

Viewing the Civil War through a natural resource window

ROBERT D. HIGGINS, National Park Service Geologic Resources Division, P.O. Box 25287, Denver, Colorado 80225-0287; bob_higgins@nps.gov

DEANNA GRECO, National Park Service Geologic Resources Division, P.O. Box 25287, Denver, Colorado 80225-0287; deanna_greco@nps.gov

Our understanding of history is enriched by trying to view the events from as many perspectives as possible. An example of an unlikely linkage is geology's influence on the campaigns and battlefields of the American Civil War. Geology has an important role in shaping the terrain, and terrain is critical to any military venture. Both Union and Confederates used, or in some cases failed to use, terrain to their benefit in choosing defensive positions, maneuvering troops, and selecting supply and communication routes. In some instances, commanders had common knowledge of geology and geologic processes and employed it to their military advantage. Through the use of three examples from the Civil War, we can reach across the boundaries of history and science.

Vicksburg

The Mississippi River was important in the Civil War. It divided the country, east from west. It was a major transportation route. Geologic processes are continually at work shaping the river's course and carving out the surrounding landscape, be it bluff, beaches, natural levies, or swamps. New channels were cut, and old ones abandoned, by the Mississippi.

During the Civil War, Confederate forces closed the river to navigation. This threatened to strangle northern commercial interests. President Lincoln felt that Vicksburg was of great importance for Union control of the lower Mississippi River and the key to ending the war. By taking control of Vicksburg and the lower Mississippi, it would split the South in two and sever a vital Confederate supply line. Within the city limits of Vicksburg as well as the surrounding forts, fortifications along the bluffs of the river were impregnable. Direct attack was considered impossible; maneuver and small attacks provided no results.

In the summer of 1862, a 3,000-man infantry brigade commanded by Brigadier General Thomas Williams began construction on a canal at the Tuscumbia Bend on the Mississippi River. It was situated at the location of an earlier canal south of Vicksburg that bypassed the city. It was hoped that the canal would divert the main river flow away from the large meander-loop channel located on the waterfront of Vicksburg. The Union commanders speculated that if the scouring effects of the Mississippi were strong enough, it would change the river's course, leaving the city high and dry and making it militarily worthless.

Canal construction began on June 27, 1862. Union soldiers felled trees and excavated soils. Progress was slow, so slave labor was added to the workforce. Unfortunately, all manner of disease took its toll on the labor force. Work on the canal was halted on July 24th so that Williams and his soldiers could take part in military operations.

In January 1863, work on the canal was resumed by troops under the command of Major General Ulysses S. Grant. He approved the idea, believing it would keep his soldiers in good physical condition for the spring campaign and, more important,

keep the spirit of the offensive alive, but he placed little confidence in the success of this project. On almost a daily basis, President Abraham Lincoln inquired about the progress of the canal. In a previous career Lincoln was a land surveyor, so he was enthralled with the scheme, and Grant always provided him with a somewhat optimistic reply.

The soldiers and the slaves who had been pressed into service continued to excavate. A sudden rise in the river caused a dam at the head of the canal to break. The area was flooded, and the canal filled with water and sediment. In a desperate attempt to rescue the project, Hercules and Sampson, two huge steam-driven dipper dredges, were put to work clearing the channel. Confederate artillery fire from the bluffs at Vicksburg drove out the dredges. By late March, Grant decided to abandon all operations on the canal.

Within a few years, the Mississippi River naturally diverted to a new channel that was located close to the Williams-Grant canal location. This event isolated Vicksburg from the main river and its traffic. It gave validity to the concept of mimicking the natural geologic processes by inducing a meander cut-off by digging a canal. Over the years, most of the canal has been obliterated through agricultural operations, and only one segment retains its original width and much of its depth. In recent times, the U.S. Army Corps of Engineers dredged a connection to the old channel that existed in 1863. Today, the Mississippi River flows past Vicksburg once again (Figure 48.1).

