



**Antietam National Battlefield  
Climate Action Plan  
August 2013**

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## Introduction

### ANTIETAM NATIONAL BATTLEFIELD

Antietam National Battlefield (park) spans over 1,937 acres featuring 96 monuments, markers, and cannons that identify numerous battle positions and casualties of the first major battle to take place on Union soil during the Civil War. Visitors come to the battlefield to experience the history of the Battle of Antietam. Located in Sharpsburg, Maryland, Antietam National Battlefield offers several trails and tours for visitors to enjoy. Additional recreational activities include camping, fishing, and horseback riding.



The Battle of Antietam occurred September 17, 1862 and is considered the “bloodiest single-day battle in American history” with over 23,000 casualties. The Battle sparked Abraham Lincoln’s issuance of the preliminary Emancipation Proclamation. It also ended the Confederate Army’s first invasion into the North. Keeping the memory of the Civil War alive preserves history for future generations and ties our past to our present. Every year, the park and its partners host the Antietam National Battlefield Memorial Illumination in honor of the soldiers who fell during the Battle of Antietam with participants lighting 23,000 candles to honor each soldier killed, wounded, or missing during the battle. September 2012 marked the 150<sup>th</sup> anniversary of the Battle of Antietam and was observed with living history, guest lectures, and memorial ceremonies.

### ANTIETAM NATIONAL BATTLEFIELD CLIMATE ACTION COMMITMENT

As the steward of the nation’s most valued public lands, the National Park Service (NPS) has an obligation and an opportunity to be a leader in protecting the environment. As a participant in the Climate Friendly Parks (CFP) program, Antietam National Battlefield belongs to a network of national parks that are at the forefront of sustainability planning. By developing a greenhouse gas (GHG) inventory, setting an emissions reduction target, developing this climate action plan, and committing to educate park staff and the public about climate change and mitigation efforts, the park is leading by example. In doing so, the park commits to reducing GHG emissions from park operations by 12 percent below FY 2011 levels, by 2020, through the following actions:

1. Prioritize facility improvements that will reduce park energy use.
2. Commission energy audits for park facilities and include considerations for historic structures.
3. Continue to pursue replacement of incandescent light bulbs throughout the park and install motion sensors for light fixtures throughout the park.
4. Develop renewable energy sources.
5. Reduce emissions from mobile combustion by upgrading park fleet, mowers, and infrastructure.
6. Create a culture that supports staff in reducing emissions from driving.

7. Develop strategies for greener meetings.
8. Educate park staff on ways to reduce emissions during the workday.
9. Develop a solid waste reduction plan that includes composting and recycling.
10. Educate visitors about climate change risks and impacts as well as the actions they can take to help reduce emissions at home and while visiting Antietam National Battlefield.

The Antietam National Battlefield climate action plan serves to support and enhance existing initiatives, such as the park's and the National Capital Region's (NCR) environmental management systems (EMS). The park's EMS is a comprehensive management system that addresses all environmental programs at the park and provides the context for actions that reduce park emissions. The NCR EMS addresses the energy- and climate-related goals for all parks in the region and aligns with the NPS Green Parks Plan; Executive Order (EO) 13423, Strengthening Federal Environmental, Energy, and Transportation Management; and EO 13514, Federal Leadership in Environmental, Energy, and Economic Performance. The park has had Fuel, Energy, Water and Environmental Audits performed. The recommendations from recent audits and the goals in this climate action plan will be incorporated into the park's EMS for performance tracking. Additionally, the climate action plan supports the park's long-term planning efforts, including the Draft Foundation Document released in 2013. It should be noted that the purpose of this climate action plan is to reduce park GHG emissions, and it is not intended to address park adaptation to climate change impacts.

## THE CHALLENGE OF CLIMATE CHANGE

The atmosphere has a natural supply of gases that trap heat and keep the temperature of the Earth warm enough for life to survive. Such gases are known as greenhouse gases or GHGs. However, the release of certain GHGs—including carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O)—has disturbed this balance. These gases are the result of burning fossil fuels during processes such as industrial manufacturing, energy production, and driving vehicles. The gases can stay in the atmosphere for at least 50 years but often remain over many centuries, and they are accumulating in the atmosphere faster than natural processes are able to remove them. The increase in GHGs is causing an overall warming of the planet, commonly referred to as “global warming.” The term “climate change” describes the variable consequences of global warming over time.

