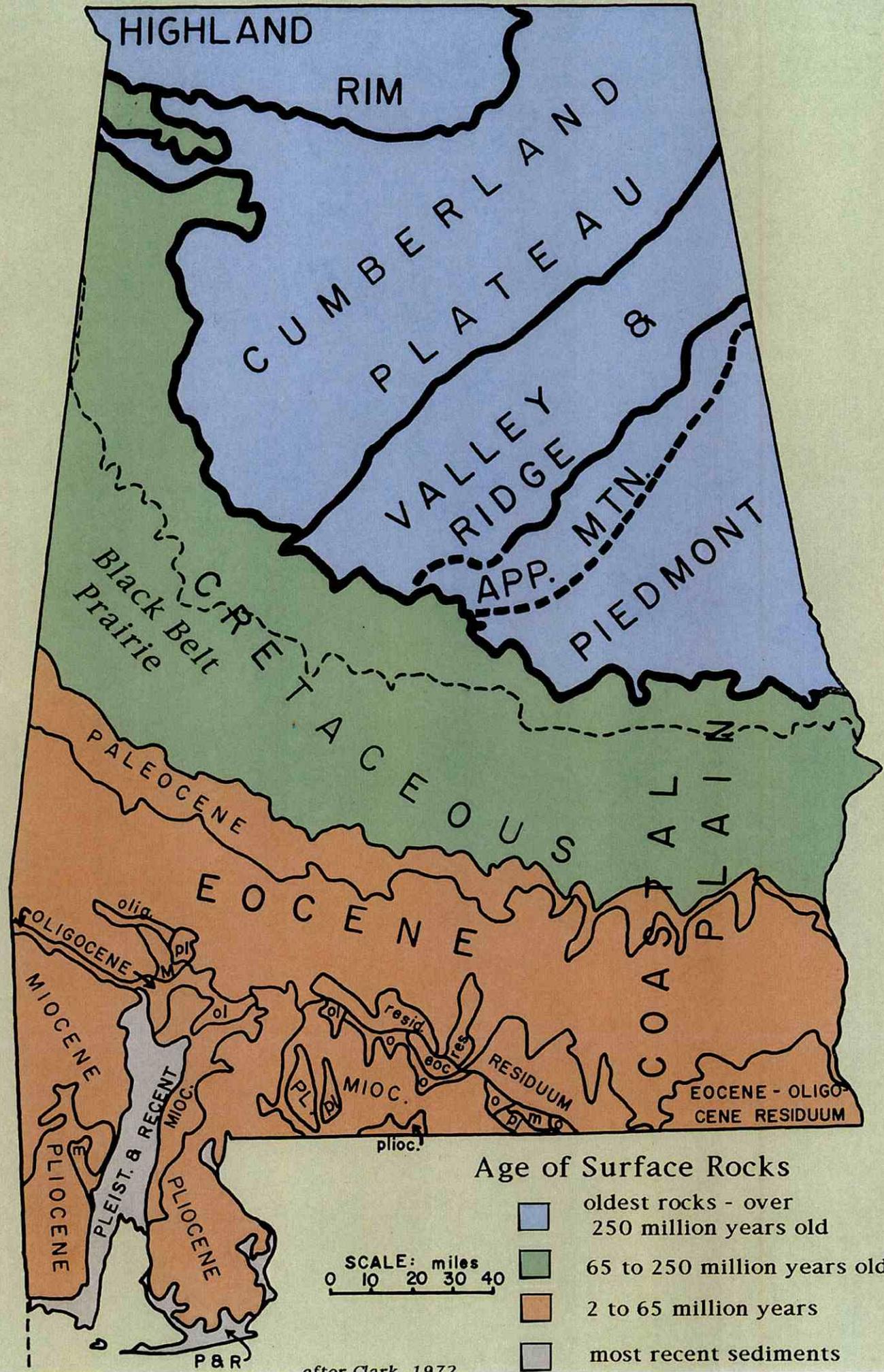
One noticeable feature of many rocks of the Highland Rim is an abundance of fossils of sea creatures. Limestone and other seafloor rocks are widespread here for a good reason. For most of the early part of the Paleozoic Era of Earth's history the continent of **Laurentia** (the name geologists give to ancient North America) was covered by shallow ocean waters.

Highland Rim rocks form a "stairstep" pattern as you travel south from the Tennessee River. South of the river is a range of sandstone-capped hills known as the Little Mountain. North of the river, the Highland Rim is dominated by low, rounded hills and "hollows" formed of beds of deeply weathered chert. Major cities of the Highland Rim Province include Florence, Muscle Shoals, Decatur, and Huntsville, which sits at the eastern edge of the province.

(Note: See following page for pictorial representation of the Age of Surface Rocks throughout Alabama's geographic regions.)

Source: Reprinted with permission from educator and club member, Elliott A. Whitton, who researched and prepared (July 2013) this condensed version of material presented in Jim Lacefield's publication, Lost Worlds in Alabama Rocks.

Editor's Note: This article has been divided into three parts due to limited newsletter space. This is Part 2. Part 1 appeared in the September 2013 edition of the *Rockhounds Herald* and Part 3 will be printed in the November 2013 edition.



HIGHLAND

RIM

CUMBER PLATEAU

VALLEY RIDGE & APP. MTN.

PIEDMONT

Black Belt
Prairie

CRETACEOUS

PALEOCENE

Eocene

COASTAL PLAIN

OLIGOCENE

MIOCENE

PLIOCENE

PLEIST. & RECENT

PLIOCENE

PL. MIOC.

RESID.

RESID.

RESID.

RESID.

RESID.

RESID.

RESID.

RESID.

Eocene - Oligocene Residuum

plioc.

Age of Surface Rocks

- oldest rocks - over 250 million years old
- 65 to 250 million years old
- 2 to 65 million years
- most recent sediments

SCALE: miles
0 10 20 30 40

after Clark 1972

P&R