

Photo provided by Gettysburg National Military Park

# Hallowed Ground

The landscape restoration and maintenance of Gettysburg National Military Park

**Since 1863**, nature and human development have changed the appearance of the landscape and historic battlefields at Gettysburg National Military Park (NMP). Now, as the 150th anniversary of that historic battle draws near, Gettysburg NMP staff members share their insights into the ongoing efforts to preserve the topographic, landscape and cultural features that were significant to the outcome of the battle.

The battlefield is now a vast national park, and the landscape is a mosaic of woodlands and woodlots, agricultural fields, pastures and intermittent streams. And although most of the landscape is natural, it still needs maintenance.

For example, fields that have not been farmed during the past 65-plus years have become forests. While some vegetation fea-

tures (thickets, woodlots and woodlands) were removed by man over the years, others were overgrown by nature, becoming dense and containing many non-native species. In addition, some historic fields, pastures and other open areas are covered by non-historic vegetation.

In 1999, the Gettysburg NMP General Management Plan/Environmental Impact

Statement (GMP/EIS) was approved, outlining goals for rehabilitating the 1863 cultural and natural features that impacted the battle.

“Battlefield Rehabilitation is a multi-year project to return major battle action areas on the Gettysburg battlefield to their appearance at the time of the Battle of Gettysburg in 1863, and to help the public better understand the soldier’s experiences on the battlefield,” said Katie Lawhon, management assistant, Gettysburg NMP. “The project includes removal of non-historic trees, but also the planting of trees, maintaining historic woodlots, planting historic orchards, building fences, and more.”

## OBTAINING HISTORICAL ACCURACY

The initial challenge was to understand the historic landscapes of the 1863 battle, and how those landscapes had changed throughout the years.

According to Lawhon, historians developed a history of the park landscapes and a set of historical base maps that documented the park’s landscape and built features. Those maps were based upon extensive research, including park archival materials, library records, historic photographs and sketches, maps, and — more recently — aerial photographs. The most important mapping resources were Department of War and Gettysburg Battlefield Memorial Association maps prepared in 1863, 1868 and 1872, as well as other maps developed by the War Department and the National Park Service (NPS) that document conditions at various times. Each set of information gathered was mapped on base maps at a common scale, and the maps were then digitized. By comparing the maps, it was possible to see how the battlefield landscape features had changed, and estimate the extent of the changes.

The next step was to determine which of the natural, manmade and topographic features were significant to the outcome of the battle.

“Using military terrain analysis, the entire battlefield was examined for characteristics such as key terrain, observation and fields of fire, cover and concealment, obstacles (both natural and manmade), and avenues of approach,” said Lawhon.



According to Lawhon, it was then a matter of determining which features were significant to the fighting of the battle. The battle action for each day of the battle was studied by reviewing official maps, War Department after-action reports written by officers of the various units that participated in the battle, letters from soldiers, diaries, and newspaper accounts.

According to the NPS, the resulting battle action maps for each day showed where troops were positioned, where they moved, and where on the field they were engaged. The maps for all three days were then combined, and a map showing the action for all three days was prepared.

Comparison of the theoretical terrain analysis map with the actual battle action map showed exactly which terrain features were significant to the outcome of the Battle of Gettysburg. Those significant features automatically became the highest priority for preservation and rehabilitation.

## REHABILITATION AND RESTORATION

The rehabilitation project began in 2000 following completion of the GMP/EIS. Much progress has been made, but there is much more yet to be accomplished.

Understanding how the generals organized the terrain for battle requires removal of non-historic trees that have grown over the past 65 to 70 years. Understanding the avenues of approach that were available and/or used requires restoration of farm lanes and roads that once crisscrossed the battlefield, but have long since disappeared.

According to the NPS, small-scale features such as fences, orchards, open woodlots and buildings affected the tactical movements of small units. These missing, dilapidated or damaged features are being repaired or replaced so that visitors can clearly understand the cover and concealment available to the soldiers and the obstacles that affected them during combat. For example, for years visitors saw the field of Pickett's Charge as one large, unbroken field. Now, nine miles of fences have been rebuilt, showing the field of Pickett's Charge in its historic configuration of 12 small fields, and the difficulties and challenges facing those troops can be understood in more depth.

According to Lawhon, the project also calls for re-establishing grasslands; restoring wetlands; replanting orchards; fencing cattle from streams to improve water quality; increasing habitat for grassland species, ground nesting birds and native plants; and more.

But rehabilitation is not without its challenges.