According to the Intergovernmental Panel on Climate Change, the leading international scientific organization for the assessment of climate change, “continued GHG emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century.”<sup>1</sup> Rising global temperatures will further raise the sea level and affect all aspects of the water cycle, including snow cover, mountain glaciers, timing of spring runoff, water temperature, ocean currents and upwelling, salinity levels of inland coastal waters, and aquatic life. Climate change is also expected

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<sup>1</sup> Intergovernmental Panel on Climate Change, Climate Change: 2007: Synthesis Report, page 45, [www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4\\_syr.pdf](http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf).

to affect human health, alter crop production, modify animal habitats, and change other features of our natural and managed environments.

## ANTIETAM NATIONAL BATTLEFIELD AND CLIMATE CHANGE

Climate change presents significant risks and challenges to the NPS. In the area around Antietam National Battlefield, climate scenarios suggest an increase in the frequency of extreme temperature and precipitation events due to climate change.<sup>2</sup> Changes in precipitation and temperature will affect the ecological, cultural, and recreational features of the park. The park staff considered the following potential climate change impacts while identifying actions to reduce greenhouse gas emissions:



- Changes in growing seasons, which will affect vegetation.
- Increased opportunity for invasive species based on ecosystem changes.
- Unpredictable management needs for Antietam National Battlefield natural resources due to climate change uncertainty.
- Changes in visitation due to changes in seasonal patterns.

By measuring and reducing GHG emissions from park-related activities, Antietam National Battlefield intends to minimize its contribution to climate change and the resulting detrimental impacts.

## INVENTORY PROCESS

Antietam National Battlefield completed an emissions inventory by gathering data from park staff about park operations, and entering the data into the Climate Leadership in Parks (CLIP) tool. The CLIP tool was initially developed by the NPS CFP program, in association with the U.S. Environmental Protection Agency, to account for GHG emissions specific to national parks. The tool is designed to:

- Convert energy and resource use data into metric tons of carbon dioxide equivalent (MtCO<sub>2</sub>e), which is a single unit that standardizes CO<sub>2</sub>, N<sub>2</sub>O, and CH<sub>4</sub>.
- Use data gathering to educate park employees about the sources of GHGs and the emissions inventory process.
- Assist with identifying strategies to reduce GHG emissions.

<sup>2</sup> Gonzalez, Patrick. "Climate Change Trends for Resource Planning at Catoctin Mountain Park." National Park Service, June 25, 2012.



- Enable park personnel to track current and future progress toward emissions reduction goals.

Park activities such as fuel and electricity use, refrigeration, and treatment of solid waste all produce different types of GHGs. Since not all GHGs affect climate change to the same degree, it is necessary to convert each GHG to a common unit in order to compare them in the park inventory. The CLIP tool automatically converts the park's data into MtCO<sub>2</sub>e.



The conversion to MtCO<sub>2</sub>e is based on the potential of a specific GHG to contribute to the greenhouse effect—which is known as the GHG's global warming potential (GWP)—relative to the potential of CO<sub>2</sub>, which is given the GWP of 1. The GWP of CH<sub>4</sub> is approximately 21, meaning that CH<sub>4</sub> has 21 times the potential of CO<sub>2</sub> to cause global warming. The output of the CLIP tool is the park's emissions profile, which was used to prioritize GHG emission reduction strategies, as outlined in this action plan.

Antietam National Battlefield set fiscal year (FY) 2011 as the baseline GHG inventory year and gathered annual usage data (e.g., gallons of fuel used in a year) related to park operations and visitor travel within park boundaries for FY 2011. Employee commuting data was collected and included in the inventory as well, through an online survey developed by the CFP program.

