

National Park Service
U.S. Department of the Interior



CLIMATE *Friendly* PARKS

Great Smoky Mountains National Park Action Plan

TABLE OF CONTENTS

Great Smoky Mountains National Park Becomes a Climate Friendly Park	3
The Challenge of Climate Change	4
Greenhouse Gas Emissions Inventory at Great Smoky Mountains National Park	5
STRATEGY 1: Identify and Implement Mitigation Actions	9
Energy Use Management	9
Transportation Management	15
Waste Management	21
STRATEGY 2: Increase Climate Change Education and Outreach	31
Visitor Outreach	31
Park Staff	32
Local Community Outreach	33
STRATEGY 3: Evaluate Progress and Identify Areas for Improvement	34
Conclusion	34
Appendix A: Save-the-date workshop flyer and agenda	36
Appendix B: Workshop summary and list of participants follow-up letter	38
Appendix C: Estimated Annual Criteria Air Pollutant Emissions at Great Smoky Mountains National Park	42

GREAT SMOKY MOUNTAINS NATIONAL PARK BECOMES A CLIMATE FRIENDLY PARK

As a participant in the Climate Friendly Parks program, Great Smoky Mountains National Park (GRSM) belongs to a network of parks nationwide that are putting climate-friendly behavior at the forefront of sustainability planning. By conducting a carbon emissions inventory, setting an emission reduction goal, developing this action plan, and committing to educate park staff, visitors, and community members about climate change, GRSM provides a model for climate-friendly behavior within the National Park Service.

This action plan identifies steps that GRSM can undertake to reduce greenhouse gas (GHG) emissions and help mitigate its impact on climate change. The plan presents the park's emission reduction goals, and associated reduction actions to achieve the park's goals. Strategies and action plan items were originally identified and developed by working groups at the "Climate Friendly Parks Workshop – Great Smoky Mountains Climate Leadership Conference – Partnering for Solutions", in Gatlinburg, Tennessee on December 5th, 2006 (see Appendix A and B). While the plan provides a framework needed to meet the park's emission reduction goals, it is not intended to provide detailed instructions on how to implement each of the proposed measures nor is it intended to be a static and inflexible plan. The Park developed an environmental commitment statement which provides the context for the action plan. It reads, "The employees of GRSM are committed to sound environmental management to protect the resources for which the park was established and also in the broader context of international environmental responsibility. We will ensure compliance with all applicable federal, state and local laws, regulations, requirements, policies, agency guidelines and Executive Orders addressing protection of the environment, and incorporate environmental protection in all project planning and operational decisions. Pollution prevention, waste reduction, best environmental management practices and environmentally preferable purchasing will be practiced in all park management activities. We will strive to set an excellent example for park visitors and neighbors, and for continual improvement and accountability to protect the environment." This plan will help support the park's Environmental Management System (EMS) which will describe priorities and details to implement many of these actions.

GRSM intends to reduce GHG emissions from its park operations to 16% below 2006 levels by the year 2020. GRSM aims to:

- Reduce 2006 energy-related GHG emissions from park operations by 20 percent by 2020. The park has initiated a program for replacing inefficient fluorescent and incandescent lighting for T5 florescent in all the comfort stations serving the picnic and campground areas. Low flush and waterless urinals/toilets are being installed in all comfort station rehabilitation, new construction projects, and corrective maintenance work activities.
- Reduce 2006 transportation-related GHG emissions from park operations by 20 percent by 2020. The Park purchases and uses bio-diesel (B-20 and B-50) in its diesel engines. Park managers look for opportunities to reduce the size of the park's vehicle fleet. The facilities management division has an operational plan in place for Ozone Alert Days.
- Reduce 2006 waste-related GHG emissions from park operations by 9 percent by 2020. The park benefits from being able to dispose of wastes at the Sevier County Solid Waste Authority. Their state-of-the art recycling center provides for 70 percent reclamation – meaning that 70 percent of the solid waste collected within the park is recycled at the plant. Only 30 percent of the total volume goes into the landfill.

To meet these goals, the park will implement strategies proposed in this plan that relate to the park's current and future emissions inventories. Specifically, the plan recommends three strategies:

Strategy 1: Identify and implement mitigation actions that the park can independently take to reduce GHG emissions resulting from activities within and by the park.

