



Antietam National Battlefield
5831 Dunker Church Rd.
Sharpsburg, MD 21782

PASSPORT TO PRESERVATION



Antietam National Battlefield



*"Preserving the legacy of the past, protecting the
landscape of the future."*

—UERLA & 4C

This Passport Belongs to:

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**Cover Image: The Final Attack,
Sherrick Farm**

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GEORGE MASON UNIVERSITY
CENTER for CLIMATE CHANGE
COMMUNICATION

Welcome to Antietam National Battlefield!

Welcome to Antietam National Battlefield! The National Park Service is proud to host your visit today.

This land has a deep and rich history embedded in centuries of indigenous livelihood and use by the Iroquoian Susquehannock/Conestoga and Algonquian Shawnee people, among others, for hunting and travel along the Blue Ridge and Appalachian mountain corridors. Colonial settlement pushed up the Potomac River towards Monocacy and Antietam in the 1720s and 30s.

Whether you are here to honor the lives lost on the bloodiest day in American military history, to learn about the gateway to the Emancipation Proclamation, to soak in the beautiful and robust scenery or to visit the monuments and architecture, you are

witnessing a landscape that has been preserved in conditions similar to September 17th, 1862, the date of the battle.

Antietam's topography played a huge role in the outcome of the day's fighting. The gentle rolling hills and rocky outcroppings are typical of what is called a karst system - the rock and soil formation that underlays the land. Comprised of porous limestone and dolomite, **karst systems** are known for the free flow of water, which creates healthy underground aquifers for the living beings above ground. The karst system's sloping features were used for cover by soldiers during their approach. Instead of being visible from long distances and confronting the enemy on flat ground, troops used the small hills and valleys to their advantage.



Image Left: Soldier digging a foxhole in the frozen forest, 1945

Image Top Right: Soldier statue

© NPS ANTIETAM



Today, the only battle occurring on the karst system is the one between Antietam's plant life and the region's impending climatic shifts. A lot has changed since 1862. Maryland's temperatures have slowly increased. Rainfall events are happening during different times of the year, affecting how much water is available to people, wildlife, crops and forests toward the end of the summer. Snow is scarcer in the winter than it once was, and the cold doesn't feel as cold anymore. The park is affected by these changes, which are also damaging Antietam's natural and cultural resources. Warmer weather means invasive species have an easier time thriving in the park's trees and crops. When more rainfall happens earlier in the season, Antietam Creek carries a greater volume of water that erodes the creek bed more with every passing day. The rain that falls on the park is polluted

and more acidic than it once was, affecting the landscape and monuments differently than it did decades ago.

These ecological stressors create difficulty in maintaining Antietam National Battlefield in its original 1862 condition. Any good scientist will tell you the first step to solving a problem is observing what is happening and where it is happening. Only then can solutions be suggested and tested. During your visit today, follow this guide to witness the effects a shifting climate is already having on Antietam. Take note of what you see, ask questions in the Visitor's Center, and pay attention to how some of these changes might affect you and your home. Let your Passport to Preservation show you the way to a better understanding of the climate's impacts on Antietam National Battlefield and beyond.

Glossary

Acid Rain

When sulfur dioxide (SO₂) and nitrogen oxide (NO_x) are emitted into the atmosphere from burning fossil fuels (oil and gas), they eventually enter the water cycle. In the atmosphere, these two gasses react with water and oxygen to create sulfuric and tantric acids. These acids come into the environment through precipitation (rain and snow) or dust particles.

Carbonate Rock

Rocks that are soluble due to their absorbable quality and their allowance of liquids to pass through them. Dolomite and limestone.

Dissolution

The process of disintegrating minerals, dispersing the components in a liquid (usually water).

Ecological Stressor

A physical, chemical, and biological constraint on the productivity of species and on the development of ecosystems.

Erosion

When soil, plant life and other materials that make up the surface of the ground or the bottom of a body of water gets worn away by the movement of water.

Forest Regeneration

The renewal or revival of a forest through the natural or artificial planting and growth of seedlings, saplings and young trees. This process fills in any lost tree coverage resulting from the death, removal or falling of mature trees.

Herbicide

A substance that is used by farmers and landowners to get rid of unwanted vegetation.

Invasive Species

Plants or animals that hurt the productivity of native species. They compete with native species' resources, disrupting the ecosystem's balance.