"Mapping and other historical documentation does not always provide enough

detail to rebuild an individual landscape feature such as a fence," said Lawhon. "Sometimes, we will know that a fence existed in a certain place, but there is not enough detail in the historical record to tell us what it looked like. Was it a five-rail fence, a Virginia worm fence, or some other type? We try to confirm each feature with two or more sources before we try to return it to the battlefield."



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Other challenges include communicating why it is important to remove non-historic trees to reopen fields and meadows of the 1863 battlefield, and keeping battlefield rehabilitation efforts sustainable by controlling brush and regrowth in newly opened fields.

### **TREE MANAGEMENT**

When it comes to achieving and maintaining the historical appearance of the trees as they were at the time of the battle, there are several examples where the appearance of trees or landscape features are considered important to the historic appearance of the battlefield, said Zach Bolitho, chief of resource management, Gettysburg NMP.

“Landscape features such as thicket areas are important to the interpretation of the battle,” he said. “The height of thickets consisted of low, woody vegetation. Thickets were possibly fields left to grow fallow, and woody vegetation started to encroach. To counter this problem, the park chose to use native shrubs to rehabilitate thickets. At a mature height, native shrubs will reach a height of 10 to 15 feet. This approach allowed the park to create a landscape feature using wood plant material that simulated young trees but removed a step to management that would involve managing vegetation that would exceed a height desired by the park. Undesirable trees found growing in the area still need to be maintained, but management of this vegetation is kept to a minimum.”

According to Bolitho, orchards were another area where historic appearance was considered important.

“Historically, it was a common practice to grow trees on a high-headed trunk, and pruning was not a common practice in the late 19th century,” he said. “After orchard trees are planted, the trees are trained and pruned for several years to create a high trunk of approximately 6 feet. The trees are then allowed to grow and take on their own appearance (see sidebar below).”

“Rootstock is also considered when rehabilitating the orchards. To create orchards that were mature at the



Photo provided by Gettysburg National Military Park

## **The Battle of Gettysburg at a Glance**

The first steps toward the Battle of Gettysburg started in June 1863. Confederate General Robert E. Lee's soldiers crossed the Potomac River in Virginia and began to march toward the Susquehanna River in Pennsylvania, with thoughts that a victory in the North would erode the Union's will to continue the fight.

The Battle of Gettysburg started on July 1, 1863, when Gen. Lee's Army of Northern Virginia, and the Union Army of the Potomac, commanded by Union General George G. Meade, met at Gettysburg by chance and engaged in battle. During the three-day battle, about 165,000 soldiers clashed in and around the small town of Gettysburg (battle-era population: 2,400).

The first shot of the Battle of Gettysburg was fired early in the morning of July 1, when fighting broke out north and west of town. During the day, Confederate troops forced Union troops southeast through Gettysburg, where the Union took up a position on Cemetery Hill, Cemetery Ridge and Culp's Hill. On July 2, the fighting centered on the southern end of the Union position, near locations such as Little Round Top, Devil's Den, the Wheatfield and the Peach Orchard. Union troops held their position, and the Battle of Gettysburg continued for one more fateful day.

On July 3, Confederate troops attacked the center of the Union line on Cemetery Ridge. After a cannonade raged for about two hours, Gen. Lee ordered his Confederate infantry to attack. More than 14,000 Confederate troops advanced across the field toward Cemetery Ridge; a deluge of artillery shot and shell raked their lines. Those who moved on toward the ridge advanced under a hail of fire. Of those who made it to the Union line, many fell or were captured in the fighting at the Angle, near the Copse of Trees. The attack that became known to history as Pickett's Charge concluded with a Confederate defeat and also ended the Battle of Gettysburg.

When the Battle of Gettysburg was over on July 3, 51,000 soldiers were casualties (killed, wounded, captured or missing) in what remains the largest battle ever fought in North America.

