

How the Gap formed

The geology of the Delaware Water Gap

Delaware Water Gap
National Recreation Area

National Park Service
Pennsylvania/New Jersey



What is a water gap?

Several words in the English language denote a “break” or “cleft” in the mountains. *Chasm* and *notch* are popular in New England; *pass* and *gorge* in the South and West of the United States. *Gap* is especially common in this part of the country.

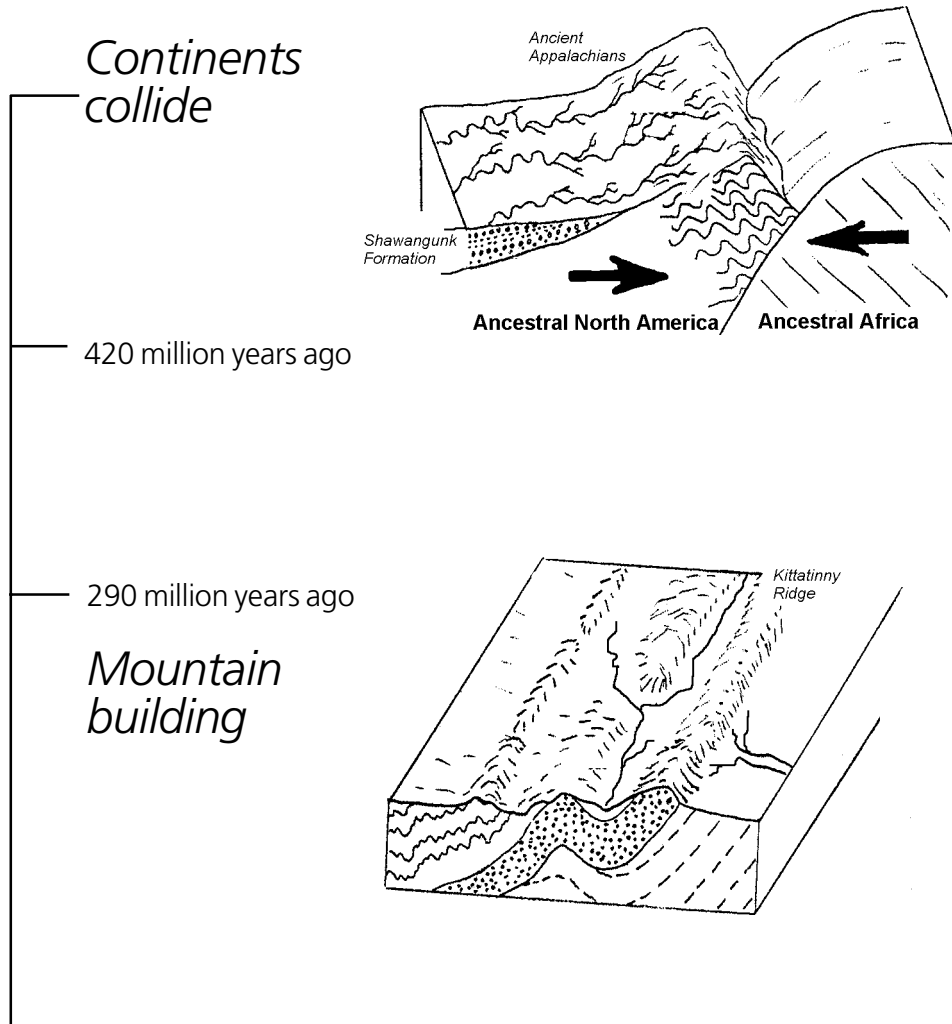
A *gap* or *wind gap* is a break or pass through the mountains, in this case the Appalachian Mountains. A *water gap* is a pass that a river runs through.

The Delaware Water Gap is justly famous for its depth, width, and scenic beauty. The Gap is a mile wide from New Jersey’s Mount Tammany (1,527 feet) to Pennsylvania’s Mount Minsi (1,463 feet.) The Gap is about 1,200 feet deep from the tops of these mountains to the surface of the river, which at this point is 290 feet above sea level. The maximum depth of the river at the Gap is about 55 feet.

How does a gap form?

Geology is the study of the earth’s formation. Though the geologist’s time frame may seem vast and remote, the results of geological processes are the mountains we hike on, the river we swim in, and the scenery we admire.

Starting with Native American legend, there have been many ideas about how the Delaware Water Gap formed. One current theory explains the Gap through a series of processes: continental shift (involving *plate tectonics*), mountain building (*orogeny*), erosion, and the “capturing” of rivers and streams. This last process of “capturing” is further explained below.



The *capturing* story begins 420 million years ago when the ancestral continents of North America and Africa collided. The impact caused the earth’s crust to rise and mountains to form, including the ancestral Appalachian range, tens of miles east of today’s Gap. Streams flowing westward off these mountains eroded their slopes, carrying sand and pebbles west and depositing them in layers. These layers later compacted into erosion-resistant gray sandstone and “conglomerate” rock called the *Shawangunk Formation*. This rock is the dominant feature of the ridges on either side of the Delaware River today.