Data categories include stationary combustion, mobile combustion (e.g., the park's vehicle fleet and mowers), purchased electricity, solid waste, refrigeration, visitor emissions, employee commuting, and livestock. These categories can be divided into direct and indirect GHG emissions. Scope 1 emissions are direct emissions from sources owned and operated by the park. This includes emissions produced when fuel is burned within park boundaries (e.g., wood) or when fueling a park vehicle; it also includes "fugitive" emissions released from refrigeration use. Scope 2 emissions are indirect GHG emissions produced from park consumption of purchased electricity. Scope 3 emissions are all other indirect emissions, such as emissions from visitor vehicles, employee commuting, and offsite waste disposal.

## Park Emissions Profile

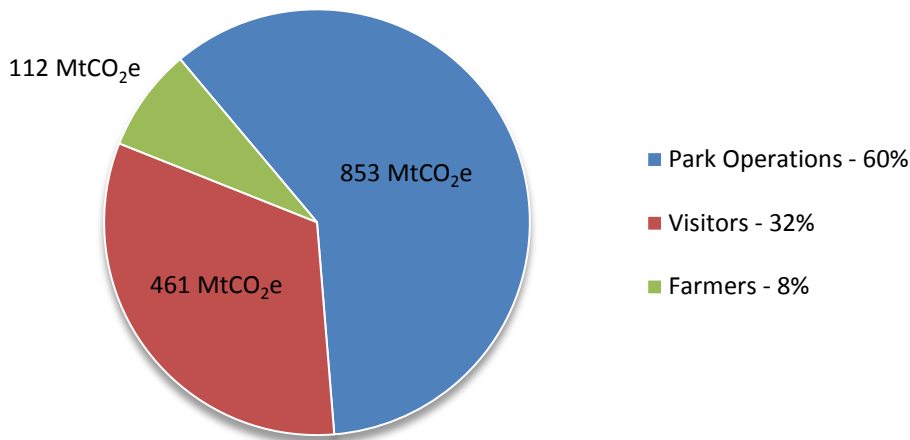
The Antietam National Battlefield GHG inventory for FY 2011 includes emissions from park operations, visitors, and farmers who lease land from the park. The cooperating association at the park operates in the Visitor Center operates the bookstore and is captured in the park operations data. Sources of emissions from park operations include heating oil, propane, kerosene, purchased electricity, gasoline and diesel use for park-owned or leased vehicles and equipment, solid waste disposal, refrigerant use, and employee commuting. The park uses minimal fertilizer periodically for projects such as turf and orchard restoration. Wastewater from most of the parks' buildings is treated through an on-site septic system; wastewater from park facilities' on Maryland Route 34, including

the Maintenance Shop, Headquarters, and Lodge are treated by publically owned treatment works. Visitor emissions are estimated based on annual visitation numbers for visitor vehicle transportation, and wood and propane used by campers. Farmer data includes a livestock inventory. Fertilizer data is not available for farmers, but will be included in subsequent inventories as the park captures more data on fertilizer use. A summary of the inventory is detailed below.

### ANTIETAM NATIONAL BATTLEFIELD GHG INVENTORY – FY 2011

Total GHG emissions from park operations, farmers, and visitors for FY 2011 amounted to 1,426 MtCO<sub>2</sub>e. For comparison, a typical single-family home in the U.S. produces 12 MtCO<sub>2</sub>e per year.<sup>3</sup> Thus, the combined FY 2011 emissions from park operations, farmers, and visitor activities within the park were roughly equivalent to the emissions from the energy use of 119 households. Park operation emissions contributed the greatest percentage of the total emissions from Antietam National Battlefield, producing approximately 853 MtCO<sub>2</sub>e (60 percent of total emissions). Visitor emissions produced 461 MtCO<sub>2</sub>e (32 percent of total emissions), primarily from vehicle use. Farmer emissions from livestock produced 112 MtCO<sub>2</sub>e (8 percent of total emissions). See Figure 1 showing the total park GHG emissions profile for FY 2011.