Karst System

A specific type of rolling landscape underlaid by carbonate rock. The system forms springs, sinkholes and caves.

Legacy Tree

Trees that have been alive since or before the date of significance of the protected area they stand in.

Microclimate

Local set of atmospheric conditions that differ from the surrounding area. Mostly created by trees or set infrastructure.

Sedimentation

When any sediment suspended in a body of water falls and settles on the bottom of that body of water.

Topography

The distribution and arrangement of human-made and natural features that make up an area.



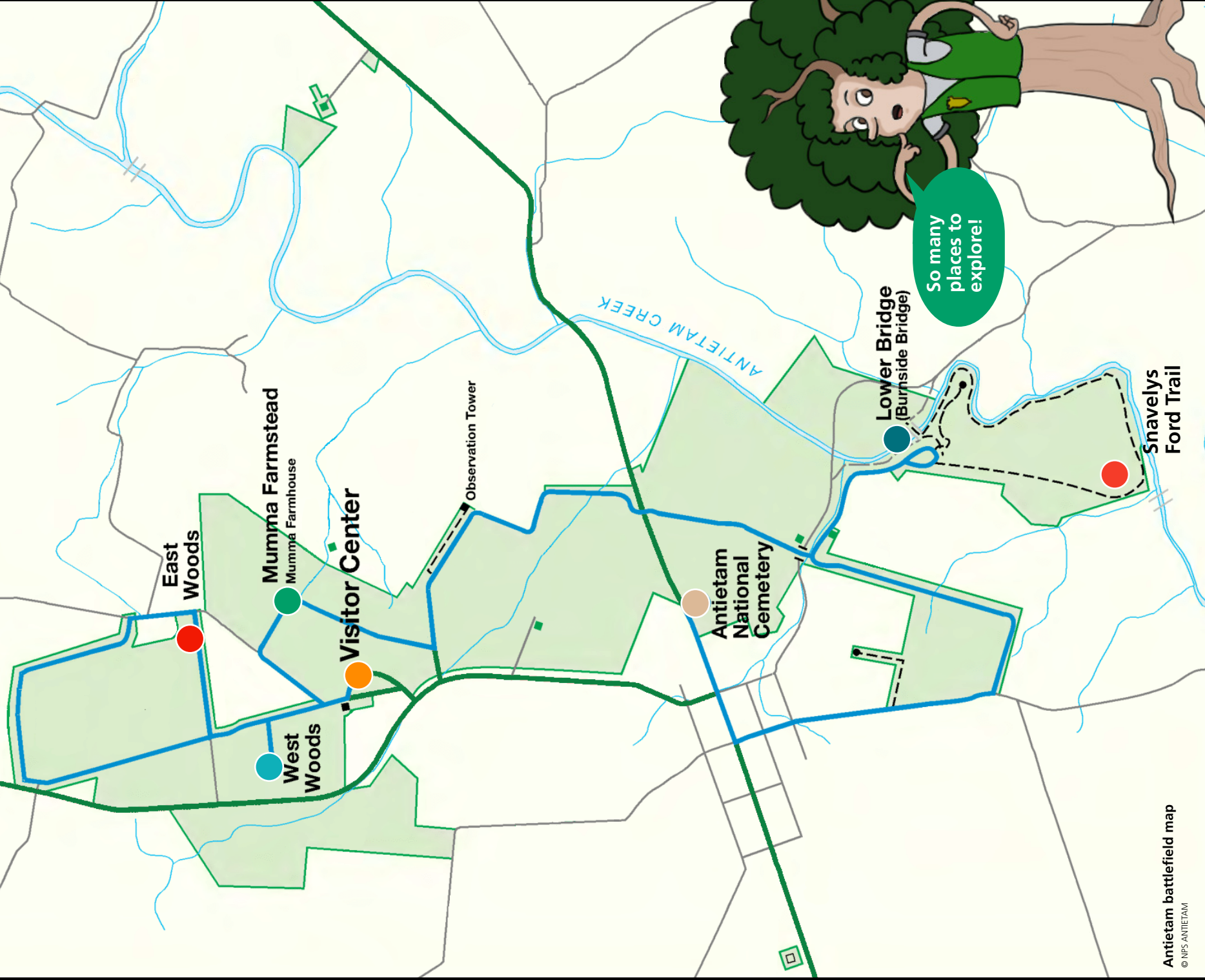
Hey, that's me!



