

IN THE SOURLANDS

Sourland Mountain Geology

By Caroline Katmann

Last Saturday, the Sourland Conservancy sponsored a *Geology Walk* in the Somerset County Sourland Mountain Preserve led by David P. Harper, former president of the NJ Geological Society and author of *Roadside Geology of New Jersey* (Mountain Press Publishing Company, Missoula, Montana, 2013). It was a hot and humid spring morning but under the cover of the Sourland forest, it was shady and cool.

In an autographed copy of his book David wrote, "Enjoy the geology but keep your eyes on the road." Not so easy to do during this hike, as there were so many amazing rock formations to look at and learn about. For over three hours, our intrepid hikers (families, couples, kids and seniors) trekked from the park parking lot to *Roaring Rocks* and back, passing by diabase boulder fields, blocky argillite rocks from the sedimentary Lockatong Formation, a possible Native American quarry, a stone wall probably from an abandoned mill dam, and the crumbly red shale of the Passaic Formation at the foot of the mountain. On the way, we learned some surprising things.

What is *Roaring Rocks*? Most folks believe that the massive boulders on Sourland Mountain were deposited here by receding glaciers, but there were no glaciers in this part of New Jersey. However, permafrost conditions existed here during the ice age. Under these conditions, soil on the Mountain moved downslope and the bare rock was broken into boulders. The stream is invisible, beneath the boulders, but can be heard "roaring" after heavy rains.

So, how did the Sourlands come to be?

250 million years ago during the Triassic geological period, what is now New Jersey was in the middle of the "Pangea" supercontinent. As the Eurasian plate and African plate moved eastward and the North American plate moved westward, Pangea split up and the Atlantic Ocean was slowly created. Movements within the layers of earth under the surface caused what is now New Jersey to lie in a sort of huge basin, now referred to as the Newark Basin, running from New York in the northeast to Pennsylvania in the southwest. The basin was a huge freshwater lake, and over millions of years running water and other kinds of "weathering" carried sandy gravelly material off the higher ground into the basin below. This is what we know as the "Stockton Formation," primarily made of sandstone and in places as thick as 1000 meters. Next, fine particles of silts, clays, and fine sands collected atop the sandstone and eventually hardened into black shale and argillite making what we call the "Lockatong Formation," also about 1000 meters thick. Later came red and gray shale, along with more sandy particles, creating the "Passaic Formation." All three of these are considered sedimentary layers.

Then during the Jurassic Age, between 195-135 million years ago, things got a lot livelier. Lava from the mantle below the Earth's surface forced its way upwards and slid forcefully between the existing horizontal sedimentary layers, cooking the parts it touched, and cooling very slowly because it was not exposed to the cool air aboveground. Over millions of years as the tectonic plates continued to slide east and west the ground, no longer flat, was forced to fold up into what is now our Sourland Ridge, running about seventeen miles from northeast to southwest. All of this pressure caused large cracks, called faults, and smaller cracks, called fractures, which to this day form the primary source of groundwater storage for our wells in the Sourlands. Right up to today the softer layers of sedimentary rock have continued to erode, leaving the hard diabase and argillite layers to create the Sourland ridge and the Princeton ridge. These two ridges are not the result of the magma splitting into two layers - rather a single magma layer was offset by the Hopewell Fault. The layer of magma was then exposed as two linear ridges when the land surface eroded away.

As we passed by a young man hanging upside down from a small building-sized boulder, mountain-bikers, trail runners and hikers, we wondered if they realized that the nature of this place is the result of over hundreds of millions of years of continents colliding, oceans widening, Ice Ages, and violent, underground volcanic activity! No matter - they (and we) had found a special place to recreate, learn, socialize, and find refuge and inspiration – right here in the middle of New Jersey!

Save the date for a presentation on the “Geological History of the Sourlands,” by Gail M. Ashley, Rutgers University Professor in the Dept. of Earth and Planetary Sciences. This talk will take place at the Hopewell Train Station on Thursday, October 15, 2015. Reservations are not required and there is a suggested donation of \$5 at the door. Contact info@sourland.org or visit the Events page at www.sourland.org for additional information.

Caroline Katmann is the Executive Director of the Sourland Conservancy. Since 1986, the Sourland Conservancy has worked to protect the ecological integrity, historic resources and special character of the Sourland Mountain region, through education and advocacy.