National Park Service
U.S. Department of the Interior

CLIMATE*Friendly* PARKS

George Washington Memorial Parkway
Climate Action Plan

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Introduction

George Washington Memorial Parkway

Few figures in United States history are more revered than George Washington, revolutionary commander-in-chief, founding father, and first president. Henry Lee's 1799 eulogy to Washington still rings true: "First in war, first in peace, and first in the hearts of his countrymen. Two centuries later, Washington lives on through countless national and local memorials, monuments and other forms of commemoration. The sites in and around his namesake city can claim special significance, though, for this is where he lived, worked, worshiped, and planned for the future of the United States. Even during Washington's lifetime, his home at Mount Vernon attracted sightseers, increasing in popularity with each subsequent generation.

In 1932, the bicentennial of Washington's birth, the Mount Vernon Memorial Highway opened to connect Arlington Memorial Bridge to the estate. This16-mile road not only improved automobile access through Virginia, but it ushered in a new era of road building.

Constructed by the Department of Agriculture's Bureau of Public Roads, the road was proclaimed "America's Most Modern Motorway." While the highway was under construction, Congress renamed it George Washington Memorial Parkway and extended its span as well as its mission. Under the Capper-Cramton Act of 1930, the federal government acquired land along the Potomac River, running from Great Falls, Virginia, to Mount Vernon, and was tasked with protecting the shoreline and palisades, preserving historic features, and providing public recreation areas. In 1939 and in the 1960s, the parkway was again extended northward. Traversing more difficult terrain than the southern leg, this section displays the latest road engineering methods for its time—a wide, gently curving road with a grassy median, low stone guardrails, and soaring steel-and-concrete arched bridges. By 1970, an additional 6.8 miles of road in Maryland was completed; that section was later named in honor of Clara Barton in 1989.

Today, George Washington Memorial Parkway is a 7,600-acre national park established to protect the landscape, historic sites, and native habitat of the Potomac River shoreline. Within the park, people can visit more than 25 sites associated with George Washington's accomplishments for the nation he helped establish.

George Washington Memorial Parkway 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, George Washington Memorial Parkway belongs to a network of national parks that are at the forefront of sustainability planning. By developing an emissions inventory, setting an emissions reduction target, developing this climate action plan, and committing to educate park staff and the public about climate change and George Washington Memorial Parkway mitigation efforts, the park is leading by example. In so doing, the park commits to the following actions to reduce GHG emissions from park operations by 2.4 percent below 2009 levels by 2016.

1. Reduce purchased electricity in park buildings;
2. Explore the use of renewable energy;
3. Reduce emissions from vehicle use;
4. Work with concessioners to use alternative fuels and reduce emissions associated with visitor activities;
5. Work with service providers to use alternative fuels and reduce emissions from landscaping;
6. Evaluate becoming a trash-free park;
7. Reduce the amount of waste generated;
8. Increase recycling;
9. Increase water efficiency;
10. Educate park staff; and
11. Educate visitors.

The George Washington Memorial Parkway climate action plan serves to support and enhance existing initiatives such as the park's environmental management system (EMS) and the National Capitol Region (NCR) 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 Executive Orders 13423 and 13514. This George Washington Memorial Parkway climate action plan will be incorporated into the park's EMS. Additionally, the climate action plan supports the EMS for the park. It should be noted that the purpose of this climate action plan is to reduce park greenhouse gas emissions, and that 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, an increase in the release of certain GHGs—including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O)—through industrial processes has disturbed this balance. These gases can stay in the atmosphere anywhere from 50 years to as long as several centuries. This persistence, coupled with increased GHG emissions from industrial activities, causes high

National Oceanic and Atmospheric Administration (NOAA) records show sea levels in the Washington D.C. area have risen over a foot in the past one hundred years.

rates of accumulation in the atmosphere, essentially creating an extra-thick insulating layer around the Earth. 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 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."[1] Rising global temperatures will further raise 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 to affect human health, alter crop production, modify animal habitats, and change many other features of our natural and managed environments.

GEORGE WASHINGTON MEMORIAL PARKWAY AND CLIMATE CHANGE

Climate change presents significant risks and challenges to the National Park Service. In the mid-Atlantic region, which includes Virginia and Maryland, sea-level is rising one to two inches per decade. However, climate change is expected to double that rate, causing sea level to rise 15 to 40 inches by 2100.[2] In addition, due to sediment compaction processes that cause land in the mid-Atlantic to sink, sea level rise in the region could be significantly greater than global sea level rise.