Strategy 2: Increase climate change education and outreach efforts.

Strategy 3: Evaluate progress and identify areas for improvement.



THE CHALLENGE OF CLIMATE CHANGE

Global climate change challenges the very foundation of the national park system and our ability to leave the park's natural resources and cultural heritage unimpaired for future generations. Part of what makes responding to climate change such a challenge is the uncertainty that surrounds it. We know that the climate is changing and that global average surface temperatures are increasing, but the rates of change and how these changes will manifest at regional and landscape scales are not fully understood. Of particular concern are issues such as how much warming species and ecosystems can withstand before widespread and irreversible changes occur, and how the distribution, timing, and intensity of precipitation will change.

While there is a critical need for more information in the face of uncertainty, we have sufficient knowledge about climate change to take some important steps in resource management and science, facilities management, and resource education. Failure to act now will severely limit our options in the future and place this park in more of a reactive rather than a proactive mode. No action is the decision that may carry the greatest risk.

The fourth and most recent report from the Intergovernmental Panel on Climate Change (IPCC 2007¹) established with certainty that Earth's climate is rapidly warming. Average global temperatures on the Earth's surface have increased about 1.1°F since the late 19th century, and the 10 warmest years of the 20th century all occurred in the last 15 years. The single leading cause of this warming is the buildup of greenhouse gasses in the atmosphere—primarily carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O)—which trap heat that otherwise would be released into space.

The continued addition of CO₂ and other GHGs to the atmosphere will raise the Earth's average temperature more rapidly in the next century; a global average warming of 4-7°F by the year 2100 is considered likely.¹ Rising global temperatures will further raise sea levels and affect all aspects of the water cycle, including snow cover, mountain glaciers, spring runoff, water temperature, and aquatic life. Climate change is also expected to affect human health, crop production, animal and plant habitats, and many other features of our natural and managed environments.

Climate change presents significant risks and challenges to the National Park Service. The physical infrastructure, natural and cultural resources, visitor experience, and intrinsic values of national parks are at risk from the effects of climate change. Some effects are already measurable. However, the long-range and cascading effects of climate change are just beginning to be understood. At GRSM, increasing temperatures and changing precipitation patterns may alter many park ecosystem functions and natural attributes, including plant primary productivity; cause the loss or relocation of native species and vegetation communities, change habitats available for species, air quality, soil and water chemistry, vernalization, animal migration, dates of first and last frost, increased drought occurrences, increased storm/flooding severity and frequency, and the experience of park visitors. These changes may also alter natural ecosystem disturbance regimes (including fire and landslides), and can facilitate exotic species invasions, among many other potential impacts. Climatic factors also strongly control/sustain ecological services, including plant sexual reproduction (pollination, fruiting), ground water and surface water recharge, phenological synchrony of ecological processes/events, decomposition, and others.

Managing park facilities in response to changing weather and precipitation patterns may result in higher operational costs in terms of the frequency of mowing, vista clearing, landslides removal, hazardous tree management, road striping, replacing roofs, siding, painting, and a host of other routine maintenance activities. Selecting an appropriate level of service based on visitor expectations will be key to finding the balance between costs and increased workloads.

NPS response to options will be developed and implemented in a manner consistent with NPS policy and Department of the Interior (DOI) guidelines set forth by Secretarial Order 3289 entitled *Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources*. Issued on September 14, 2009, the order calls upon all DOI bureaus to participate in a departmental climate change response initiative.

¹ IPCC 2007. Climate Change 2007: The Physical Science Basis. Intergovernmental Panel on Climate Change, Geneva Switzerland. Available online at < <http://ipcc-wg1.ucar.edu/wg1/wg1-report.html> >



GREENHOUSE GAS EMISSION INVENTORY AT GREAT SMOKY MOUNTAINS NATIONAL PARK

Naturally occurring GHGs include CO₂, CH₄, N₂O, and water vapor. Human activities (e.g., fuel combustion and waste generation) lead to increased concentrations of these gases (except water vapor) in the atmosphere.