ANTIETAM NATIONAL

BATTLEFIELD

Checkpoint Locations



Snavelys Ford Woods

This area is one of the most important and resilient environments in the park. Located in the southeast corner of the park, it has excellent forest structure characterized by oak, hickory, beech, maple and poplar trees. The developed canopy and **rolling hills** create **microclimates** that allow for a thriving understory. Like the majority of the park, it's underlaid with a **karst system** rich in limestone and dolomite. This is what helps make this area so biologically diverse.

Limestone, while high in nutrients, forms a fragile soil structure. As a **carbonate** rock, limestone is susceptible to **dissolution** from surface and groundwater. The **topography** of this landscape is threatened by acid rain, a type of precipitation caused by pollution in the atmosphere. Acid rain is high in pH, which is a measure of how acidic or basic a liquid is. This high pH makes the water highly acidic to plant life. The acidic property allows the rain to cut through the limestone, speeding up the dissolution and creating more sinkholes and erosion. This can cause harm to the infrastructure and cultural integrity of this resilient area of the landscape.

Objectives:

1. Try and find outcrops of limestone in the woods (an example of limestone illustrated in drawing below and pictured to the right)
2. Using page 11, Draw an area with high biodiversity (tree and plant life) in Snavelys Ford Woods

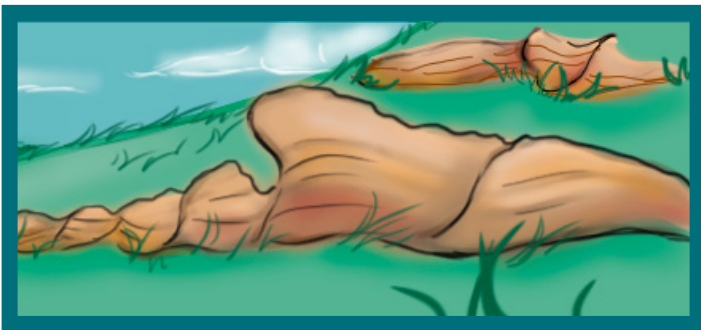


Image right: Rock units at Harpers Ferry.

© NPS/ TRISTA L. THORNBERRY-EHRlich

September 17, 1862

"After lying in the woods a while we were formed and marched about 2 mile over hills and through valleys, fording a river about knee deep. From the ford, we were marched to a side hill near it. Here the Rebels again opened on us from another battery, wounding some of our men. We were after a while formed and marched over the hill and finally in a sort of valley, behind our battery - here we had to lie down under the bursting of the enemy's shells. One shell burst so near as to scatter dirt in my face as I laid upon the ground. After staying here a short time we were ordered over the hill and were formed in a cornfield upon the opposite side."

- Robert Kellogg, 14th Connecticut Volunteer Infantry fought from near the Mumma farmhouse, down to the west of the Roulette farm near Sunken Road.



CHECKPOINT

Objectives:

1. Connect the dots of the invasive species
2. Can you identify the invasive plant species you've revealed in the connect the dots activity below?



Mumma Farm

Mumma Farm marks the only place where deliberate destruction of property took place during the battle. The Confederate soldiers burned the structures of the farm. Today, a reconstruction of the buildings stand, highlighting the historical importance of the battle and those that fought there.

The agricultural landscape at Antietam National Battlefield helped make it a pivotal battle, and preserving that scenery allows visitors to experience the land just as the soldiers did. The crops found in the park—such as corn, soybeans, barley—are similar to what were planted in the 1800s, further preserving the cultural heritage of the park. Unfortunately, as temperatures rise in the area, it becomes a challenge for park staff to maintain this landscape.

Invasive species, types of nonnative plants, thrive in warmer temperatures and are competing for the native crops' resources. The most pervasive are johnsongrass, marestail, thistles, onion weed and lambsquarters.

Climate change is likely to increase the range of johnsongrass, as the species is able to adapt in varying climate conditions.



Dead Johnsongrass
© NPS NATURAL RESOURCES



Horseweed
© NATIONAL PARK SERVICE

Hotter temperatures and an increase in carbon dioxide levels will not only boost plant growth, but also make these plants more resilient. Marestail is predicted to become more resistant to herbicides with increased temperatures and carbon dioxide levels.