Increased temperatures and hydrologic changes have the potential to alter the natural and manmade landscape of the parkway, impacting the wide variety of ecological, cultural, and recreational features the parkway currently provides. In particular, these changes will affect the cultural and natural resources entrusted to the George Washington Memorial Parkway. The following potential climate change impacts were considered while the park staff developed this climate action plan:

- Landscape changes, such as flooding, erosion, and drought, which could affect access to and the structural integrity of bridges, buildings, and monuments;
- Change in growing seasons, which could affect vegetation;
- Changes in growing season and precipitation, which could lead to increased opportunity for invasive species establishment;
- Change in management needs for George Washington Memorial Parkway cultural and natural resources; and
- Shifts in visitor trends related to temperature changes.

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[1] Intergovernmental Panel on Climate Change. 2007. Climate Change: 2007: Synthesis Report. Page 45. www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf.

[2] U.S. Environmental Protection Agency. EPA/903/F-00/002. June 2001. How Will Climate Change Affect the Mid-Atlantic Region? http://oaspub.epa.gov/eims/eimscomm.getfile?p_download_id=4011

By measuring and tracking the reduction of GHG emissions from park-related activities, George Washington Memorial Parkway intends to minimize its contribution to climate change and the resulting detrimental impacts. Also, by demonstrating actions that reduce GHG emissions, George Washington Memorial Parkway hopes to educate parkway visitors about sustainable choices that can be made in their own lives.

INVENTORY PROCESS

Greenhouse gas emissions inventories are done by calculating the emissions produced by certain activities, such as those involving electricity and fuel use. Energy and resource use data from NPS staff and concessioners were gathered and entered into the Climate Leadership in Parks (CLIP) tool. The CLIP tool was developed by the NPS Climate Friendly Parks 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 CO_2 equivalent ($MTCO_2e$);
- Educate park employees about the emissions inventory process through data gathering;
- Assist with identifying strategies for each park to reduce emissions through a workshop; and
- Enable park personnel to track current and future progress toward emissions reduction goals.

To comply with federal guidance, the CLIP tool measures all the GHGs—including CO_2, N_2O, and CH_4—and then automatically converts them into $MTCO_2e$. The conversion of a GHG to $MTCO_2e$ is based on the potential of that GHG to contribute to the greenhouse effect, or its global warming potential (GWP), relative to the potential of CO_2. CO_2 is given the GWP of 1. CH_4's GWP is 21 times that of CO_2, and N_2O's GWP is 310 times that of CO_2. Converting all the gases to one GWP enables the park to easily compare sources of GHGs in an inventory. The output of the CLIP tool is the park's emissions profile, which is used to prioritize GHG emission reduction strategies.

George Washington Memorial Parkway staff gathered annual usage data (e.g., gallons of fuel used in a year) related to park operations, concessioner operations, and visitor travel within park boundaries for the baseline inventory year, fiscal year (FY) 2009. Employee commuting data was collected by a survey in June 2012 and was included in the FY 2009 inventory as proxy data.

Data categories include stationary combustion, mobile combustion, purchased electricity, waste, fertilizer, refrigeration, and wastewater. These categories can be divided into direct and indirect emissions. Scope 1 emissions, or direct emissions, are emissions from sources owned and operated by the park. This includes emissions produced when fuel is burned within park boundaries to perform such tasks as powering a park generator, using natural gas, or fueling a park vehicle, as well as "fugitive" emissions released from refrigeration and fertilizer use. Scope 2 emissions are indirect emissions generated by electricity, steam, or heat purchased by the park. Although the park does not generate its own electricity, steam, or heat, it still contributes to GHG emissions by purchasing these energy sources from an offsite source. Scope 3 emissions are all other indirect