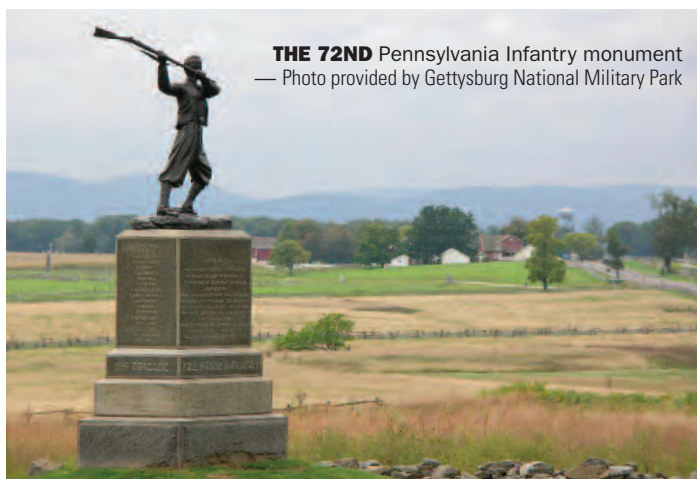
It proved impossible for the war-stressed economy of the Confederacy to replace the extensive losses suffered during the Battle of Gettysburg by Gen. Lee and the Army of Northern Virginia. On July 4, as smoke still lingered from the Battle of Gettysburg, the besieged city of Vicksburg, Miss., surrendered to Union soldiers, restoring Union control of the Mississippi River. Twenty-one months later, Gen. Lee surrendered to Union General Ulysses S. Grant at Appomattox Courthouse, signaling the end of the Civil War.

— Sidebar information provided by Gettysburg National Military Park and the National Park Service.

For the official map of Gettysburg National Military Park, visit [www.nps.gov/gett/plan\\_yourvisit/upload/GETT%20brochure.pdf](http://www.nps.gov/gett/plan_yourvisit/upload/GETT%20brochure.pdf)

**“The world will little note, nor long remember what we say here, but it can never forget what they did here.”**

**— Abraham Lincoln, The Gettysburg Address**



time of the battle, trees are planted on standard and MM111 rootstock. These trees will reach a height of 21 to 35 feet when mature. To simulate younger orchards, tree varieties were chosen that were budded on EMLA 7 rootstock. These trees reach a mature height of 10 to 12 feet.”

Unless tree species and cultivars are specific to a landscape feature, trees planted in the park are those that have been found growing in the park, are documented in scientific studies, and also are known to occur naturally in Adams County, Bolitho added.

“Fruit trees used to rehabilitate the park’s orchards were chosen for known resistance to diseases such as fire blight, scab, mildew and cedar apple rust,” he said. “By using resistant varieties, the park hopes to lessen the overall potential output of harmful pesticides.”

Since 2003, approximately 48 acres of historic woods, 28 acres of historic thickets and 28 acres of riparian buffers have been rehabilitated or established throughout the park. The park used a strategy to saturate the areas through a high-density planting using small bare root trees. It was decided that woodlands would be replaced using 680 trees per acre, Bolitho added.

“If we had an approximate survival rate of 60 percent (400 trees per acre) of the total trees planted, this would be a sufficient number of trees to begin regenerating a forest,” he said. “It was also decided that successional tree species would be used to begin regenerating a woodland because they are better adapted for growing in warmer soils exposed to higher amounts of sun. To rehabilitate thickets and riparian areas, 1,200 shrubs were planted per acre. It was important to the park that these areas receive a heavy planting that would quickly establish a woody appearance. The soils in all these areas were evaluated for wet/dry characteristics, and trees species were chosen and planted in the soil types that they were better suited for growing in.”

Irrigation needs are one of the most limiting factors on new plantings, said Randy Hill, supervisor of the Landscape Preservation Branch, Gettysburg NMP.

“We have limited water sources throughout the park, so most of our irrigation is done by hand with a water buffalo,” said Hill. “Fortunately, we have a good climate in this region which takes care of the majority of the watering naturally.”

Trees are consistently monitored for disease, insects and other

factors that could cause death or decline in the park’s trees. Issues concerning trees are correctly identified before any action is taken, and treatment options are evaluated to best resolve the given situation in an environmentally sound way.

According to Bolitho, a typical orchard day may include monitoring the approximately 117 acres of re-established orchards for damage from deer, rodents or insects and disease.

“If necessary, tree guards are installed or replaced,” he said. “The fruit trees are checked for browsing, and deer deterrents are hung from the trees to discourage browsing from becoming excessive on the young fruit trees. Throughout the season, the trees are consistently monitored for insect and disease problems. Monitoring usually occurs when doing other work activities in the orchards such as pruning and mowing or drive-by observations when an employee observes something that may be out of place.”

## COMBATING INVASIVE PLANT SPECIES

Another major factor for the rehabilitation and maintenance of Gettysburg NMP is combating invasive plant species such as multiflora rose, Japanese barberry, ailanthus and mile-a-minute.

“We have a layered and an adaptive management approach to combating invasive plant species in the park, which means we have a priority list of target species,” said Bolitho. “However, if we discover a threat through Early Detection Rapid Response, the priority may shift.”