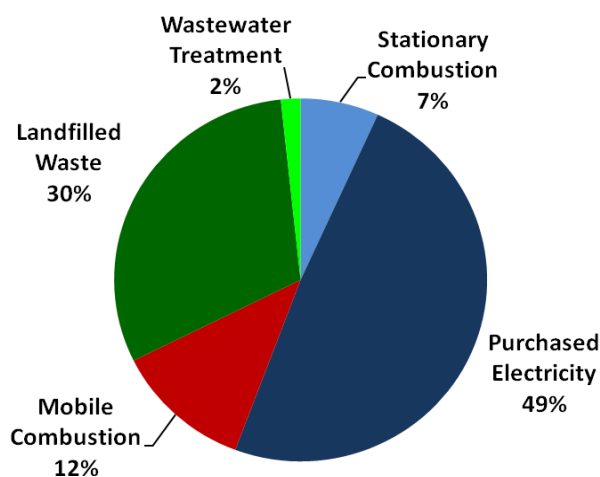
Greenhouse Gas Emissions

GHG emissions result from the combustion of fossil fuels for transportation and energy (e.g., boilers, electricity generation), the decomposition of waste and other organic matter, and the volatilization or release of gases from various other sources (e.g., fertilizers and refrigerants).

In 2006, GRSM GHG emissions totaled 21,050 metric tons of carbon dioxide equivalent (MTCO₂E). These emissions were from park visitors, park operations, concessioners, and Tremont activities from transportation, energy, and waste. Park operations account for only 5% of the annual total GHG emissions or 1,060 MTCO₂E. This includes emissions from park operations (but not visitor transportation activities), including NPS vehicle use within the park (See Figure 1). For perspective, a typical single family home in the United States produces approximately 11 MTCO₂ per year.² Thus, the emissions from park operations are roughly equivalent to the emissions from the electricity use of 96 households each year.

FIGURE 1

Source Contribution of GRSM 2006 Park Operations GHG Emissions



The largest emission sector when considering only park operations for GRSM is energy (purchased electricity and stationary combustion), totaling 590 MTCO₂E (see Figure 2 and Table 1), or 56% with emissions associated with waste totaling 343 MTCO₂E or 32% of total emissions from park operations. Noteworthy also is that park visitor emissions from transportation are 19,947 MTCO₂C/year whereas park operations emissions are 127 MTCO₂C/year.

The park benefits from being able to dispose of wastes at the Sevier County Solid Waste Authority. Their state-of-the art recycling center provides for 70 percent reclamation – meaning that 70 percent of the solid waste collected within the park is recycled at the plant. Only 30 percent of the total volume goes into the landfill. It is cost-effective, reduces employee exposure to health and safety issues, and eliminates the need for multiple refuse collection containers, thus, protecting the resources (e.g. wildlife). There is a possible disadvantage in that public perception from visitors is that the park is not recycling due to the same refuse container used

² U.S. EPA, Greenhouse Gases Equivalencies Calculators – Calculations and References, Retrieved; Website: <http://www.epa.gov/RDEE/energy-resources/calculator.html>

parkwide and not labeled as a recycling container. Of the nearly 544,000 tons of refuse sent to the Sevier County Solid Waste authority in 2010 from the Park, 70% was composted and or recycled and only 30 percent reached the landfill.