Gettysburg

For two bloody years (1861-1863) the Union and Confederate armies had fought to a standstill in the countryside between Washington and Richmond, the two capitols. Another entire campaign was fought to a standstill in 1862 on a peninsula of coastal lowland southeast of Richmond. In the summer of 1863, the two armies faced each other across the Rappahannock-Rapidan rivers defense line. General Robert E. Lee decided to make a move to bring the war to the North and, he hoped, end it.

The Gettysburg campaign took place in four geologic provinces, running roughly parallel lengthwise from northeast to southwest. From southeast to northwest they are: (1) the Piedmont, (2) Mesozoic (Triassic) basins, (3) the Blue Ridge, and (4) the Valley and Ridge (Great Valley; Figure 48.2). Each province had advantages and disadvantages for a military campaign. The Piedmont was hard for armies to move through and favored the defenders. The Triassic basins had better roads, but rock outcrops restricted maneuverability. The Blue Ridge was a mountain barrier, impassable to armies except through the mountain gaps. The Great Valley, the first in the Valley and Ridge province, was the interstate highway of the time. Broad, flat valleys made for easy transport and excellent troop movement.

Troop movement and geology. The Gettysburg campaign began on June 3, 1863, when the Army of Northern Virginia left Fredericksburg, Virginia, under the direction of Lee. The campaign started in the Piedmont; however, the armies left it as soon as possible. The exposed rocks, ridges, and ravines made for rough roads that were hard on troops, animals, and equipment. The only practical roads on which Lee's Army could move north were by way of the Culpepper basin toward the high and narrow Blue Ridge. The Confederates would cross the rugged steep mountains through a series of gaps and into the Great Valley. The gaps are of great significance to the Gettysburg campaign because they were the passages by which armies could cross the Blue Ridge. The mountains of the Blue Ridge were equally important because they shielded the Confederates from view by the Union Army.

Skillful use of the terrain to move the 80,000-man Confederate army with all its equipment and supplies into enemy territory, almost unseen and unhampered, was a hallmark of the Gettysburg campaign. The geologic processes that faulted, widened, and sculpted the Cashtown Gap in the mountains of Pennsylvania made it the only possible route for Lee's army to concentrate and move swiftly through the mountains,

all at one time, to attack Union targets. The gap destined Lee's army to pass through Gettysburg (Figure 48.3).

