

Bob Higgins

Viewing the Civil War Through a Geological Window

Our understanding of history is enriched by viewing events from many perspectives. An unlikely window through which to view the American Civil War is geology, the study of the planet Earth — the materials of which it is made, the processes which act upon these materials, and the changes which it has undergone and is undergoing. Geology shapes terrain, and terrain is critical to any military venture. Both Union and Confederate soldiers 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 employed it to their military advantage. Let us reach across the boundary of science and history and view three examples from the Civil War through a geological window.

Battle of Vicksburg

The Mississippi River divided the country, east from west, and was a major transportation route. Today, and during Civil War times, geologic processes continually shape and reshape the

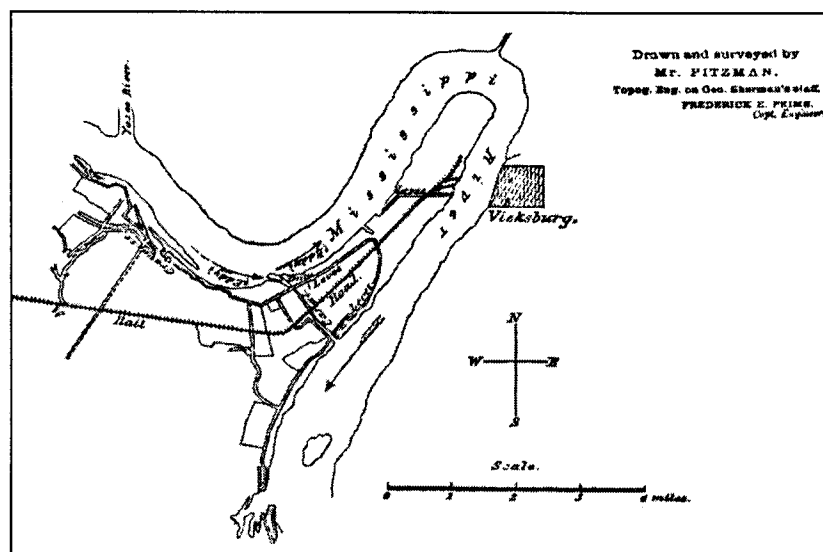
river's course and carve out the surrounding landscape: bluffs, beaches, natural levies, and swamps. New channels are constantly cut, and old ones abandoned by the Mississippi.

During the Civil War, Confederate forces closed the river to navigation. Although the Union gained control of the river south at New Orleans and north of Memphis early in the war, the Confederates held Vicksburg and controlled the Mississippi at that point. This threatened to strangle northern commercial interests while it thwarted military objectives. President Lincoln believed that the river town of Vicksburg was of great importance for Union control of the lower Mississippi River and a key to ending the war. By taking control of Vicksburg and the lower Mississippi, the South would be split in two, severing a vital Confederate supply line. Nevertheless, Vicksburg and the surrounding forts — strongholds along the bluffs of the Mississippi River — seemed impregnable. Direct attack was considered impossible; maneuvering and small attacks provided no results. A plan was needed.

In the summer of 1862, a 3,000-man infantry brigade commanded by Union Brigadier General Thomas Williams began construction of a canal at the Tuscumbia Bend of the Mississippi River. The site was 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 militarily worthless.

Canal construction began on June 27, 1862. Union soldiers felled

Map showing the hairpin bend in the Mississippi River at Vicksburg and the proposed canal to divert the river away from the city. Map reproduced from "The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies." (Washington, DC: Government Printing Office, 1880-1902).



trees and excavated soils. Progress was slow, and all manner of disease took its toll on the labor force. Eventually fugitive slave labor was added to the workforce. Nonetheless, work on the canal was halted on July 24 so that Williams and his soldiers could take part in other 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. In actuality, however, 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 had been a land surveyor, so he was enthralled with the scheme; Grant always provided him with a somewhat optimistic reply.

The soldiers and the fugitive slaves that 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 ended the dredges' progress, and by late March 1863 Grant decided to abandon all operations on the canal.

Ironically, within a few years after the end of the war, 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 digging a canal to induce a meander cutoff. 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 of the Mississippi that existed in 1863. Today, the Mississippi River flows past Vicksburg once again.

Battle of Gettysburg

For two bloody years (1861-1863) the Union and Confederate armies fought to a standstill in the countryside between Washington and Richmond, the two capitols. Another entire cam-

paign also came 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 shift the war to the North and hopefully end it.

The resulting Gettysburg Campaign took place in four geologic provinces running roughly parallel from northeast to southwest. From southeast to northwest they are the Piedmont, the Basins of Triassic age (206 – 248 million years old), the Blue Ridge, and the Valley and Ridge (Great Valley). Each province has advantages and disadvantages for a military campaign. The rough, rocky terrain of 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.