FIGURE 2

GRSM 2006 Emissions by Source Sector

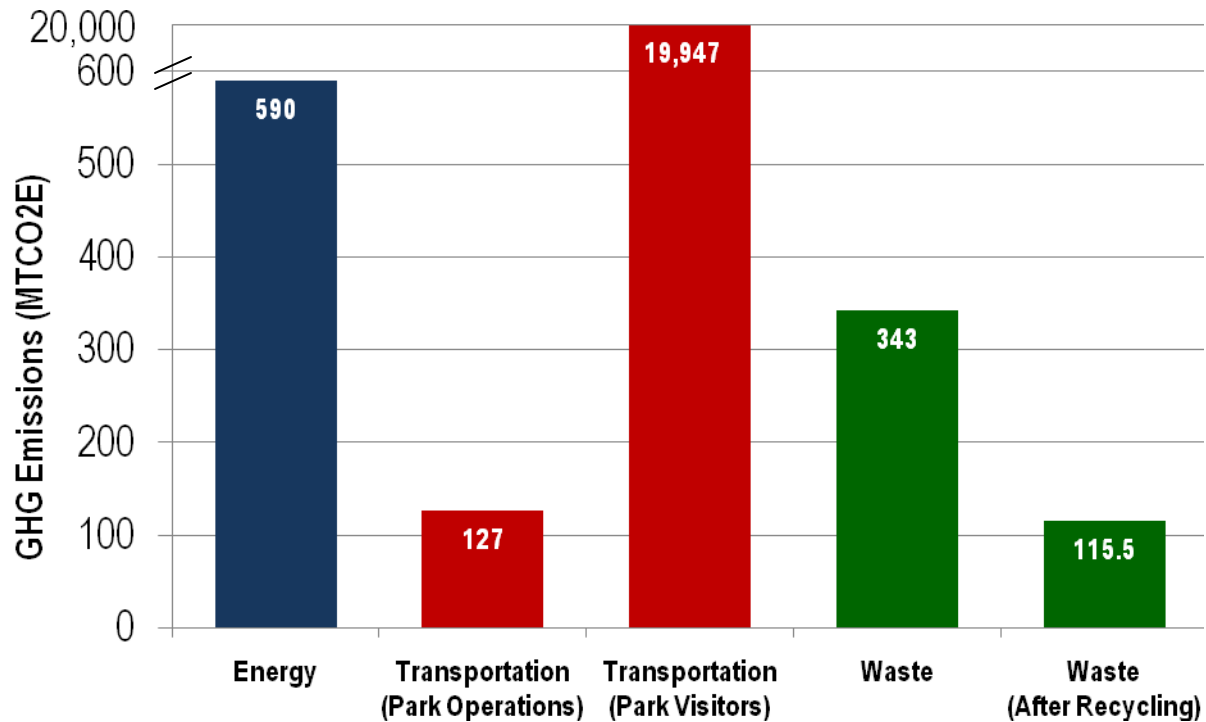


TABLE 1

GRSM 2006 Park Operations Emissions by Sector

Park Operations GHG Inventory Results (MTCO₂E)

	MTCO ₂ E
Energy	590
Stationary Combustion	72
Purchased Electricity	519
Transportation	127
Mobile Combustion (Vehicles)	127
Waste	343
Landfilled Waste*	325
Wastewater	18
Total	1,060

Note - Totals may not sum due to rounding.

Note - Park visitor emissions from transportation are 19,947 MTCO₂C/year; park operations emissions are 127 MTCO₂C/year.

Note- Landfilled waste is now reduced 70% (from 325 MTCO₂E/year to 97.5 MTCO₃/year) after recycling at the Sevier County Solid Waste Authority.

Not applicable data sources represented by "-"



CLIMATE Friendly PARKS
Empowering parks to address climate change

www.nps.gov/climatefriendlyparks

Great Smoky Mountains National Park Responds to Climate Change

The following actions were developed during the Great Smoky Mountains Climate Leadership Conference, Partnering for Solutions held in Gatlinburg, Tennessee on December 6th, 2006 in order to meet the park's climate change mitigation goals.

STRATEGY 1: IDENTIFY AND IMPLEMENT MITIGATION ACTIONS

GRSM has developed a set of actions that the park is committed to taking in order to reduce its emissions by 16% overall (174 MTCO₂E out of the total 1060 MTCO₂E) from activities within and by the park. These actions have been prioritized based on a qualitative assessment of a set of criteria including: emission reduction potential, cost-effectiveness, feasibility, co-benefits, regional impact, and ability to rapidly implement. GRSM plans on implementing the actions presented below, in order from highest to lowest priority within each sub-category (energy, waste, and transportation).

Energy Use Management

Emission Reduction Goal: Reduce 2006 energy-related GHG emissions from park operations by 20 percent (118 MTCO₂E) by 2020.

Improving energy efficiency and implementing alternative energy sources reduces park-based fuel use, lowers GHG emissions, decreases electricity consumption, and offers monetary benefits for the park. Emissions inventory results indicate that 56 percent of the park's GHG emissions from park operations are from energy consumption. Consequently, GRSM identified actions it will take to reduce energy-related emissions. Presented below are the actions that are currently under way and that comprise the park's progress to date, as well as those actions the park will pursue.