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Some of the steps that have been taken to combat invasive plants include the following:

- \* Identify the top-10 most highly invasive plant species within the park.

- \* Understand the plants' biology to determine the best approach to either eradication, if possible, or control. This may be through mechanical means, or through chemical controls.

- \* Identify the long-term goals of landscape rehabilitation and ensure that invasive plant control is conducted in coordination with these activities. "Prior to opening the tree canopy, which will allow more sunlight to reach the forest floor and encourage seedlings to sprout more readily, we target invasive plant species (within those woodlots) that have characteristics to out-compete native species," said Bolitho.

According to Bolitho, current documentation indicates that there are probably more than 700 species of vascular plants in the park, with some 200 of those being non-native.

## ADDRESSING PROJECT NEEDS

Gettysburg NMP has a current year-round maintenance staff of 28 permanent employees and a seasonal staff of 26 that grows the total to 54 employees.

"At the height of the season, we have 21 employees devoted to cultural landscape care, 18 employees devoted to historic structure care, nine employees devoted to monument care, and six employees that work on the administrative requirements of the program," said Marc Pratt, chief of maintenance, Gettysburg NMP.

The staff includes professionals with a range of specialties, including facilities operations, safety, budgeting, maintenance, engineering, tractor operation, maintenance, gardening, labor, welding, automotive work, exhibits, preservation, masonry, carpentry, electrical, plumbing and more.

"These varied professionals take care of over 6,000 acres of land, 150 historic structures, and 1,200 monuments," said Pratt.

According to Hill, the majority of the work performed is done using an in-house fleet, but some pieces of equipment are rented when the need arises. The frequency of use of an item determines whether it is better to rent or purchase the equipment.

"Each equipment operator is responsible for the day-to-day maintenance of that item," said Hill. "We have a mechanic on staff who performs diagnosis and repairs on equipment beyond

the scope of routine maintenance. Service intervals are performed according to the manufacturer's recommendations."

Gettysburg NMP utilizes several different equipment dealers locally and regionally due to its use of a diverse range of equipment brands, and also to spread business throughout the region.

With regard to plant stock, much of the bare-root tree and shrub stock is purchased from several nurseries located in the Mid-Atlantic region, said Bolitho. Purchases are dependent on the extent of species availability and quantity from individual nurseries.

"Native seed is used to rehabilitate open areas such as fields, pastures and wetland areas," he added. "In the early years of grassland rehabilitation, the park purchased native grass seed varieties through local seed suppliers. Additionally, the park cooperatively worked with Fort Indiantown Gap north of Harrisburg, Pennsylvania, to plant bio-types that are indigenous to this area of Pennsylvania. However, in recent years, volunteers have assisted with collecting native grass and other native herbaceous seeds in the park for use in our rehabilitation efforts. Seed from native shrubs has been collected and used in thickets and riparian areas to supplement riparian plantings."

## AN ONGOING EFFORT

The Gettysburg NMP GMP/EIS project involves continuous effort, and includes not only major rehabilitation efforts, but also day-to-day maintenance of the park.

"Winter is when we perform the majority of our tree work, field mowing, and preparing equipment for the spring and summer," said Hill. "In the spring, summer, and into fall, mowing, trimming, brushing, and fence repair/replacement are daily occurrences. When the grass is growing quickly, a typical day would be to get on the tractor and mow roadsides all day, or get a string trimmer and trim all day. But when the grass slows down, you could build a fence one day, and the next day be working with a volunteer group on a special park project."

Bolitho added that managing erosion along park avenues and trails is one of the park's routine concerns.

"Recently, the park completed a site-specific cultural landscape report that addresses erosion issues of the Little Round Top, as well as many other landscape features important to that area," he said. "Designing better trail alignments and using appropriate surfaces for traffic are just some tools that will help to reduce erosion in this one area."

And, according to Lawhon, the Gettysburg NMP GMP/EIS project has also enhanced Gettysburg's natural environment. Some of the environmental benefits of the project include:

- \* Increasing grassland areas to increase habitat for grassland species such as Upland Sandpipers, Meadowlarks, Loggerhead Shrikes and Least Shrews, many of which are state-listed species of special concern.

- \* Removing cattle from key pastures with streams and wetlands to reduce soil compaction, erosion, excess nutrient loading, and ground cover loss, as well as improve water quality in the park and the Chesapeake Bay watershed.

