Chapter 77

Water and Wind Gaps Appalachian Mountains

The Appalachian Mountains include the Blue Ridge, the Valley and the Ridge Provinces. Hundreds of water and wind gaps cut through their resistant ridges.[1] [2,3,4,5,6] There are 653 water gaps within the Susquehanna River drainage basins alone.[7] Alvarez stated: "The Appalachian Valley and Ridge Province is the classic area for the problem of rivers cutting through the narrow ridges of fold-thrust belts."[8] Speculation and controversy over the origin of Appalachian water gaps has been going on for about 150 years. Major rivers flow through water gaps of the Valley and Ridge and Blue Ridge Provinces, but many tributary streams also flow through water gaps especially in the northern Appalachians (Figures 77.1 and 77.2).

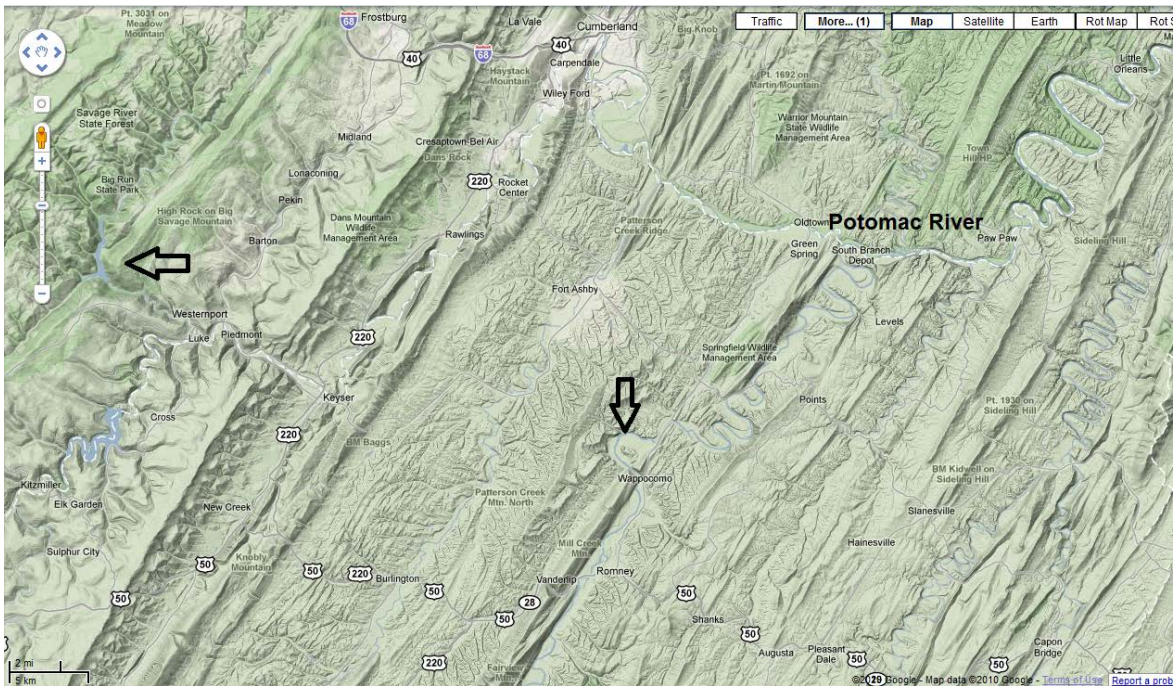

Figure 77.1. Google Maps image of two tributaries (arrows) of the Potomac River that generally flow parallel to ridges but then cross the ridges.

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[1] Thornbury, W.D., 1965. *Regional Geomorphology of the United States*, John Wiley & Sons, New York, NY, p. 109.

[2] Ver Steeg, K., 1930. Wind gaps and water gaps of the Northern Appalachians, their characteristics and significance. *Annals of the New York Academy of Sciences* 32:87-220.

[3] Thompson, H.D., 1939. Drainage evolution in the southern Appalachians. *GSA Bulletin* 50:1,323-1,356.

[4] Strahler, A.N., 1945. Hypotheses of stream development in the folded Appalachians of Pennsylvania. *GSA Bulletin* 56:45-88.

[5] Ahnert, F., 1998. *Introduction to Geomorphology*, Arnold, London, U.K., p. 202.