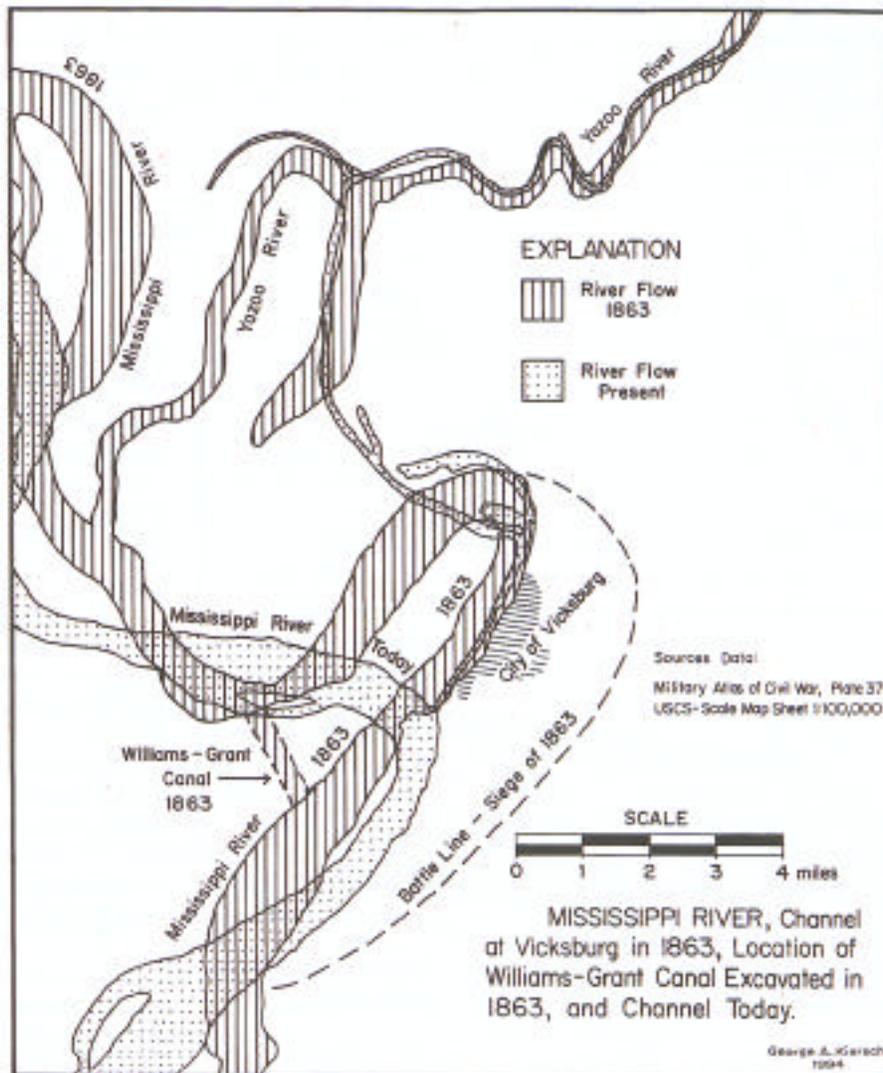


Figure 48.1. U.S. Army Corps of Engineers map of the Williams-Grant Canal and the change in the Mississippi River.

While Lee was moving northeast in the protected valley, General George G. Meade was setting up a strong defensive position east of Gettysburg on Parr's Ridge. This position, in the Piedmont province, provided an excellent defensive position.

Battlefield. The battle involved three fierce days of fighting. The first day, July 1, 1863, involved elements of both armies stumbling into one another north of the town

of Gettysburg. The Union forces were outnumbered and fell back while both commanders were desperately trying to reinforce their combatant troops. At the end of that day, the Union army had the best field position, which was essentially located along Gettysburg sill, an outcrop of diabase. The outcrop is shaped like a fishhook and extends northward for approximately three miles from Round Top through Little Round Top and Cemetery Ridge to Cemetery Hill. Then, it turns east and south and terminates at Culps Hill. General Lee surveyed the strong Union position and occupied the next best position along Seminary Ridge, which is a diabase dike, an offshoot of the westward-dipping Gettysburg sill. On the second day, July 2, the Confederates attacked the flanks of the Union line. The left flank did not appear to be anchored to any significant feature, so Lee surmised that this was a weak point in the Union position. He then launched a series of attacks against the southern end of the Union line in the vicinity of the Round Tops. The natural defenses provided by rock outcrops and boulders at Cemetery Hill, the Round Tops, and Devils Den proved to be stronger than Lee thought, and the Confederates were unsuccessful. The final day of battle, July 3, would culminate in Lee's attempt to break the Union center by one final assault, known as Pickett's Charge. The charge on Cemetery Ridge failed, and the Union army held its position.