FIGURE 1: FY 2011 ANTIETAM NATIONAL BATTLEFIELD TOTAL GHG EMISSIONS – 1,426 MtCO<sub>2</sub>E



In order to target emissions reduction efforts, the park assessed park operations emissions by source. At 506 MtCO<sub>2</sub>e (59 percent of total park operations emissions), purchased electricity is by far the largest contributor of GHG emissions from park operations. Mobile combustion contributed 156 MtCO<sub>2</sub>e (18 percent) to the total park operations emissions, making it the second largest contributor. Stationary combustion contributed 103 MtCO<sub>2</sub>e (12 percent), refrigeration (e.g., refrigerators, freezers, and air conditioning) contributed 10 MtCO<sub>2</sub>e (1 percent), and solid waste contributed 8 MtCO<sub>2</sub>e (less than 1 percent). Park employee commuting contributed 70 MtCO<sub>2</sub>e (8 percent) to the

<sup>3</sup>U.S. Environmental Protection Agency. "Greenhouse Gases Equivalencies Calculators." Clean Energy Resources. EPA, 2011. Web. <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>.

park's GHG emissions for FY 2011. See Figure 2 for a breakdown of emissions from park operations.

**FIGURE 2: FY 2011 ANTIETAM NATIONAL BATTLEFIELD OPERATIONS GHG EMISSIONS BY SOURCE – 853 MtCO<sub>2</sub>e**

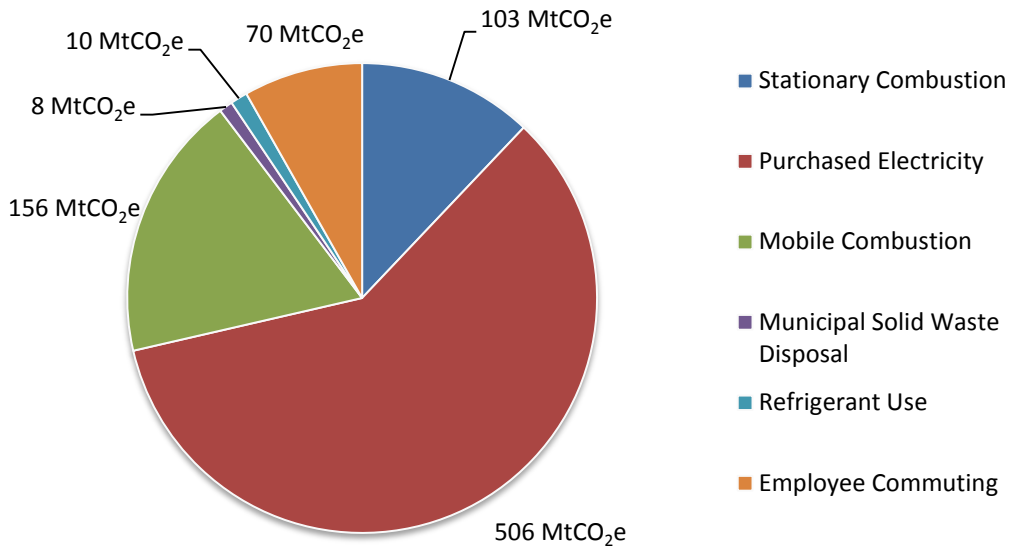
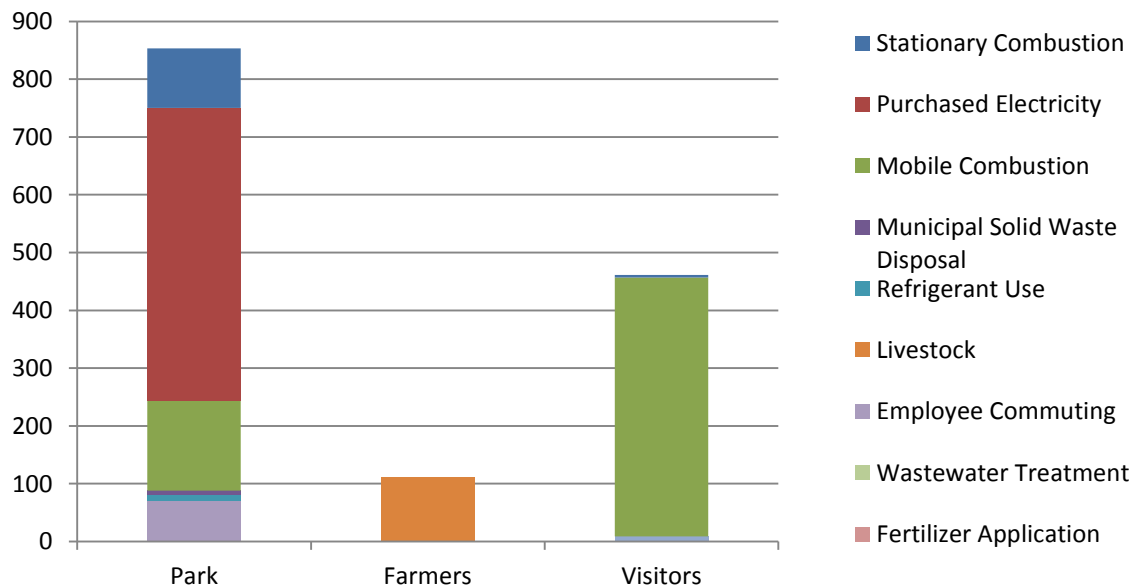