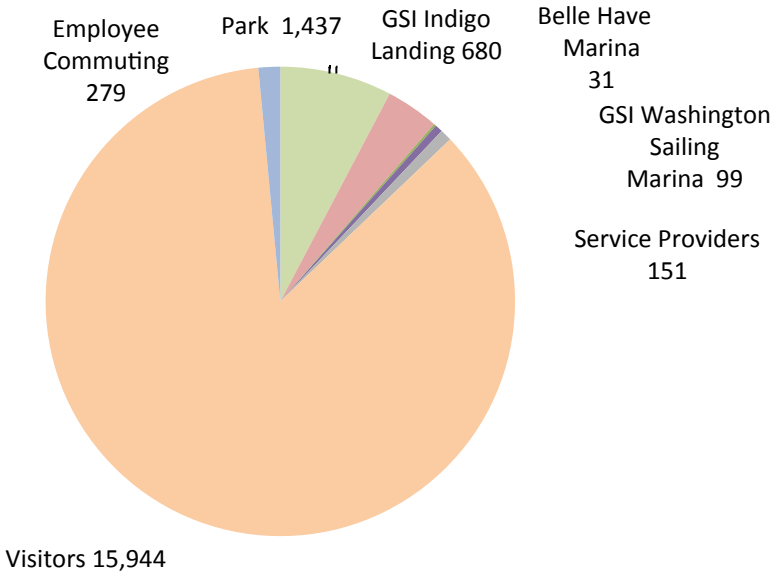
emissions, such as emissions from concessioner operations, visitor vehicles, employee commuting, offsite wastewater treatment, and offsite waste disposal.

Park Emissions Profile

The George Washington Memorial Parkway GHG inventory includes emissions from park operations, service providers or outside landscapers, concessioners, and visitors. Outside landscapers are important to include because these service providers burn fuel in the park while maintaining the area along the parkway with landscaping equipment. Park operations include activities associated with gasoline and diesel use, electricity, emissions from refrigerants, waste, and wastewater use. Emissions from service providers and landscapers are estimated from their operations within park boundaries. Park concessioners include the Belle Haven Marina, Guest Services Incorporated (GSI) Washington Sailing Marina, and GSI Indigo Landing. Visitor emissions are estimated from recreational visitor vehicle transportation within park property and with statistical information from the NPS Visitor Statistics Website.

Total GHG emissions from park operations, concessioners, and visitors for FY 2009 were estimated to be 18,621 $MTCO_2e$.[3] Approximately 1,437 $MTCO_2e$, (eight percent) are from park operations; 961 $MTCO_2e$ (five percent) are from park concessioners and service providers; and 15,944 $MTCO_2e$ (86 percent) are from visitor vehicles. The George Washington Memorial Parkway GHG inventory is influenced by the length of the parkway and the distance that visitors must travel to sites within the parkway. See Figure 1 below for the total park GHG emissions profile, including visitors.

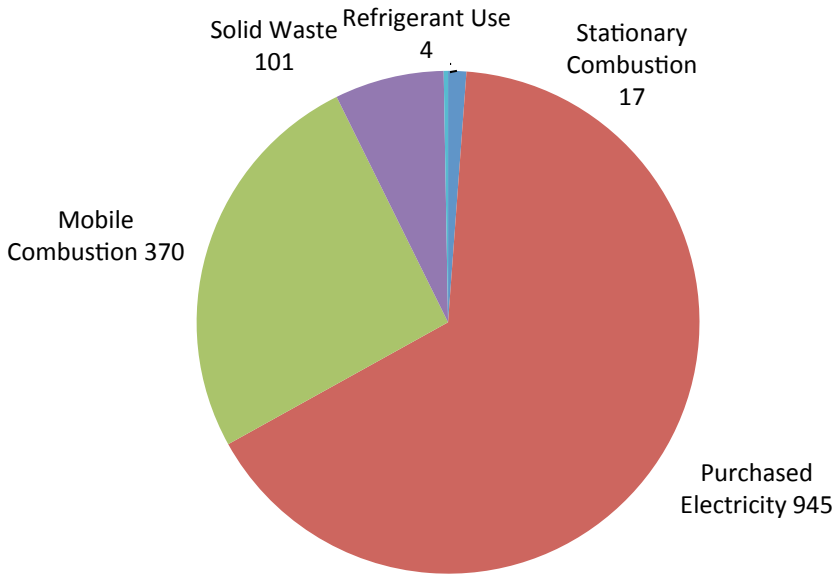
Figure 1: 2009 George Washington Memorial Parkway GHG Emissions – 18,621 MTCO2e



[3] This total does not include GHG emissions from approximately 144 million miles driven by commuters on the Parkway annually.

