

Features

Using GIS analysis to help determine Civil War cannon locations in Manassas National Battlefield Park

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MANASSAS NATIONAL BATTLEFIELD Park, Virginia, preserves and protects the land and resources associated with the First and Second Battles of Manassas. The park is located on the northern tip of the Piedmont Plateau within the Culpeper Basin (Fleming and Weber 2003). It is situated approximately 2 miles (4 km) northwest of Manassas, Virginia, and 26 miles (42 km) west of Washington, D.C. The park comprises 2,073 acres (839 ha) of forests, varying from early succession stands of Virginia pine (*Pinus virginiana*) to relatively mature oak-hickory and bottomland hardwood forests (Fleming and Weber 2003). Hay fields, abandoned fields, and a high-use administrative area account for 3,000 acres (1,214 ha) of the park.

Much of the park's vegetation patterns, particularly the arrangement of open and forested areas, are now as they were historically. However, some areas that were grassland during the battles have subsequently grown up into forest, or were already forested when acquired by the park. In these areas, the historical vistas that helped determine the strategies and locations of cannons and troops of the combatants have been blocked from view (figs. 1A and 1B). Woodlands that obstructed historical lines of sight and corresponding fields of fire are important for understanding the nature of the fighting on the afternoon of 30 August 1862. Unfortunately, the intervening maturation of forests has made interpretation of the Second Battle of Manassas, especially the fighting that occurred on 28 and 30 August, nearly impossible.

Abstract

Manassas National Battlefield Park preserves and protects the land and resources associated with the First and Second Battles of Manassas. However, some park locations do not have vegetation patterns that are representative of historical conditions, and in some cases present-day vegetation directly obscures lines of sight that are critical to the interpretation of the battles. In this article we discuss how a three-dimensional analysis of lines of sight employing a geographic information system (GIS) was used to help decision makers choose locations for artillery placement.

Key words

artillery, cannon, Civil War, line of sight, Manassas, viewshed



Figure 1A (above left). Original (assumed) location of S. D. Lee's cannon line and interpretive wayside exhibit, prior to GIS analysis and scene restoration. Figure 1B (above right). The view from the S. D. Lee wayside after scene restoration reveals a clearing and ridgeline at the left side of the photograph.

Cannon placement and historical background

The Second Battle of Manassas is one of the few battles of the Civil War where Confederate artillery dominated the field. More than 30 guns belonging to L. M. Shumaker and S. D. Lee's artillery battalions were concentrated at Brawner Farm (fig. 2). Another four guns of Chapman's Dixie Artillery delivered a destructive raking fire from Battery Heights onto the Dogan Farm. The Confederate gunners had a clear field of fire all the way to Groveton-Sudley Road. Fitz John Porter's Union attack failed largely because of this heavy concentration of Confederate artillery fire. It has been impossible for

park visitors to comprehend the advantage of the Confederate position with the woodlands blocking these historical views (Sutton et al. 2005) (see figs. 1A and 1B).

Cannons, of course, were mobile, and cannon lines were more than likely placed at numerous locations during a battle. However, the cannons on display at the park were originally emplaced for interpretive purposes based upon the findings of a local historian and assumptions about lines of sight from the Confederate position on Brawner Farm to Deep Cut, the location of oncoming Federal troops. Civil War artillery fire was based on "line of sight," that is, in order to hit a target,



Figure 2. Overall setting where the Battle of Second Manassas took place with a commanding advantage by the Confederate army.

artillerists had to see the target. The Federals at Second Manassas, for example, were limited in the effective employment of their artillery because of restrictions resulting from ground cover and terrain, not because their guns were inferior to those of the Confederates. By contrast, the Confederates on 30 August occupied an open ridge with commanding views of the field of attack and enjoyed a day of dominance with their artillery such as they rarely experienced during the war.

Using GIS to visualize cannon placement

Park staff had suspected that Deep Cut would not have been visible from Brawner Farm. Contours observed while walking through the woodlands and while looking at GIS maps indicated a ridge may have blocked the view (see fig. 1B). However, because of the forest growth, on-the-ground testing of this question was not possible. The purpose of this study, therefore, was to conduct a simple line-of-sight analysis using GIS to determine if the original placement of the Confederate cannons on Brawner Farm was correct.

Our GIS database contains 5-foot contours for the park, so we decided in 2006 to examine various locations that would have provided a clear line of sight from Brawner Farm to Deep Cut (fig. 3, next page). We used ArcGIS software and its “line-of-sight” tool and set the observer and target heights at the average height of a Civil War soldier, which was about 5 feet, 8 inches (1.7 m). We drew three primary lines of sight, one from the original placement of the cannons on the northern section of Brawner Farm just outside the 330-foot plateau down to Deep Cut, another from a refined cannon placement inside the 330-foot plateau, and one from what we thought would be the historically ideal cannon placement. We thought this last location might have been a better vantage point, avoiding the ridge between the two areas (fig. 3). The results varied significantly.

Outcome and conclusions

Based upon three-dimensional analysis of lines of sight, we were able to determine that Deep Cut would not have been visible from the northern point of Brawner Farm, the original interpretive location of the

cannons (fig. 3). Deep Cut only becomes visible when the cannons are relocated to the southern edge of this plateau, as the angle of that view avoids the intervening ridge (see fig. 3). This was confirmed in 2007 when the trees were removed as part of the historical scene restoration project.