Progress to Date and Ongoing Actions

Promote energy efficiency and energy conservation in the park through behavioral change

- Encourage energy conservation in all park activities.
 - Each division/individual is responsible for being energy wise i.e., turning lights off when leaving for the day; last one on the floor making sure all lights are off (but there is no written policy).
 - The park has created two PMIS packages requesting funding to replace light fixtures and the exterior windows and door in Park Headquarters Building with sustainable, energy-efficient light fixtures, windows and doors.
- Establish operations and maintenance schedule.
 - The park is beginning to address preventative maintenance on more consistent basis through FMSS.
- Adjust thermostats.
 - Where applicable thermostats are set to government standard. The park is utilizing building management systems to control heating and cooling as the opportunity is available.
- Adjust janitorial schedules.
 - The park has flex scheduling to cover hours of operation. Most janitorial services are performed during normal hours of operations.

- Adjust computer power management settings.
 - IT staff sets computers and monitors to hibernate when not in use.
 - All new electronic purchases are ENERGY STAR compliant.

Upgrade lighting options

- Install energy-efficient light fixtures.
 - As light fixtures are replaced the park is replacing with T-5s, T-8s, and compact fluorescent bulbs.
 - The park has created a PMIS package requesting funding to replace light fixtures in Park Headquarters Building with sustainable, energy-efficient light fixtures.
- Incorporate building siting.
 - Twin Creeks Science & Education Center and the new Oconaluftee Visitor Center are oriented to maximize passive solar energy. Both buildings are LEED certified–Silver.
- Use daylighting.
 - Twin Creeks Science & Education Center and the new Oconaluftee Visitor Center are oriented to maximize day lighting.
- Install dimmable ballasts.
 - Twin Creeks Science & Education Center is equipped with dimmable ballasts.

Improve heating, ventilation, and air conditioning (HVAC) systems

- Develop an HVAC maintenance schedule.
 - Most HVAC units have a maintenance schedule. The Park will continue to improve its PM program through FMSS.

Switch to more efficient electronics and devices

- Purchase only energy-efficient electronics.
 - New electronic purchases are ENERGY STAR compliant.
- Establish and implementing a procurement policy.
 - The park has procedures in place for purchasing computers and appliances that are ENERGY STAR compliant.
- Replace existing boiler or furnace with an energy-efficient model.



- Building retrofits are being implemented as funding permits.
- The park has created a PMIS package requesting funding to replace the existing HVAC system in Park Headquarters Building with sustainable, energy efficient, geothermal unit.
- Replace large boilers with several small boilers grouped together in parallel to provide staged heating capacity.
 - The Park is moving away from using boilers and will be utilizing geothermal units for heating and cooling.
- Install energy-efficient water heaters.
 - The park is currently using on-demand/tankless water heaters at Headquarters and Sugarlands Visitor Center.
 - When replacing some of the older units, on-demand/tankless water heaters are being installed.

Improve building structures and envelopes

- Upgrade windows.
 - The park has a PMIS package in to replace windows at HQ.
- Install window shading.
- The park is implementing window shading at the New Twin Creeks Science & Education Center to reduce the solar heating load imposed by windows Improve insulation.
 - The park is implementing as funding for new construction and renovation projects become available

Utilize alternative energy sources

- Consume biomass or biofuel instead of conventional fuel.
 - The park is implementing on a limited basis: Headquarters building is using biodiesel for heating and cooling. Biodiesel (B-20) is currently being used for diesel fueled vehicles in the park.
- Run existing devices such as generators using biofuel instead of conventional fuel.
 - The park is implementing on a limited basis
- Purchase electricity from a renewable energy provider.
 - The park is currently purchasing small increments of renewable energy from Sevier County Electric System.

Other energy-related actions

- Install building-level utility meters including new major construction and renovation projects to track and continuously optimize performance.

- Ongoing - working to get building level utilities meters installed throughout park. Implementing as appropriate on new construction projects-Twin Creeks Science & Education Center, new Oconaluftee Visitor Center.
- Complete an energy audit of all structures in park.
 - Completed December 2009.

Energy Use Management – Planned Actions

1 Promote energy efficiency and energy conservation in the park through behavioral change

- Develop a mandatory energy-saving training program.
 - Conduct training for new employees and seasonals.

Provide energy-saving training reviews for permanent employees during regularly scheduled safety meeting.
- Establish an Operations and Maintenance (O&M) schedule that evaluates energy use across the entire park.
 - Begin to address preventative maintenance on more consistent basis through FMSS.
- Ensure all computers' power management settings follow current ENERGY STAR recommendations.
 - All new electronic purchases are ENERGY STAR compliant.