[6] Oard, M.J., 2012. Origin of Appalachian geomorphology Part III: channelized erosion late in the Flood. *Creation Research Society Quarterly* 48(4):329–351.

[7] Lee, J., 2013. A survey of transverse drainages in the Susquehanna River basin, Pennsylvania. *Geomorphology* 186:50–67.

[8] Alvarez, W., 1999. Drainage on evolving fold-thrust belts: A study of transverse canyons in the Apennines. *Basin Research* 11:267–268.

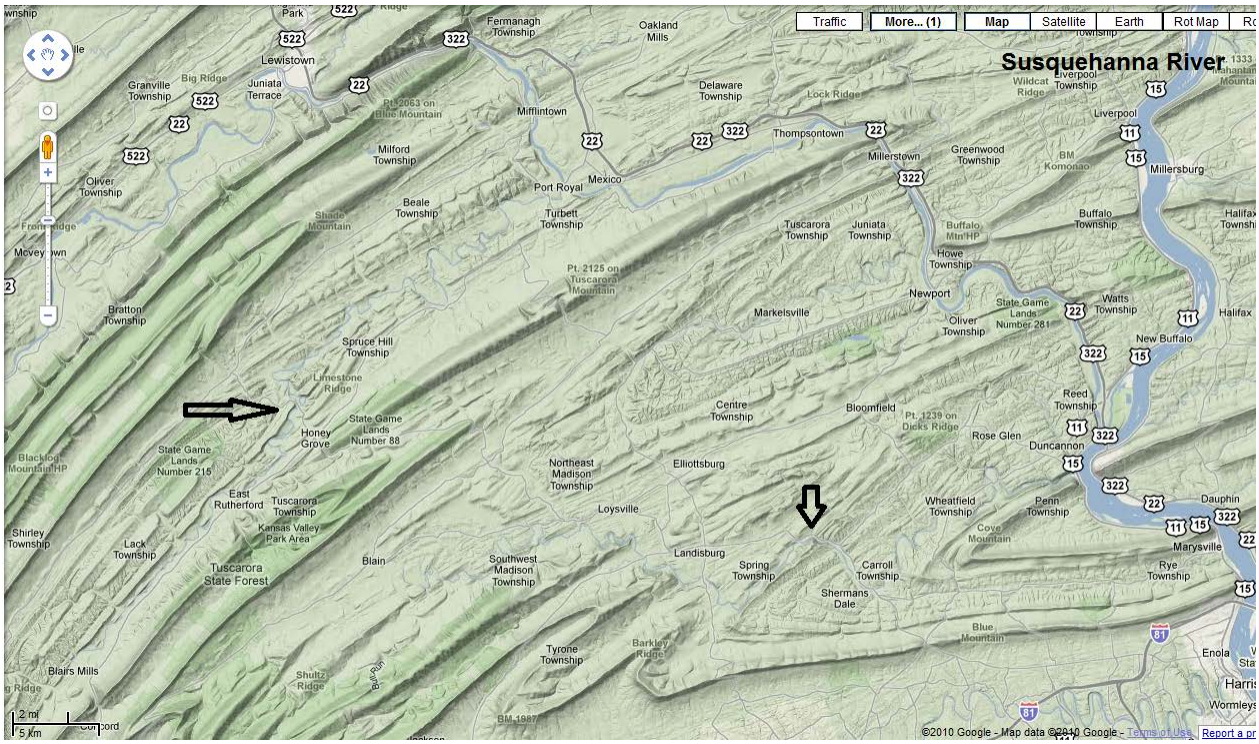

Figure 77.2. Google maps image of two tributaries to the Susquehanna River passing through water gaps.

Water Gaps Northern Appalachians

The water gaps in the northern Appalachians start in the Valley and Ridge Province and flow to the Atlantic Ocean. One of the most famous is the nearly aligned series of water gaps through which the Susquehanna River flows (bottom, right of Figure 77.2). The river cuts through the folded and eroded ridges of Blue Mountain north of Harrisburg, Pennsylvania (Figure 77.3). Blue Mountain is a linear mountain that stretches a few hundred miles northeast and is also called the Eastern Structural Front.[9] Figure 77.3 shows the last water gap through Blue Mountain before the river flows out into the Great Valley at Harrisburg. Figure 77.4 shows the fifth water gap north of Harrisburg. The Susquehanna River course is not influenced by the hardness or softness of the rocks.[10] The river, on the 23 mile (37 km) stretch upstream from Harrisburg, could have flowed around four out of five of the resistant ridges, had it followed the expected course at lower elevations over softer rocks.[11]