Ideally, we would have liked to move the cannons to the southernmost location indicated by the analysis. This location does provide the best view of the Deep Cut area; however, some forest within the scene restoration area had to be retained because of wetland concerns, and so the forests block the view. Therefore, this location would not allow visitors to have a line of sight to Deep Cut. We therefore adjusted cannon placement to a location that does allow for a direct line of sight, even though it is not ideal.

Epilog

In 2007 we finalized the environmental assessment, allowing us to restore much of this area to near-historical conditions. This opened up views that previously had been blocked by forest (figs. 1B and 4 [next page]). In addition, the restoration revealed that the ridge blocking views of Deep Cut was itself a very probable location for placement of some forward cannons under L. M. Shumaker of the Confederate army (fig. 5, next page), and so we placed cannons in that location as well (see fig. 4, left side).

References

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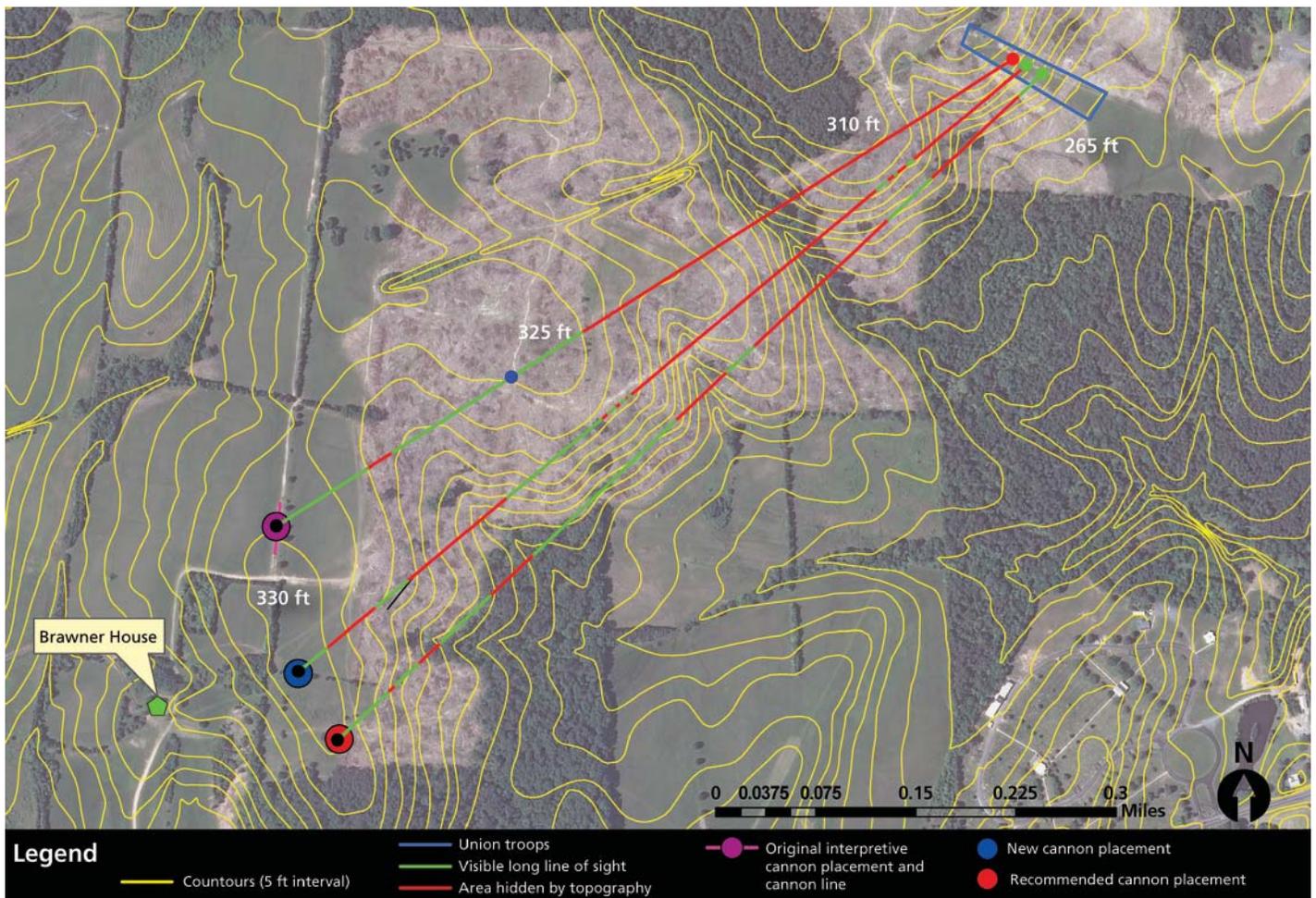


Figure 3. Topographical line-of-sight comparison among three locations; (1) previous cannon placement, (2) new cannon placement, and (3) ideal cannon placement. Green indicates visible areas; red indicates areas hidden by topography.



Figure 4. This view from the adjusted location of S. D. Lee's cannon line reveals the Deep Cut monument in the distance (arrow). This feature was not visible from the previous location. The cannon in the distance at the left is the new cannon line placed on the forward ridge. This location was not considered prior to the clearing of forest, but became an obvious probable location when the views were restored.



Figure 5. The view from the forward ridge reveals the Deep Cut monument and the hillside that was part of the primary target for L. M. Shumaker's guns.

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