- \* Delaying the cutting of hay to allow ground-nesting birds such as

Henslow's Sparrows, Bobolinks, and Grasshopper Sparrows to thrive.

\* Removing exotic plant species to provide opportunities for re-establishment of native plant species.

July 1-3, 2013, will signify 150 years since the largest battle ever fought in North America. Over much of that time, historic topographic features and their significance had been lost. As a result, visitors and historians could not fully understand the Battle of Gettysburg. But through their continuing efforts, the staff members at Gettysburg National Military Park (NMP) are undoing the effects of time, and realizing the goals of the NPS to preserve the features that were significant to the outcome of the Battle of Gettysburg. Because of their work and attention to detail, current and future generations can better understand this historic event.

John Kmita is associate publisher at Green Media, and editor of Landscape and Irrigation magazine and Arbor Age magazine.

Green Media editors Eric Schroder and Steve Noe contributed to this piece.

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For more information, visit [www.nps.gov/gett/index.htm](http://www.nps.gov/gett/index.htm) or [www.gettysburgfoundation.org/](http://www.gettysburgfoundation.org/)



▲ **RANDY KRICHTEN**, orchard manager for the Gettysburg National Military Park, poses in front of "The Barn with the Bullet Hole" as it is known to the locals; it also is known as "The Trostle Barn." The hole is just below the diamond-shaped patterns in the brickwork. It was near this barn that General Dan Sickles lost his leg to a Confederate cannonball.  
— Photo by Eric Schroder

## Pruning for Historic Appearance

As part of the overall battlefield cultural landscape rehabilitation described in the 1999 General Management Plan (GMP), Gettysburg National Military Park (NMP) has been systematically reintroducing orchards into the cultural landscape.

A primary goal is to manage the orchards to achieve a historic appearance rather than fruit production. Pruning in these orchards is limited to the removal of dead and diseased wood, crossed branches, and other conditions that threaten the health of the tree. Pest control has been modified to treat only those pests that threaten the health and structural stability of trees. It is believed that these actions will have a positive impact on the historic character and appearance of orchards, and also reduce possible safety concerns for visitors.

In 1847, the influential agricultural writer Andrew Jackson Downing published his "Fruits and Fruit Trees of America." This occurred at a time when farmers were taking up commercial orcharding as a vocation more than any other time in American history. During this era, farmers were planting at least a handful of fruit trees for subsistence and/or curiosity. Nearly every farmer on the battlefield had a small orchard of some type. Many of these were for home use, with occasional surpluses being sold at market. Downing believed a lack of pruning helped to promote the longevity of an orchard. He also believed "high heading" the tree canopy kept fruit out of the reach of cattle and swine (Dolan, 2009).

During the mid-19th century, most fruit trees had a rounded head, and were un-pruned, with a 4- to 6-foot-high trunk before the first scaffold branches (Dolan, 2009). When several orchards were first being established, Gettysburg NMP began experimenting with pruning techniques to achieve an historic appearance. Staff used historic photographs taken during and after the battle to guide its efforts.

Structural pruning begins when the trees are first planted, and this initial

pruning begins to establish their mature appearance. The young trees are pruned back to a height of 3 feet. Limbs that are broken and those with narrow crotches are removed, and the scaffold branches are shortened to approximately 15 inches. Reducing the tree's height and shortening the scaffold limbs stiffens the branches so they are able to support the weight of new growth. As the trees grow for the next 5 years or so, they are pruned aggressively in order to train them to have a strong central leader and to set up the structure of the scaffold limbs. The limbs are pruned to remain relatively horizontal to the ground, so they do not interfere with the limbs growing further up the trunk. The trees are pruned to a pyramidal or Christmas tree shape, and as the trees grow, the lower scaffolds are removed and the limbs are pruned to keep them flattened. Again, limbs that are diseased, dead, growing up or down, or growing toward the trunk are removed so they do not interfere with each other.

As the trunk is raised to the desired height of 4 to 6 feet, the trees are left to grow naturally, and their appearance takes on a rounded head. At this point, the trees will no longer need to be pruned, and eventually the trees will take on their own characteristics and shapes. The only pruning that will be necessary from this time on is to remove crowded, dead or diseased branches.

*Sidebar provided by Gettysburg National Military Park and the National Park Service.*

*Resources: Dolan, Susan, A Fruitful Legacy: A Historic Context of Orchards in the United States, with Technical Information for Registering Orchards in the National Historic Register of Historic Places, U.S Government Printing Office, 2009.*