2 Upgrade lighting options

- Install dimmable ballasts and pair lighting with photosensors to reduce electricity use.
 - As opportunities are available with new construction and/or rehabilitation projects buildings will be equipped with dimmable ballasts (Twin Creeks Science & Education Center is equipped with dimmable ballasts).
- Install lighting controls.
 - Park headquarters building is being considered for recommissioning (lighting controls are in place at Twin Creeks Science & Education Center and Oconaluftee Visitor Center).
- Install energy-efficient exit signs, street lighting, and traffic signals.
 - During all retrofit projects energy efficiencies will be considered.
- Consider building siting when constructing and renovating park buildings.
 - As opportunities are available with new construction and/or rehabilitation projects buildings will be oriented maximize energy efficiencies (Twin Creeks Science & Education Center and Oconaluftee Visitor Center are oriented to maximize passive solar energy).

- Utilize day lighting.
 - As opportunities are available with new construction and/or rehabilitation projects buildings will be oriented maximize day lighting (Twin Creeks Science & Education Center and Oconaluftee Visitor Center are oriented to maximize day lighting).

3 Switch to more efficient electronics and devices

- Install Smart Strip power strips.
 - IT has made it a priority to install Smart Strip power strips for all of the park's computers.
- Consider replacing older appliances (e.g. refrigerators) in Park housing with newer more efficient units.
- Purchase only energy-efficient electronics.
 - New electronic purchases are ENERGY STAR compliant.

4 Improve heating, ventilation, and air conditioning (HVAC) systems

- Ensure efficient use of Building Automation System (BAS).
 - Advanced BAS systems can be programmed to adjust the cooling coil temperatures based on the outdoor temperature so the least amount of energy is used to achieve the cooling required by the outdoor condition. (Twin Creeks Science & Education Center, Oconaluftee Visitor Center, and Park Headquarters are all currently operating using a BAS system.)
- Upgrade air distribution systems.
 - Has been recommended in energy audit. **VAV (Variable Air Volume)** will be considered as the park upgrades housing and administrative buildings.

5 Improve building structures and envelopes

- Improve insulation.
 - The park is implementing as funding for new construction and renovation projects become available.
- Add window films.
 - The park will implement as funding allows.
- Create a "cool roof" by installing a highly reflective outer surface that reduces the amount of heat conducted through the roof.
 - Two park buildings have cool roof technology Oconaluftee Visitor Center and Twin Creeks Science & Education Center.

6 Utilize alternative energy sources



- Install photovoltaic panels on park buildings, parking lots, open areas, etc.
 - PV panels both generate electricity as well as (if placed correctly) decrease building energy use by reducing solar heat gain.
 - Park is considering where feasible.
- Switch to biomass and biofuel instead of conventional fuel to heat park buildings and run generators.
 - Implementing on a limited basis – Park Headquarters building is using biodiesel.
- Install geothermal heating systems.
 - The park has a geothermal heating system at Oconaluftee Visitor Center. The PMIS funding package to replace the HVAC in Park Headquarters Building calls for the replacement unit to be a geothermal heating/cooling.

7 Measure energy use throughout the park

- Review and implement the DOI Sustainable Buildings Implementation Plan.
- The DOI Sustainable Buildings Implementation Plan provides guidance for improving the energy performance of new and existing buildings. The park has initiated a program for replacing inefficient fluorescent and incandescent lighting for T5 florescent in all the comfort stations serving the picnic and campground areas. Low flush and waterless urinals/toilets are being installed in all comfort station rehabilitation, new construction projects, and corrective maintenance work activities.
 - Consider conducting an evaluation of parkwide outdoor nighttime lighting (without compromising safety or security) with the potential to switch to motion detection lights which could save energy and reduce costs. Shielding the lights to prevent “upward-cast” light would prevent light pollution.
- Incorporate energy efficiency criteria into new contracts for park and concessioner construction. The Facility Management Division is working with contracting to incorporate energy efficiency criteria into new contracts.
- Install building-level utility meters in existing buildings and in new major construction and renovation projects to track and continuously optimize performance.
 - Ongoing working to get building level utilities meters installed throughout park. Implementing as appropriate on new construction projects (Twin Creeks Science & Education Center and Oconaluftee Visitor Center).