Herbicides can be used to target invasive species. However, if not used properly, herbicides can cause contamination in surrounding waterways. Park management and land tenants use precautions to ensure this doesn't happen.

CHECKPOINT

Objective:

1. Look at how fast Antietam Creek is moving today. Try to find places where the bank looks like it is being washed away or cut into by the moving water.

Burnside Bridge/Antietam Creek

The Burnside Bridge next to Antietam Creek marks where General Ambrose Burnside and the Union Ninth Corps fought to advance on Confederate troops, finally finding success and crossing the bridge after losing 500 soldiers over the course of three hours. Today, cables are used to keep large limbs of surrounding trees from falling on the bridge. The most famous tree that stands next to the bridge, known as the Burnside Sycamore, witnessed the battle and the many years that have passed since then. The tree's root system is embedded along the edge of the creek bed, where **erosion** and **sedimentation** have taken their toll. With every extreme precipitation event, more of the bank washes down the stream, causing the ground that anchors those roots to erode. This compromises the structure of this piece of natural and cultural history. Since more extreme precipitation events are occurring every year, an intensification driven by climate change, this process has been sped up over time.

Burnside Bridge

© NPS ANTIETAM/BIAS, MARK MARK'S PHOTO

September 21, 1862

"I followed in the rear of the Regt. Until it reached the fatal bridge that crosses the creek, this bridge is composed of 3 stone arches and the stream is about the size of that one just west of Berlin. The enemies sharpshooters commenced the action being posted in trees and under cover of a wall on the high ground on the other side of the creek, the order was for the 11th to take and hold the bridge until the division of Genl. Rodman passed."

- George, 11th Connecticut, fought at Burnside Bridge

West Woods

The West Woods originally covered 45 acres of land during the time of the battle. Today, this area is home to 16 reforested acres and a trail for visitor exploration. The park management staff is charged with the reestablishment and upkeep of these 16 acres, making sure they are planted with tree species that are authentic to forest conditions in 1862. Those tree species include oak, ash, hackberry and hickory trees.

Forest regeneration has been difficult for all of the parks within the National Capital Parks Area, Antietam National Battlefield especially. According to the 2019 Annual Tree Report, only 10% of Antietam's forested areas had enough seedlings and saplings to support healthy and sustainable tree regeneration. This problem is largely driven by the increased frequency and intensity of extreme weather events, which is caused by a changing climate. When an extreme weather event occurs, and mature trees are damaged or brought down, the canopy loses some cover, allowing more sunlight to come through to the forest floor. This introduced source of light and heat creates a harsher environment for the seedlings and saplings trying to grow there, and not all of them can survive. The increasingly sporadic nature of precipitation events could also leave young trees without enough water to grow and thrive during certain times of the year.

Objectives:

1. Find a sapling or seedling in a large patch of direct sunlight
2. Find a sapling or seedling in a cool shady spot



CHECKPOINT



Ash Trees in the East Woods

Across the nation, all types of ash trees have been killed off by the Emerald Ash Borer. These small green insects lay their eggs on the bark of the ash trees, and the larvae burrow down into the wood. They feed off the water, sugar, and nutrient sources of the trees, depriving the trees of basic necessities for survival. Once an ash tree has been infested, it is certain that the tree will die. Since the borers were discovered in Antietam in 2012, they have destroyed most of the ash trees across the landscape that measure 10 inches in diameter or larger.

The ash tree is a native species to the area, and the park management staff has worked hard to protect and reestablish it within the park. With shifting climate patterns, however, other species of bugs that act as parasites to the borers have been largely killed off. The borers, who are less susceptible to climate extremes and therefore aren't hosting as many of these deadly parasites, are able to flourish and take down every ash tree they can lay their eggs on. The East Woods has some of the strongest evidence of ash borer destruction.