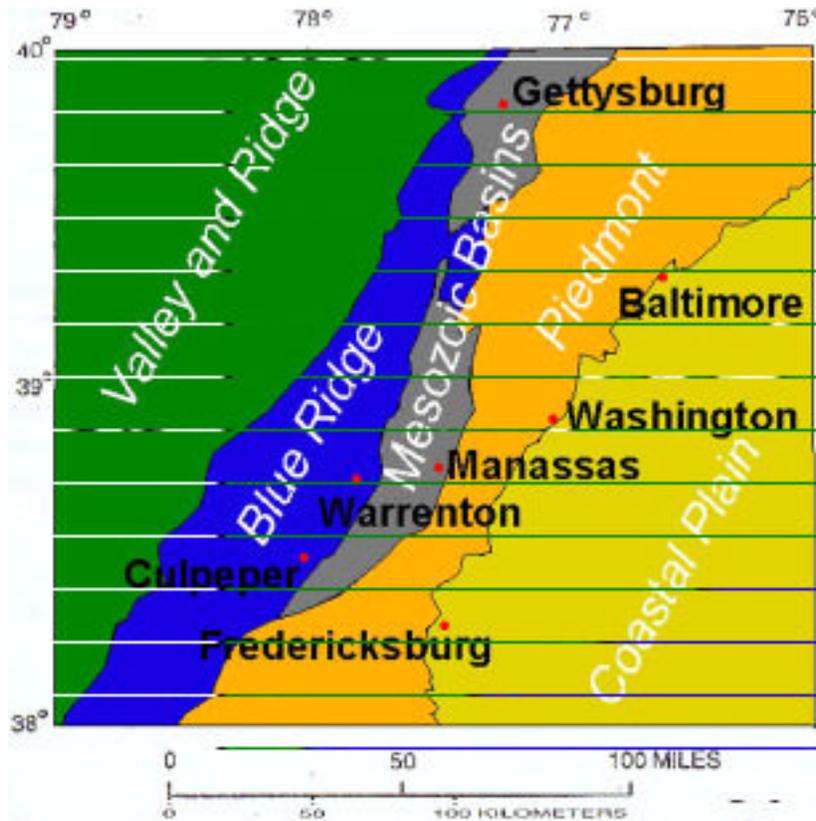


Figure 48.2. Geologic provinces in the Gettysburg campaign.

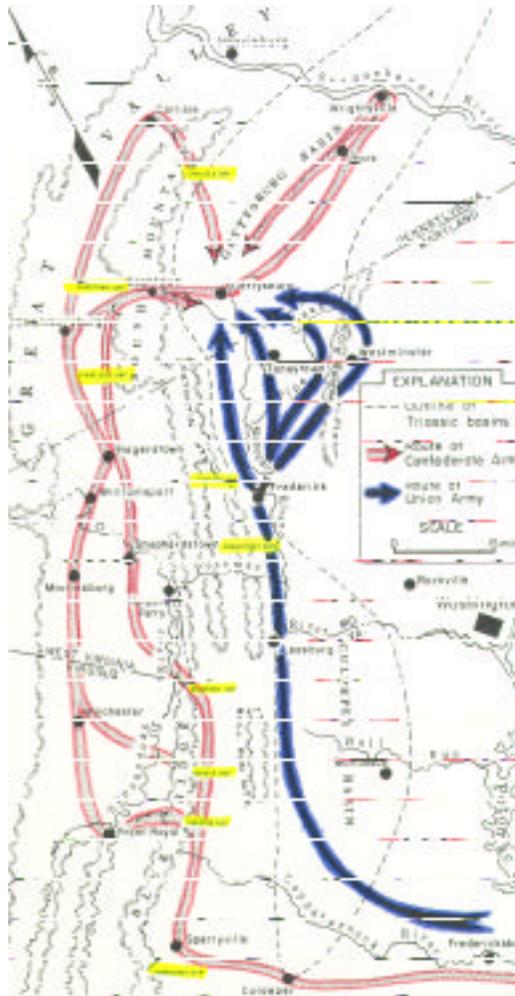


Figure 48.3. Using gaps and getting to Gettysburg

The Union army suffered 23,000 casualties, while the Confederates lost 28,000. The numbers are disproportionate, given that the Union army was the defending force in the battle. In previous battles, the defender would normally be entrenched and had a 1:2 advantage and, in some cases, as high as 1:4. The Union position had a weakness that became more apparent as the battle progressed. Owing to the local geology, the resistant diabase sill had very little overburden. It was virtually impossible for the Union soldiers to “dig in” and the only protection provided was by existing stone walls, outcrops such as Devils Den, and isolated boulders.

Under storm clouds and heavy rain, the end of the battle signaled a retreat by Lee and the Confederate army back to Virginia. Within a matter of weeks, both armies were on the Rappahannock–Rapidan rivers defense line where they had started June 3, 1863.