In order to target emissions reduction efforts, the park assessed park operations emissions by source. Emissions from park operations only totaled 1,437 $MTCO_2e$. At 944 $MTCO_2e$ (66 percent), purchased electricity is by far the largest contributor of GHG emissions from park operations. Mobile combustion is the second largest contributor, accounting for 370 $MTCO_2e$ (26 percent) of total park emissions. The park produces too few emissions from fertilizer and wastewater to register in the inventory. See Figure 2 for a breakdown of sources.

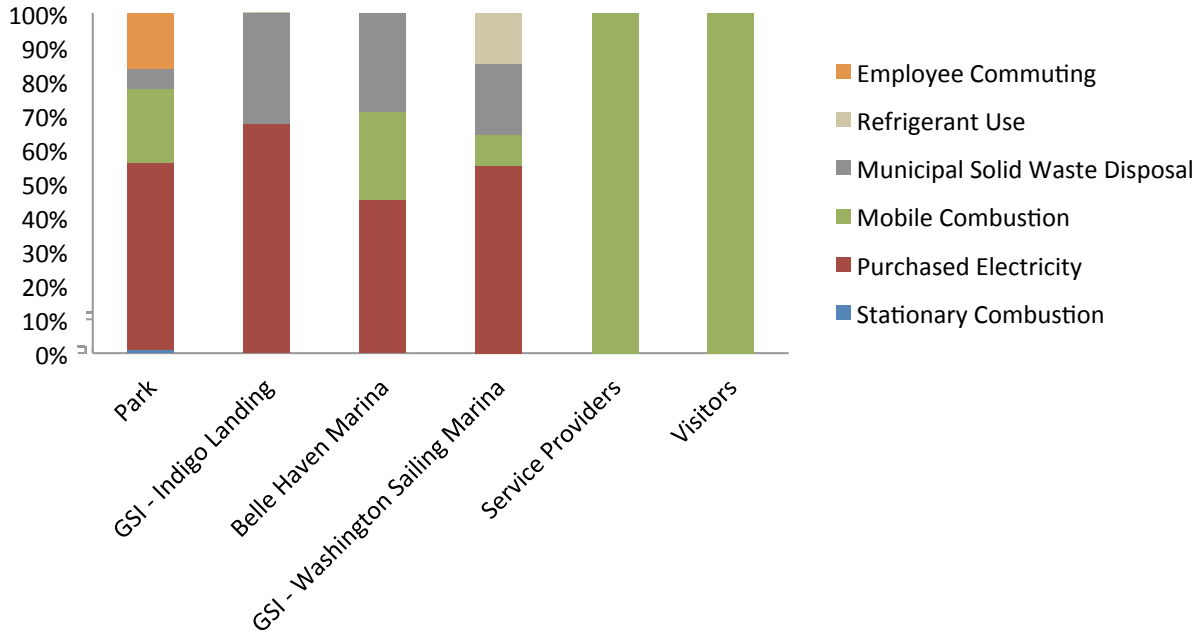
Figure 2: 2009 George Washington Memorial Parkway Park Operations GHG Emissions by Source – 1,437 MTCO2e



* Note: Park operations does not contain emissions from employee commuting

The emissions profile for each group (park operations, service providers, concessioners, and visitors) is different, but aligns with each group's activities. As noted above, most emissions from park operations are from purchased electricity. The largest emission source from all three concessioners was also purchased electricity, and solid waste was the second largest source of concessioner emissions. As noted above, the park, including park concessioners and service providers, produces too few emissions from fertilizer and wastewater to register in the inventory. See Figure 3 on the next page.

Figure 3: George Washington Memorial Total GHG Emissions- Percent Contribution by Source



Strategies for Reducing Emissions

George Washington Memorial Parkway developed GHG reduction strategies and actions during the park's CFP action planning workshop held November 16-17, 2011, at Indigo Landing in Alexandria, Virginia. Strategies for reducing emissions from park operations focus on reducing energy consumption, transportation emissions, water use, and waste generation, and increasing climate change educational efforts. Developing and implementing a comprehensive action plan will allow for better informed decision making. The George Washington Memorial Parkway strategies to reduce emissions are based on emission reduction potential, cost-effectiveness, feasibility, co-benefits, local impact, and implementation timeframe.