Over millions of years, many different kinds of rock were laid down on top of the Shawangunk Formation. About 290 million years ago, in an era of mountain building, further pressures crumpled and folded the layers of rock in the area of today’s Gap. These layers eroded at different rates: softer limestones and shales eroded more quickly into valleys, while harder sandstone and conglomerate rock remained as mountains like Kittatinny Ridge. Now, the “mountain” part of today’s Gap was essentially in place.

The geology of the Delaware Water Gap, continued

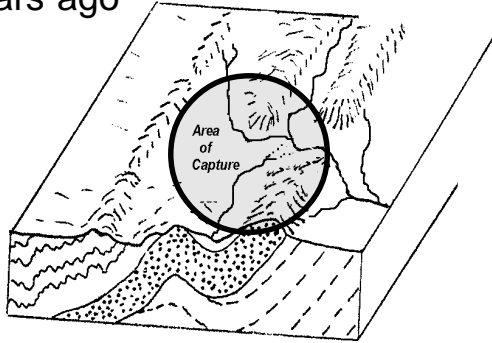
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Capturing streams

a few million years ago



A few million years ago (a geological yesterday!) there was a river whose headwaters were around present-day Trenton, and which flowed from there south to the sea. North of Kittatinny Ridge, near today's Water Gap, streams flowed into a second river, which flowed southwest.

Over time, the headwaters of the first river eroded their way north to the area of today's Gap. Finding a fault in the rock—probably only a small cleft or fracture—the headwaters worked their way through the ridge to the north

side. There they “captured” the flow of the streams and river on the north side of the ridge, making their water flow through the Gap.

Cherry Creek (*See map below*) may represent the abandoned bed of this “captured” river. However, at the time the creek “turned around” to flow into the river, the surface of the Delaware River was hundreds of feet higher than it is today.

Over time, the cleft in the ridge eroded further from wind, rain, and the constant scraping of sand and rock carried by the river. A *water gap* was taking shape.

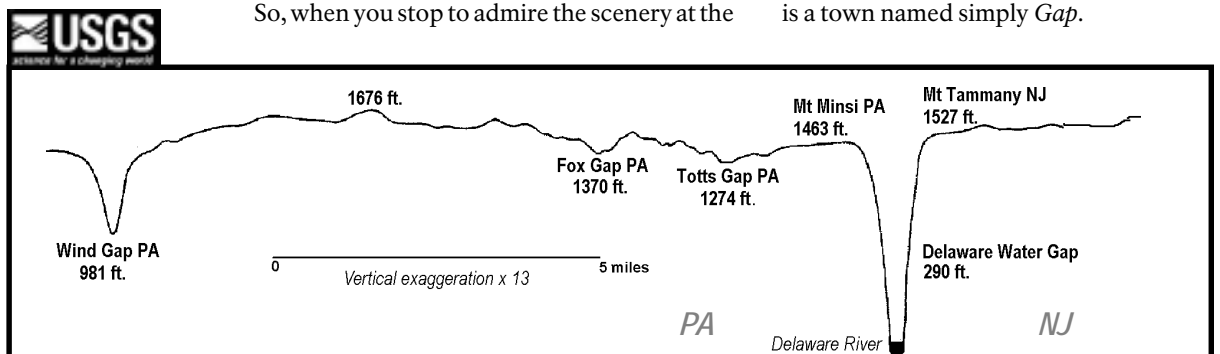
Are there other “gaps”?
Are they “water gaps”?

Near the recreation area are several other gaps whose formation is related to that of Delaware Water Gap. At one time, rivers may have run through these gaps also, and it is possible that the Delaware River has “captured” the rivers in these other gaps as well. When these gaps “dried up,” the erosive action of the river stopped, and most of these gaps are much higher (less eroded) than the Water Gap. At the Water Gap, the Delaware River continues to cut into the mountains to the present day. So, when you stop to admire the scenery at the

Delaware Water Gap, you are also watching the Water Gap continue to form.

While in the area, look on maps and signs for other gaps. Culvers Gap, near Newton NJ, and Totts Gap and Fox(town) Gap PA near the south end of the recreation area (*see the map below*) are three gaps nearby. To the southwest, along other ridges of the Appalachian Range, are the towns of Wind Gap PA and Little Gap PA, and west of Philadelphia near Rt. 30 is a town named simply *Gap*.

(Right) A profile of the gaps in the ridges of Blue and Kittatinny Mountains today, looking northwest across the axis shown in the map below.



(Right) The same view showing surface features. The streambed of Cherry Creek may indicate the ancient course of today's Delaware River. The creek runs under Route 611 at the traffic light in the town of Delaware Water Gap PA, and continues north into the Delaware River.