Objectives:

1. Find a dead ash tree, and look closely at its branches to find tunneling
2. On page 18, circle the photographs that show Emerald Ash borer tunneling activity



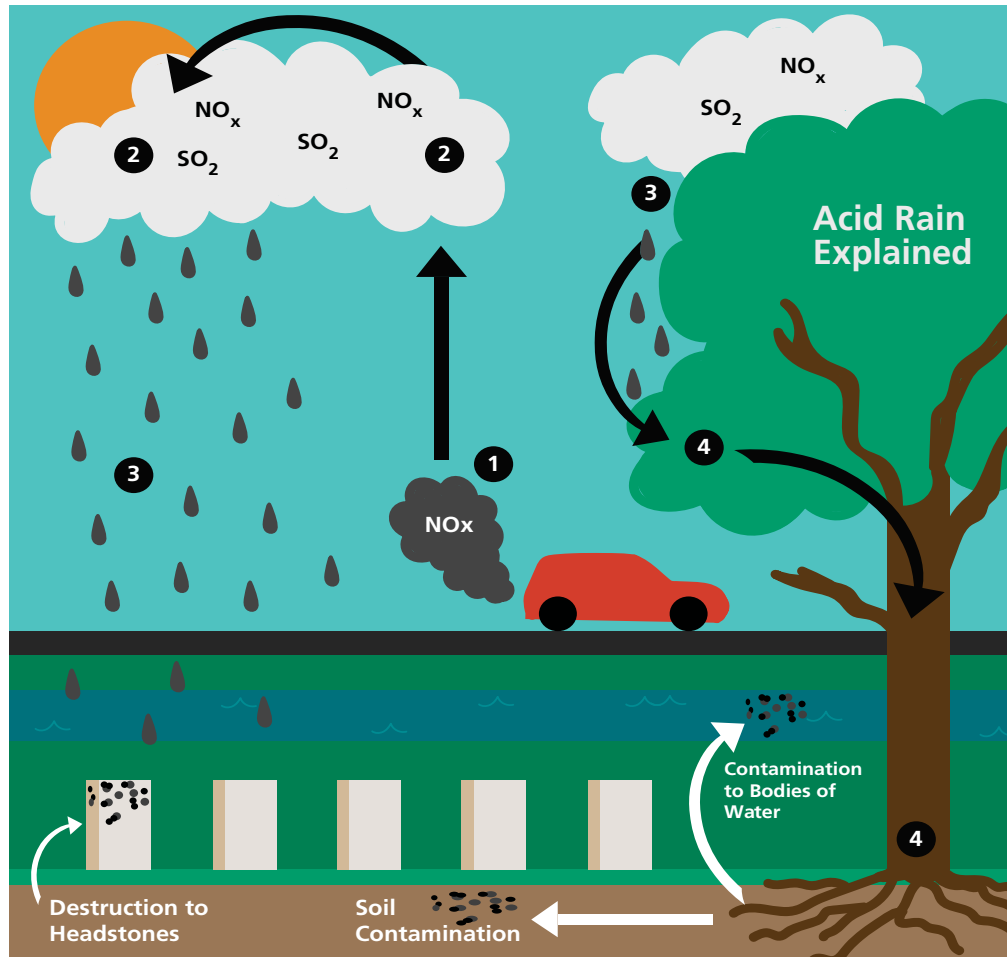
Emerald Ash Borer

© NPS/ LEAH BAUER

Cemetery

The cemetery was officially dedicated in 1867 and serves as a burial site for 4,776 Union soldiers, in addition to 200 non-Civil War burials from the Spanish War, World War I and II and Korea. The area is a place of solemnity and reverence.

But today this sacred resting place has fallen under threat from wildlife like burrowing groundhogs and **acid rain**. Acid rain may speed the weathering process for monuments and gravestones and is harmful to the **karst system** underlying the park. These structures that are held in remembrance of the battle could begin to deteriorate with the increase of acid rain and pollution.



Objective:

1. Describe the effects of acid rain and wildlife you see at the cemetery on page 23



September 26, 1862

"I now have a few moments in writing to you to let you know of an accident which happened to me on the evening of the 18th. One of the 135 P.V. boys accidentally shot me through the back... There was a hard fought battle and many lives lost on both sides but I think the loss of the Rebels were more than double our loss... I am now 10 miles from Middletown Md and as soon as we get moved I will write to you to let you know where we are moved to. As I do not think of any thing more that will interest you I will bring this letter to a close and write to you again in a few days."

- Erred Fowles, died on October 6, 1862. He is buried in Grave #3724 in the cemetery at Antietam. His daughter, Ida May Fowles, was born October 10, 1862.

Passport Stamp

Battlefield Defender Pledge

*"I am proud to be a Battlefield Defender.
I promise to appreciate, respect, and
protect all national park places. I also
promise to continue learning about the
landscape, plants, animals and history
of these special places. I will share what I
learn with my friends and family."*

Defender Signature

Ranger Signature