STRATEGY 1: REDUCE GHG EMISSIONS FROM PARK ENERGY USE BY 2 PERCENT BELOW 2009 LEVELS BY 2016

By far the most significant contributor of GHG emissions is purchased electricity, which represents 66 percent of emissions from park operations (see Figure 2). Therefore, George Washington Memorial Parkway will focus on actions to reduce energy and, more specifically, electricity. In addition to reducing GHG emissions, reducing energy use will provide the park with financial savings from reduced costs.

PROGRESS TO DATE:

- Upgraded lighting to electronic ballasts, changed T12 lamps to T8 lamps, and installed compact fluorescent light bulbs (CFLs) at Great Falls; implemented a policy of upgrading lighting at other park locations as time and money permits;
- Evaluated appropriateness of induction lighting for lighting needs along the parkway;
- Submitted a project request for solar lighting at the Great Falls parking lot;
- Purchased energy efficient appliances based on replacement needs;
- Installed more efficient heating, ventilation, and air conditioning systems at Great Falls;
- Installed motion sensors for lighting control in most offices and restrooms (more will be installed as time permits at Maintenance and Turkey Run);
- Shut down Fort Hunt facility for the winter in 2011 and will evaluate if the electricity saved justifies closing the facility in the winter; and
- Winterized six out of nine comfort stations in order to shut them down in the winter.

GEORGE WASHINGTON MEMORIAL PARKWAY COMMITS TO THE FOLLOWING ACTIONS IN ORDER TO REDUCE PARK ENERGY USE:

1. Reduce purchased electricity in park buildings:
    - Review actions from the energy audit and pursue energy conservation measures; share energy saving projects with the park EMS/Green Team so the team can help with prioritization.
    - Install a computerized building management system to see real time energy use;
    - Use a computerized building management system to identify problems or areas for improvement;
    - Encourage energy saving behavioral changes; and
    - Work with the IT department and the NCR to enable computers to be turned off each night.
2. Explore the use of renewable energy:
    - Evaluate possibility of installing utility grid connected solar lights along the parkway and in parking lots;
        - Present this project to management and follow up with a plan and project proposal, and
        - Create project estimates and address potential compliance issues.

STRATEGY 2: REDUCE GHG EMISSIONS FROM TRANSPORTATION BY 3 PERCENT BELOW 2009 LEVELS BY 2016

Representing 26 percent of emissions from park operations, transportation is George Washington Memorial Parkway's second largest source of GHG emissions. Therefore, taking actions to reduce transportation-related emissions can significantly reduce the park's emissions.

PROGRESS TO DATE:

- Implemented a policy of replacing vehicles with more efficient models as needed;
- Added seven hybrid sports utility vehicles;
- Brought five small electric vehicles into the park's fleet;
- Integrated B5 biodiesel as a fuel option; and
- Established meadow areas at Jones Point Park to reduce mowing needs.

GEORGE WASHINGTON MEMORIAL PARKWAY COMMITS TO THE FOLLOWING ACTIONS TO REDUCE PARK EMISSIONS FROM TRANSPORTATION:

1. Reduce emissions from vehicle use:
    - Evaluate the use of B20 biodiesel;
    - Review how vehicles are assigned to staff and develop a plan to use the right vehicle for right job;
    - Create a better mechanism by which staff can reserve the best low mileage vehicle;
    - Partner with Clean Cities to fund high efficient vehicles for the park's fleet;
    - Color code the vehicle key board to indicate more efficient and less efficient vehicles;
    - Encourage carpooling to meetings;
    - Schedule meetings to minimize time spent in traffic and educate staff about being sensitive to timing of meetings around rush hour and road construction times;
    - Encourage teleconferencing;
    - Enforce no-idling rule for park staff; and
    - Improve tracking system for gasoline and fuel use in the park vehicles; consider working with other parks in the region to collaborate for Clean Cities for funding.
2. Work with concessioners to use alternative fuels and reduce emissions from visitor use:
    - Consider using used cooking oil from concessions operations as fuel;
    - Enforce no-idling rule for park visitors;
    - Work with concessions tours to encourage the public to use mass transit to enjoy the park; and
    - Work with concessioners to encourage the use of more efficient vehicles.
3. Work with service providers to use alternative fuels and reduce emissions from landscaping:
    - Add clause into mowing contracts to require the use of more efficient fuel or biodiesel (this can be phased in over time in a multi-year contract);
    - Evaluate areas in which mowing could be minimized;
    - Work with the contracting office to structure request for proposals to offer incentives to contractors who use green practices, energy efficient equipment, and alternative fuels;
    - Reduce leaf blowing during high leaf-drop months and rake more instead; and
    - Purchase rechargeable leaf and snow blowers.