Figure 3 below provides a comparison between the emissions profiles for the park, visitors, and farmers. The visitor profile consists of vehicle emissions, emissions from idling during the annual Antietam Memorial Illumination event, and stationary combustion from burning wood and propane. All emissions from farmers are the result of 90 cows and 17 sheep.

**FIGURE 3: FY 2011 ANTIETAM NATIONAL BATTLEFIELD GHG EMISSIONS BY SOURCE – SOURCE CONTRIBUTION**





## Strategies for Reducing Emissions

Antietam National Battlefield staff developed reduction strategies and actions during the park's CFP workshop held on April 2 and 3, 2013, at the National Conservation Training Center in Shepherdstown, West Virginia. These strategies focus on reducing energy consumption, reducing transportation emissions, reducing the amount of solid waste sent to the landfill, and increasing climate change education efforts. Since the majority of park wastewater is treated by a septic system, wastewater was not a top priority for action planning; however, as natural resource stewards, staff are still dedicated to reducing water use. Park staff identified a number of strategies to reduce emissions based on emission reduction potential, cost-effectiveness, feasibility, co-benefits, local impact, and feasibility.

### STRATEGY 1: REDUCE GHG EMISSIONS FROM ENERGY USE BY 16% BELOW FY 2011 LEVELS BY 2020

The largest contributor of GHGs from park operations is purchased electricity, which produced 506 MtCO<sub>2</sub>e in FY 2011. Because of this, Antietam National Battlefield will focus on reducing energy consumption as a top priority. In addition to reducing overall GHG emissions, reducing energy consumption will provide the park with reduced costs and overall operational savings.

#### PROGRESS AS OF APRIL 2013:

- Installed light-emitting diode (LED) lamps in the Visitor Center, and compact fluorescent lamps, motion sensors, and dimmers throughout the park.
- Installed more efficient heating, ventilation, and air conditioning (HVAC) systems; heat pumps; and furnaces.
- Installed energy-efficient hand dryers in the Visitor Center restrooms.

#### ANTIETAM NATIONAL BATTLEFIELD COMMITS TO THE FOLLOWING ACTIONS IN ORDER TO REDUCE PARK ENERGY USE:

1. Reduce energy use in buildings through the following actions:
  - Evaluate energy audit results and set priorities for implementation across park buildings.
  - Continue to upgrade lighting throughout the park where appropriate.
  - Initiate an internal lighting audit to prioritize which structures need to be upgraded with LED light bulbs.
  - Add window insulation where possible.
  - Install light occupancy sensors in hallways and on porches.
  - Insulate garage doors at the maintenance shop and other areas where applicable.
  - Purchase and install programmable thermostats.
  - Upgrade HVAC systems at Mumma House and throughout the park where needed.
  - Insulate chimneys.
  - Look for opportunities for more efficient winterizing strategies.