The Gettysburg Campaign began on June 3, 1863, when the Army of Northern Virginia left Fredericksburg, VA, under the direction of Lee. The campaign started in the Piedmont, and, not surprisingly, the armies left it as soon as possible. The exposed rocks, ridges, and ravines made roads rough and difficult for troops, animals, and equipment to pass. The only practical route for Lee's army to move north was 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 were of great significance to the Gettysburg Campaign because they were the passages by which armies could cross the Blue Ridge Mountains. These mountains were equally important because they shielded the Confederates from view by the Union Army.

The hallmark of the Gettysburg Campaign was the skillful use of the terrain. Eighty thousand Confederate soldiers, with all of their equipment and supplies, moved into enemy territory almost unseen and unhampered. 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 move swiftly through the mountains, all at one

time, to attack Union targets. The gap destined Lee's army to pass through Gettysburg.

While Lee was moving northeast in the protected valley, General 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.

The battle involved 3 fierce days of fighting. The first day, July 1, 1863, involved elements of both armies stumbling onto each other north of the town of Gettysburg. The Union forces were outnumbered and fell back while both commanders were desperately trying to reinforce their combatants. At the end of that day, the Union Army had the best field position, which was essentially located along the Gettysburg Sill, an outcrop of diabase (a dark-colored, intrusive rock). The outcrop is shaped like a fishhook and extends northward for approximately 3 miles from Round Top through Little Round Top, 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, a broad layer of rock that cut across and infilled the country rock. Seminary Ridge is a diabase dike and 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.

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 have a 1 to 2 advantage, and in some cases, as high as 1 to 4. The Union position had a weakness that became more apparent as the battle progressed. Owing to the local geology,

only a thin layer of dirt covered rock making it virtually impossible for the Union soldiers to "dig-in." The only protection was provided by isolated boulders and stone walls, such as the rock outcrop of Devils Den.

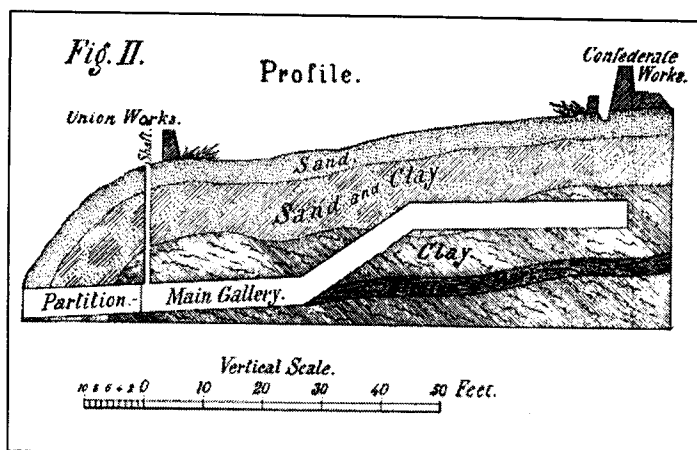
Under storm clouds and heavy rain, Lee and the Confederate Army retreated back to Virginia, signaling the end of the battle. Within a matter of weeks, both armies were on the Rappahannock-Rapidan Rivers defense line where they had started back in June 1863.

Battle of the Crater

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 connection to Richmond's supply lines. Three rail lines and two roads, which linked Petersburg with the region to the south and southwest, converged on the city. The siege of Petersburg was part of General Grant's strategy to force General Lee to extend and thin his lines in an attempt to prevent the Union from cutting off vital communication routes. The siege of Petersburg was the longest of the Civil War, lasting more than 9 months.

By June 1864, an extensive system of trenches and forts had been constructed along the eastern side of Petersburg at a distance of more than 4 miles. A 500- to 1,000-foot-wide siege line separated the two armies. Just west of Poor Creek, the lines approached the narrowest distance between them. These lines remained fairly stationary for the next 9 months. A professional mining engineer in Pennsylvania before the war, Colonel Henry Pleasants was in command of a brigade that held the Union position opposite the Confederates at this point. Colonel Pleasants conceived the idea of digging a tunnel from his regiment's position to the west of Poor Creek under a Confederate fort. Pleasants contended that by filling the end of the tunnel with 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 dig.

The excavation of the tunnel went well for the first 200 feet. At this point, miners encountered "marl" — a clay-rich deposit — which was extremely difficult to tunnel through. Pleasants ordered the tunnel to be ramped slightly upward



An illustration of the tunnel showing the upward diversion due to the strata of "marl." Illustration reproduced from "Battles and Leaders of the Civil War."

for approximately 20 feet to avoid the marl and facilitate digging. The final tunnel excavation was brought to within 20 vertical feet of the Confederate fort.

At 4:45 a.m. on July 30, the tunnel 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 forces outnumbered the Confederates, yet they were unable to advance from the crater or easily retreat. At 9:30 a.m., the attack was called off and no more support was provided to the Union soldiers in the crater. The Confederates sealed the gap and slowly advanced on the crater. The Union troops, who still outnumbered the Confederates, were forced to surrender. Although the tunnel and explosion were an engineering success, history records it as a failure. The best chance for ending the siege has instead become a symbol of a military debacle. After 10 hours of fighting and the combined loss of nearly 6,000 lives, nothing had tactically changed.