STRATEGY 3: REDUCE GHG EMISSIONS FROM WASTE BY 5 PERCENT BELOW 2009 LEVELS BY 2016

Solid waste disposal is the third largest contributor to GHG emissions from park operations, representing six percent of park emissions. It will be important for park operations to reduce trash sources as well as look for ways to increase recycling. The park is currently implementing many policies to support recycling and waste reduction. These programs can be expanded to reduce emissions associated with solid waste disposal.

PROGRESS TO DATE:

- Installed a water filling station at Great Falls, and the concessioner provides reusable bottles for purchase;
- Implemented composting for branches, leaves and other organic matter;
- Created a policy to recycle used tires; and
- Implemented a no-trash policy at some park sites.

GEORGE WASHINGTON MEMORIAL PARKWAY COMMITS TO THE FOLLOWING ACTIONS TO REDUCE PARK EMISSIONS FROM WASTE GENERATION:

1. Evaluate becoming a trash-free park:
    - If trash must be picked up, evaluate the use of solar powered compactors.
2. Reduce the amount of waste generated.
    - Evaluate trash composition and target the largest contributing source for reduction;
    - Expand filling stations and sale of reusable water bottles, based on Great Falls experience;
    - Include “pack in, pack out” language for use permits;
    - Include sustainability and waste review in Fort Hunt development review;
    - Consider installing a monitor in the breakout room for viewing memos and notices instead of printing them out and posting them on bulletin boards;
    - Explore the possibility of food composting by concessions;
    - Cooperate regionally with state and regional districts to encourage lead-free fishing weights to reduce the solid waste produced by the weights; and
    - Purchase printers that will default to print double-sided.
3. Increase recycling:
    - Clarify and communicate proper collection and recycling of batteries; and
    - Add “Don’t print unless necessary” language to emails.
4. Increase water efficiency:
    - Use water monitoring system to detect problems and repair water leaks; and
    - Ensure that efficient water fixture replacements are being used in new construction.

STRATEGY 4: INCREASE CLIMATE CHANGE AND GREENHOUSE GAS EMISSIONS REDUCTION EDUCATION AND OUTREACH

George Washington Memorial Parkway is visited by approximately nine million people annually. This presents an opportunity to educate the public about climate change and GHG emissions reductions. There are also opportunities to educate park staff and members of the surrounding community.

GEORGE WASHINGTON MEMORIAL PARKWAY COMMITS TO THE FOLLOWING ACTIONS TO INCREASE CLIMATE CHANGE EDUCATION WITH PARK STAFF, VISITORS, AND THE LOCAL COMMUNITY:

1. Educate park staff:
    - Provide training for current staff at a CFP review meeting required for all employees and incorporate climate change education into employee seasonal training.
2. Educate visitors:
    - Develop a communications plan and timeline to establish themes and messaging, activities;
    - Develop and maintain consistent messaging for signs, brochures, and programs, including:
        - Creating educational signage to tell visitor about past and future climate friendly actions,
        - Creating a CFP brochure customized for George Washington Memorial Parkway, telling the story of climate change,
        - Adding CFP goals to park website,
        - Educating volunteers on the trails so that they can provide information about climate friendly practices and impacts to visitors,
        - Putting signs on vehicles that are hybrids or fuel efficient, and
        - Using social networking to communicate CFP goals to the public;
    - Investigate a Climate Friendly Junior Ranger program;
    - Work with other parks in the region to hold a CFP kickoff campaign for the public and partners; share information about what the park is doing about climate change and the park's carbon footprint;.
    - Contact "Bridging the Watershed" education program to find out about if the curriculum contains climate change information.

Conclusion

The George Washington Memorial Parkway has a unique opportunity to educate staff and visitors and set an example for reducing GHG emissions. This plan summarizes the actions to which the park commits in order to reduce its GHG emissions. By addressing emissions in a targeted, prioritized manner, the park can efficiently and effectively reduce its greenhouse gas emissions. Additionally, by sharing these strategies with park visitors, concessioners, and partners, George

Washington Memorial Parkway will promote an awareness of climate change as well as actions to reduce GHG emissions on a broader scale.