- Evaluate buildings that are only used seasonally, and consider opportunities for winterizing and shutdown of buildings.
  - Purchase and install circulation devices for large HVAC units.
  - Insulate existing water heaters, and consider replacing large water heaters with smaller ones.
  - Monitor power use by building.
  - Consider installing and/or upgrading shading and awnings for windows.
  - Benchmark current staff use of power strips, and install smart power strips for electronics accordingly.
  - Install aerators at locations using public water.
2. Determine which park historic structures need to be prioritized for energy improvements.
    - Collaborate with a historical architect to determine how to preserve finishes and plaster work of historic structures when making structures more energy efficient.
    - Determine appropriate energy-saving activities for historic structures, on a per building basis.
  3. Ensure that contracting language reflects energy-efficient requirements for new products.
  4. Update solar lighting system in parking lots.
  5. Reduce heating oil use.
  6. Reduce propane use.
  7. For long-term planning, consider constructing a new energy efficient administrative building to accommodate all park staff in one location.
  8. Purchase and install solar arrays for the roofs of the Visitor Center and the resource management and law enforcement offices. The solar energy can be used as a power backup or can be resold to the park's power provider.

## **STRATEGY 2: REDUCE GHG EMISSIONS FROM TRANSPORTATION BY 5% BELOW FY 2011 LEVELS BY 2020**

The second largest contributor of GHGs from park operations is mobile combustion, which produced 156 MtCO<sub>2</sub>e in FY 2011. This includes fuel use in vehicles and small equipment such as mowers and leaf blowers. Taking actions to reduce mobile emissions sources is critical for reducing the park's GHG emissions.

### **PROGRESS AS OF APRIL 2013:**

- Performed fleet inventory analysis.
- Identified fleet vehicles in need of replacement.
- Purchased three electric utility task vehicles and one hybrid vehicle.
- Prioritized areas for mowing and reduced the need for mowing around fences.
- Increased trail network to encourage visitors to walk rather than drive.
- Increased interpretive tours and signage for trails to make them more appealing to visitors.
- Acquired two zero-turn mowers.

### **ANTIETAM NATIONAL BATTLEFIELD COMMITS TO THE FOLLOWING ACTIONS TO REDUCE PARK EMISSIONS FROM TRANSPORTATION:**



1. Reduce emissions from park fleet through the following actions:
  - Group cars by location and make sure all safety, environmental, and appropriate job criteria are met in order to use the right vehicle for the job.
  - Consider replacing older, less efficient vehicles.
  - Consider whether it is more cost-effective to purchase new vehicles and equipment rather than maintaining old, inefficient ones.
  - Consider using more General Services Administration-owned vehicles when appropriate rather than purchasing new vehicles.
  - Consider using project funds to rent vehicles for specific projects, as this allows opportunity for the right size vehicle to be used for the job.
  - Consider having park staff take breaks in field instead of driving back to the maintenance shop.
  - Continue to consider carpooling and teleworking when appropriate.
  - Upgrade fleet to include more hybrid and electric vehicles.
2. Reduce emissions from park mowing through the following actions:
  - Have the EMS team update the mowing plan to be more comprehensive and to outline the best way to reduce fuel use.
  - Consider the potential for reducing park mowing and trimming.
  - Determine criteria for staff to use when determining the proper mower for the job, and educate staff on those criteria.
  - Develop a mower purchasing strategy and ensure that the mower purchasing strategy is incorporated into park planning documents.
  - Stage mowers in different parts of the park to reduce transportation time to the location to be mowed.
3. Reduce emissions from visitors by considering the following actions:
  - Provide a shuttle (bus or trolley) for visitor use throughout the park.
  - Provide bike rentals for visitors.
  - Purchase radio transmitters for communicating with visitors.

### **STRATEGY 3: REDUCE GHG EMISSIONS FROM WASTE BY 50% BELOW FY 2011 LEVELS BY 2020**

Solid waste disposal creates emissions when organic matter decomposes in the landfill. Because the waste in landfills has little exposure to oxygen, the organic matter decomposes anaerobically, releasing methane in the process. The disposal of solid waste produced 8 MtCO<sub>2</sub>e (less than 1 percent of emissions) in FY 2011. Although this is a relatively small contributor to the overall emissions, there are opportunities to significantly reduce GHG emissions associated with this activity. In addition, reducing solid waste can save on disposal fees and staff time.