Ver Steeg listed 34 major water gaps in the northern Appalachian Mountains,[12] although there are 653 of all depths.[7] Besides the Susquehanna River, the Schuylkill, Lehigh, and Juniata Rivers flow through major water gaps in various mountains or ridges. Another famous gap is the Delaware water gap (Figures 77.5) on the Delaware River through the Eastern Structural Front at the border of New Jersey and Pennsylvania.[9] Interstate 80 follows this narrow, 365-m deep gap.[12] Early geologists thought that it followed a transverse fault through the ridge,[4] but later

[9] Karle, K.H. 2009. Young evidences in an ancient landscape: part 1—the Eastern Structural Front of the Appalachian Mountains. *Journal of Creation* 23(3):76-83.
[10] Short, N.M. and R.W. Blair, Jr. (editors), 1986. *Geomorphology from Space: A Global Overview of Regional Landforms*, NASA, Washington, D.C., p. 56
[11] Strahler, Ref. 4, p. 57.
[12] Ver Steeg, K., 1930. Wind gaps and water gaps of the Northern Appalachians, their characteristics and significance. *Annals of the New York Academy of Sciences* 32:87-220.

research has discounted that hypothesis.[13] Karle showed that with vertical cliffs and talus slopes devoid of vegetation, the cliffs around the Delaware water gap, as well as the Eastern Structure front, must be young features.[9] Most water gaps in the Appalachians are erosional, and cannot be attributed to faulting. In fact, many well-known faults have not resulted in water gaps.[14]

Figure 77.3. View north of the last water gaps on the Susquehanna River before entering the Great Valley at Harrisburg, Pennsylvania.

Water Gaps Central Appalachians

In the central Appalachians, water gaps are found on the Potomac, James, Shenandoah, and New Rivers.[15,16,17] Harpers Ferry on the Potomac River is one of historical significance. The New River starts near the Blue Ridge Escarpment in North Carolina and cuts northwest through at least four ridges of the Valley and Ridge Province via major water gaps.[18,19]

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[13] Epstein, J.B., 1966. Structural control of wind gaps and water gaps and of stream capture in the Stroudsburg area, Pennsylvania and New Jersey. *U. S. Geological Survey Professional Paper 550-B*, Washington, D.C., p. B81.
[14] Strahler, Ref. 4, pp. 46, 63–65.
[15] Short, and Blair, Ref. 10, pp. 1–717.
[16] Thompson, H.D., 1939. Drainage evolution in the southern Appalachians. *GSA Bulletin* 50:1,323–1,356.
[17] Fridley, H.M., 1939. Solution and stream piracy. *Journal of Geology* 47:178–188.
[18] Bartholomew, M.J. and H.H. Mills, 1991. Old courses of the New River: its late Cenozoic migration and bedrock control inferred from high-level stream gravels, southwestern Virginia. *GSA Bulletin* 103:73-81.
[19] Ward, D.J., J.A. Spotila, G.S. Hancock, and J.M. Galbraith, 2005. New constraints on the late Cenozoic incision history of the New River, Virginia. *Geomorphology* 72:54-72.

Figure 77.4. The fifth water gap north of Harrisburg, Pennsylvania (view south).

Figure 77.5. The Delaware water gap through Kittatinny Mountain (Eastern Structural Front) along the border of Pennsylvania and New Jersey (view east just off Interstate 80).

Enigmatic Water Gaps Southern Appalachians

Other enigmatic water gaps occur in the southern Appalachians. The course of the Tennessee River has always perplexed geologists. The river flows south down a valley in the Valley and Ridge Province for 250 miles (400 km) and instead of transecting a relatively low divide, 76 m higher, to the south, it turns southwest across the southeast Cumberland Plateau southwest of Chattanooga, Tennessee, through a 1,000 feet (300 m) deep "youthful" water gap in Walden Ridge (Figure 77.6).[20,21,22,23] A close up view shows that the water gaps strongly meander (Figure 77.7). I found this is the case with many other water gaps. The nearly flat-topped, relatively wide Walden Ridge lies between Chattanooga, Tennessee and Sequatchie Valley. Had the Tennessee River followed the easiest course, it would have flowed south from Chattanooga, out onto the Piedmont of northern Georgia. Thornbury stated:

> The abrupt change in direction of the Tennessee River southwest of Chattanooga, Tennessee, from a southwest to a northwest [actually south to a southwest] course, along with its gorge through Walden Ridge, has long puzzled geologists.[24]

Figure 77.6. Walden Ridge, southeast Cumberland Plateau, view west across Chattanooga, Tennessee.