Petersburg

Petersburg is situated on the south bank of the Appomattox River in a geologic area known as the Prince George upland. The city of Petersburg was important to the Confederate army because of its relationship with Richmond's supply lines. Three important rail lines converged at the city, as did two important roads that linked Petersburg with the region to the south and southwest. The Siege of Petersburg was part of a strategy by General Grant. He wanted to force General Lee to extend and thin his lines in an attempt to prevent the Union from cutting off vital communications. The Siege of Petersburg was the longest of the Civil War, lasting more than nine months.

In June 1864, an extensive system of trenches and forts had been constructed along the eastern side of Petersburg at a distance of more than four miles. The two armies were separated by a siege line that was 500-1,000 feet wide. Just west of Poor Creek, the line's width narrowed to a distance of approximately 250 feet. These lines remained fairly stationary for the next nine months. Colonel Henry Pleasants was in command of a brigade that held the Union position opposite the Confederates at this closest point along the line. A professional mining engineer in Pennsylvania before the war, Colonel Pleasants conceived the idea of digging a mine from his regiment's position to the west of Poor Creek under a Confederate fort. Pleasants contended that by filling the end of the mine tunnel with a series of magazines of black powder, a tremendous hole could be blown in the rebel line. This would allow the Union army to rush through the opening and drive the Confederates out of Petersburg. With support for his plan from the commander, he began to mine.

The excavation of the tunnel went well for the first 200 feet. At this point, the miners encountered "marl," which was extremely difficult to excavate. Pleasants ordered the tunnel to be ramped slightly upward for approximately 20 feet into less-resistant material. The final tunnel excavation brought the end to within 20 vertical feet of the Confederate fort.

At 4:45 AM on July 30, the mine was exploded. A 200 foot-wide gap was created in the Confederate line and numerous Union soldiers were sent into the crater. The tunnel was an engineering success, but the poorly led Union soldiers headed into the crater and not around it, as planned. The Union outnumbered the Confederates, yet they were unable to advance from the crater or easily retreat. At 9:30 AM, the attack was called off and there was to be no more support to the Union soldiers in the crater. The gap was sealed by the Confederates, and they slowly advanced on the crater. The Union troops, who still outnumbered the Confederates, were forced to surrender. The best chance for ending the Siege of Petersburg had instead become a symbol of military debacle. After ten hours of fighting and the combined loss of nearly 6,000 lives, nothing had tactically changed.

Since the Battle of the Crater in 1864, there has been much speculation concerning the geologic strata encountered in the tunnel. It was fortunate that the Union commander and the miners who dug the tunnel had enough knowledge of geology from their experience in the coal mines of Pennsylvania to know how to react to the change in conditions.

Due to the presence of the Dutch Gap fault zone, it had been speculated that the Union miners had encountered a fault while digging the tunnel. In addition, previous publications had suggested that excavation of the tunnel was through the Eastover formation. In August 2000, the National Park Service's Geologic Resources Division and the Virginia Geological Survey investigated the geologic reason for the difficulty that Pleasants's men encountered while excavating the tunnel. The investigation used a four-inch auger drill to interpret the geologic units of the site (Figure 48.4). Two holes were drilled adjacent to the tunnel at the Crater. Using the information, geologists produced a geologic cross-section.

Drilling confirmed that tunneling took place in the Yorktown formation. The Yorktown formation consists of rock strata that are 3-5 million years old, with the

lower formation consisting of marine deposits that include quartz pebbles and cobbles, shark teeth, coral, and very fine-to-medium sand-sized shell debris. The “marl” encountered by the Union troops has now been confirmed to be an abandoned channel deposit located in the upper Yorktown formation. The abandoned channel formed an oxbow lake, filled with extremely fine-grained material and consisting of dense sticky clay. The abandoned channel deposit found during the drill investigation was located precisely at the level where the Union soldiers reported having great difficulty excavating. The Eastover formation was found in the drill hole at approximately 10 feet below the tunnel (Figure 48.5). The geologic puzzle that influenced the military operation was solved.



Figure 48.4. Drilling for geology to solve the puzzle.

Conclusion

The Battle of Vicksburg, the Battle of Gettysburg, and the Battle of the Crater were events greatly influenced by the areas' geology. By adding this information, we gain a better understanding of the circumstances of events, and we enrich the telling of the Civil War Story.