For over 130 years, geologists have theorized that the Union miners encountered a fault¹ while digging the tunnel and that the marl was displaced strata of the Eastover Formation. In August 2000, the Virginia Geological Survey and the National Park Service's Geologic Resources Division decided to test this theory to finally understand what caused the difficulty that Pleasant's men encountered while excavating the tunnel. Using a 4-inch auger drill to penetrate the sedimentary layers at the site, two holes were drilled adjacent to the tunnel at the crater. The

information gained from the rock cores produced a geologic cross section,

The drilling confirmed that the 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 sand-sized shell debris. Geologists confirmed that the marl encountered by the Union troops was an abandoned channel deposit located in the upper Yorktown Formation. The abandoned channel formed an oxbow lake² that was filled with extremely fine-grained material and consisted 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.

Since the Battle of the Crater in 1864, geologists have speculated on why the strata changed in the Union miners tunnel thereby causing a change in military operations. The answer is the presence of an ancient oxbow lake, not a fault and displaced strata, as originally speculated.

Conclusion

The Battle of Vicksburg, the Battle of Gettysburg, and the Battle of the Crater near Petersburg were events greatly influenced by geology. By becoming geologic detectives and historians, we gain a better understanding of the circumstances surrounding the events that enrich the telling of the Civil War story.

Notes

- 1 A fault is a fracture or fractures in rock together with movement that displaces the sides relative to one another.
- 2 A ox-box lake is a U-shaped lake, so named because of its similarity to the part of a yoke that goes around an ox's neck.

Bibliography

- Berquist, C.R. Jr. Oral communication, 2000.
- Brown, Andrew. *Geology and the Gettysburg Campaign*. Commonwealth of Pennsylvania: Department of Conservation and Natural Resources, Office of Conservation and Engineering Services, Bureau of Topographic and Geologic Survey, 1962.
- Inners, Jon D., Brant E. Inners, and David M. Sayre. *Military Geology of the Richmond and Petersburg National Battlefield Parks, Virginia*. Open File Report 95-08. Harrisburg, PA: Pennsylvania

- Geological Survey, Department of Conservation and Natural Resources, Office of Conservation and Engineering Services, Bureau of Topographic and Geologic Survey, 1995.
- Hack, John T. and Leslie H. Durloo, Jr. *Geology of Luray Caverns Virginia*. Report of Investigation 3. Charlottesville, VA: Department of Conservation and Economic Development, Division of Mineral Resources, 1977 Revision.
- Morse, William Clifford. *The Geologic History of the Vicksburg National Military Park Area*. Bulletin 28. Mississippi: Mississippi State Geological Survey, 1935.
- Tilberg, Frederick. *Gettysburg National Military Park Pennsylvania*. National Park Service Historical Series No. 9. Washington, DC: U.S. Government Printing Office, 1954.
- Underwood, James R., Jr., and Peter L. Guth. "Military Geology in War and Peace." *Reviews in Engineering Geology*, Volume XIII. Boulder, CO: The Geological Society of America, 1998.
- Zen, E-an, and Alta Walker. *Rocks and War: Geology and the Civil War Campaign of Second Manassas*. Shippensburg, PA: White Mane Books, 2000.
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Susan B. Hawkins

Partners in Researching Fort Donelson's African American Past

Historians often downplay the importance of the campaign for Tennessee's Fort Donelson in February 1862, compared to the larger, bloodier battles at Shiloh, Antietam, and Chickamauga. This first major Union victory of the Civil War was significant, for the Army gained control of much of Middle and West Tennessee and of major waterways that flowed out of the Confederate heartland. The capital at Nashville eventually became a center of communications for the Union Army — a river and rail network that was vital to future wartime successes. Similarly, the significance of these battles for freedom-seeking slaves and their families has been ignored. By their own initiative, thousands of runaway slaves used the opportunity of Union victory to escape from their masters.¹

Now, 140 years later, we are learning more. Volunteers from the community, university professors, and local schoolteachers have provided valuable information and support to help the Fort Donelson National Battlefield staff document and interpret the African American experience at these battles. This volunteer initiative and enthusiasm has allowed the park to piece together the overlooked African American legacy. We now know that runaway slaves used Fort Donelson (and other forts) as safe havens, where they built

homes and schools, cared for their families near the forts, and enlisted as Union soldiers in African American units.

Research Partnerships

One of the first project supporters was John Cimprich, professor of history at Thomas More College in Crestview Hills, KY. His work, "Slavery's End in Tennessee, 1861-1865," documented some of the hardships that escaped slaves endured at Fort Donelson. His book was only one of the many contributions he made. Professor Cimprich continues to offer suggestions and sources for research; and he frequently reviews text for site bulletins, web pages, and future exhibits. He recently lectured to the local community about his research on the African American experience.²

View of Cumberland River overlooking the gun batteries at Fort Donelson NB. The river served as an escape route for freedom-seeking slaves. Photo by James P. Bagsby.