[20] Fenneman,N.M., 1938. *Physiography of Eastern United States*, McGraw-Hill book company, New York, NY.
[21] Milici, R.C., 1968. Mesozoic and Cenozoic physiographic development of the lower Tennessee River: in terms of the dynamic equilibrium concept. *Journal of Geology* 76:472-479.
[22] Ollier, C. 1981. *Tectonics and Landforms*, Longman, New York, NY.
[23] Williams, E.L. and A.J. Akridge, 2005. Sequatchie Valley Tennessee and Alabama: a different approach. *Creation Research Society Quarterly* 41 (4):276-288.
[24] Thornbury, Ref. 1, pp. 124, 126.

Figure 77.7. Tennessee River passing through Walden Ridge in a 1,000 feet (300 m) deep water gap.

If that is not enough of a puzzle, the Tennessee River continues south down Sequatchie Valley for 75 miles (120 km) into northeastern Alabama, then turns west northwestward into northwest Alabama, and finally turns almost due north into higher terrain.[25] The expected course for the Tennessee River should be south through Alabama to the Gulf of Mexico. Instead it ends up flowing into the Ohio River at Paducah, Kentucky!

Aligned Water Gaps

One of the most interesting aspects of the Appalachian water gaps is multiple gaps are *often aligned* as if the eroding current continued its course regardless of obstructions.[26] Even ridges and mountains did not divert the flow! This phenomenon occurs in both the northern[4] and southern[16] Appalachians. The bottom, right corner of Figure 77.2 show aligned water gaps north of Harrisburg. There are other aligned water gaps, such as two aligned water gaps at Harpers Ferry just downstream of the Shenandoah River, coming from the south, joins the Potomac River coming from the north.

Multiple Wind Gaps

[25] Thornbury, Ref.1, pp. 1–609.
[26] Von Engeln, O.D., 1942. *Geomorphology: Systematic and Regional*, Macmillan, New York, NY.

Ver Steeg listed many wind gaps through the northern Appalachian ridges.[12] Figure 77.8 shows a wind gap along Interstate 80. The wind gaps occur at various altitudes, ranging from 722 to 1,705 feet (220 to 520 m) above msl. Thompson described 161 wind gaps through the Virginia Blue Ridge alone.[16] One of the more famous is the Cumberland wind gap on the border of southwest Virginia and southeast Kentucky (see Figure 75.3). Early settlers passed through it on their way to Kentucky. It is nearly 610 feet (185 m) deep, measured on the northeast side.[27] Like the other Appalachian wind gaps, its origin is a mystery.[28]

Figure 77.8. A wind gap through a ridge near milepost 251 on Interstate 80 in Pennsylvania.

Appalachian Water and Wind Gaps a Mystery

This anomalous drainage is a major geomorphological problem for evolutionists: "One of the major geomorphic problems of the folded Appalachians is the anomalous drainage, with transverse streams flowing across the structure, creating wind and water gaps"[10] Mills and others. testified:

> Second, many master streams flow in deep gorges through ridges of resistant rock, with the Valley and Ridge of Pennsylvania having the most dramatic examples. The problem of how streams were able to cut through such obstacles has fascinated many geomorphologists.[29]

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[27] Rich, J.L., 1933. Physiography and structure at Cumberland Gap. *GSA Bulletin* 44:1,219-1,236.
[28] Thornbury, Ref.1, p. 145.
[29] Mills, H.H., G.R. Brakenridge, R.B. Jacobson, W.L. Newell, M.J. Pavich, and J.S. Pomeroy, 1987. Appalachian mountains and plateaus, In, Graf, W.L. (editor), *Geomorphic Systems of North America*, Geological Society of America Centennial Special Volume 2, Boulder, Colorado, p. 12.