References

- Brown, Andrew. 1962. *Geology and the Gettysburg Campaign*. Harrisburg, Penna.: Department of Conservation and Natural Resources, Office of Conservation and Engineering Services, Bureau of Topographic and Geologic Survey.
- Inners, Jon D., Brant E. Inners, and David M. Sayre. 1995. *Military Geology of the Richmond and Petersburg National Battlefield Parks, Virginia*. Open File Report 95-08. Department of Conservation and Natural Resources, Office of Conservation and Engineering Services, Bureau of Topographic and Geologic Survey. Harrisburg, Penna.: Pennsylvania Geological Survey.

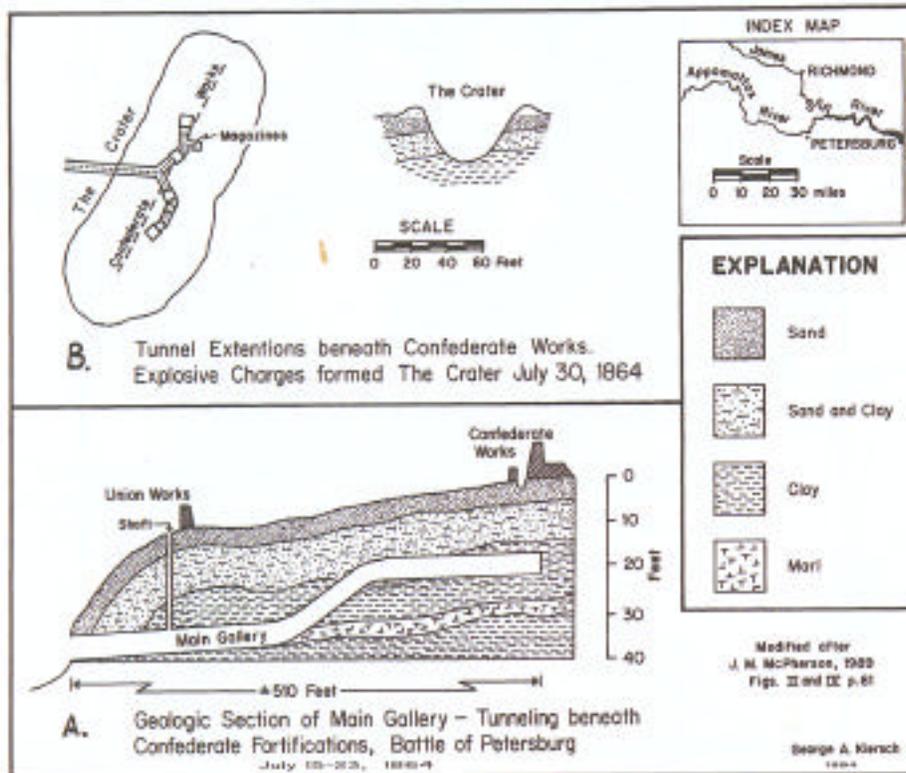


Figure 48.5. U.S. Army Corps of Engineers schematic of the tunnel at Battle of the Crater.

Hack, John T., and Leslie H. Durloo, Jr. 1977. *Geology of Luray Caverns, Virginia*. Report of Investigations 3. Revised ed. Charlottesville, Va.: Department of Conservation and Economic Development, Division of Mineral Resources.

Morse, William Clifford. 1935. *The Geologic History of the Vicksburg National Military Park Area*. Bulletin 28. Jackson: Mississippi State Geological Survey.

Tilberg, Frederick. 1954. *Gettysburg National Military Park, Pennsylvania*. National Park Service Historical Series No. 9. Washington D.C.: U.S. Government Printing Office.

Underwood, James R., Jr., and Peter L. Guth. 1998. *Military Geology in War and Peace*. Reviews in Engineering Geology, Volume XIII. Boulder, Colo.: The Geological Society of America.

Zen, E-an, and Alta Walker. 2000. *Rocks and War: Geology and the Civil War Campaign of Second Manassas*. Shippensburg, Penna.: White Mane Books.