#### **PROGRESS AS OF APRIL 2013:**

- Created a strong staff recycling program that includes battery, cardboard, aluminum, paper, composting, and yard waste.
- Decreased the amount of visitor waste containers.
- Reduced park junk mail delivery.
- Purchased green products.
- Networked printers to eliminate excessive ink use and reduce energy consumption.

## ANTIETAM NATIONAL BATTLEFIELD COMMITS TO THE FOLLOWING ACTIONS TO REDUCE PARK EMISSIONS FROM SOLID WASTE DISPOSAL:

1. Evaluate current waste composition at the park.
2. Consider implementing a trash-free park program to reduce or eliminate visitor trash.
3. Consider small-scale composting at the group campground.
4. Increase opportunities for recycling at the group campground.
5. Compost paper towels throughout the park.
6. Educate staff about current recycling program to ensure understanding with procedures and recycling opportunities.
7. Install additional water refill stations in the park to reduce the need for bottled water.

## STRATEGY 4: INCREASE CLIMATE CHANGE EDUCATION AND OUTREACH

Over 384,000 people visited Antietam National Battlefield in FY 2011. The park will encourage GHG emissions reductions by educating its visitors on actions they can take to reduce emissions at the park and in their daily lives. The park is also dedicated to taking advantage of opportunities to educate park staff and members of the surrounding community.

### PROGRESS AS OF APRIL 2013:

- Installed a reusable water bottle station with interpretive signage at the Visitor Center.
- Encouraged walking rather than driving by developing walking interpretation programs.
- Incorporated internal and external messages about environmental stewardship, through collaboration between park operations and resource management.
- Developed a tree planting program, including reforestation efforts and the establishment of a riparian buffer to protect the local watershed.
- Decreased fertilizer and herbicide use.

## ANTIETAM NATIONAL BATTLEFIELD COMMITS TO THE FOLLOWING ACTIONS TO INCREASE CLIMATE CHANGE EDUCATION AND OUTREACH FOR PARK STAFF, VISITORS, AND THE LOCAL COMMUNITY.

1. Educate staff on energy, recycling protocols, environmental stewardship, and park commitments in this climate action plan.
2. Educate staff about park landscapes and land management practices that are needed to reduce mowing.
3. Provide education to staff on energy-saving activities.
  - Add signage to remind staff to turn off lights when not in use.
  - To conserve energy, lower thermostat settings in the winter and raise thermostat settings in the summer for buildings that do not require Curatorial & IPM temperature and humidity controls, and as appropriate for staff comfort.
  - Look for opportunities to lower thermostat temperature settings in buildings where temperatures need to be kept stable.
  - Shut down computers in the evenings and on weekends.
  - Further network printers to reduce individual printer use.
4. Educate park staff on ways to reduce the amount of printing and copy paper.

5. Use internal meetings and communications currently in place to educate staff on environmental effects of park operations.
6. Include climate change messages in current interpretive programs.
7. Improve signage on recycling containers for visitors to increase the recycling capture rate.
8. Put signs in restrooms to encourage visitors to turn off lights and use hand dryers.
9. Educate visitors about new park mowing practices and the anticipated effect on the landscape.
10. Use park social media outlets to educate visitors on park stewardship efforts.
  - Use Facebook posts to educate visitors about mitigation actions the park is taking to reduce resource use.
  - Produce video clips for the park website.
11. Communicate environmental stewardship messages with permittees through the application process for use of the campgrounds.

## Conclusion

Antietam National Battlefield has a unique opportunity to educate both national and international visitors and set an example for reducing GHG emissions in the National Capital Region and Servicewide. By addressing emissions in a targeted, prioritized manner, the park can efficiently and effectively reduce its GHG emissions. Additionally, by sharing these strategies with park visitors and partners, Antietam National Battlefield will promote an awareness of climate change and encourage visitors and staff to take action to reduce GHG emissions on a broader scale. These efforts will further support the park's historical commitment to environmental stewardship.