Transportation Management

Emission Reduction Goal: Reduce 2006 transportation-related GHG emissions from park operations by 20 percent (25 MTCO₂E) by 2020.

Reducing vehicle miles traveled, improving vehicle efficiency, and using alternative fuels can significantly reduce Great Smoky Mountains National Park's emissions. As the inventory results indicate, GHG emissions from transportation comprise 12 percent of park operations emissions. Presented below are the actions that are currently under way and which comprise the park's progress to date, as well as those actions that the park intends to pursue.

Progress to Date and Ongoing Actions

Decrease transportation impacts through behavioral changes

- Reduce meeting travel.
 - The park is currently using webinars/conference calls to avoid excessive travel, both within and outside of the park.
 - The park has purchased necessary equipment for teleconferencing and videoconferencing.
- Reduce staff idling.
 - The park does not prohibit vehicle idling but does have procedures in place to remind employees not to let vehicles idle.

Reduce visitor vehicle travel

- Use alternative fuel shuttle buses.
 - City of Gatlinburg provides limited trolley service to the park's busiest campground (Elkmont), hiking trail (Laurel Falls), and Sugarlands Visitor Center (these shuttles use biodiesel).
 - Cherokee, NC provides shuttle service between gateway communities (these shuttles use biodiesel).
- Partner with surrounding state and local communities on alternative transportation initiatives.
 - The park partners with Tennessee gateway communities by serving on the Sevier Transportation Board. The Board is a member of the East Tennessee Clean Fuels Coalition.
 - The park participated in a consultant study that investigated the potential for BRT and PRT service in the main travel corridor in Sevier County and along the Spur.
 - Cherokee, NC provides shuttle service between gateway communities. Their shuttles use biodiesel.
 - The City of Gatlinburg provides limited trolley service to the park's busiest campground (Elkmont) and hiking trail (Laurel Falls); these shuttles use biodiesel.

- Designate periods of time or locations that are free of motorized vehicles.
 - Cades Cove Loop Road is closed to motorized traffic two mornings a week from March through end of September (sunrise until 10:00 AM).
- Promote accessible, front-country trails for hiking, biking, and walking.
 - The park has published maps and books of park trails. Currently there is one accessible, front-country accessible trail on each side of the park.

Reduce vehicle and equipment fuel consumption

- Analyze fleet fuel consumption patterns for efficiency improvements.
 - The park administration division completes the FAST report annually.
 - Facility Management Division will begin tracking mileage and fuel usage for analysis.
- Convert from diesel to biodiesel parkwide.
 - The park currently uses B-20 and B-50 for fleet and heating.
- Promote efficient driving.
 - The park enforces the speed limit: Traveling the speed limit reduces excess engine load and decreases fuel consumption.
 - Employees car pool to meetings and share rides when schedules allow.
- Require all carriers used by vendors and park facilities to be certified under EPA's Smartway Transport Partnership.
 - The park implements when feasible.

Vehicle and equipment replacement

- Develop a vehicle replacement plan.
 - Park has a fleet of hybrids and uses biodiesel in its diesel engines. As available and practical AFVs will be considered as funds are available for vehicle/equipment replacement.
 - When appropriate and feasible the park partners with outside agencies and friends group and association to purchase hybrids.
 - The Park took advantage of the ARRA funding and replaced six old model vehicles for new HHRs.

- Right-size the vehicle fleet by the number and type.
 - The park has begun the process of right-sizing its fleet as the fleet is converted to GSA. No formal process was used. Every vehicle purchased is evaluated to ensure right-size and type.
- Use biodiesel in diesel fuel vehicles.
 - The park does use biodiesel in its diesel-fueled vehicles.
- Replace aging fleet vehicles with alternative fuel or hybrid vehicles.
 - The park has a fleet of hybrids and uses biodiesel in its diesel engines.
 - As available and practical AFVs will be considered as funds are available for vehicle/equipment replacement
- Use alternative fuel vehicles in demonstration projects.

Improve vehicle maintenance procedures

- Develop and maintain a fleet maintenance schedule.
 - PM on vehicles is left to individuals using the vehicles. However, the auto shop has begun tracking routine maintenance and repairs for all its DOI vehicles.
- Operate all fleet vehicles using re-refined engine oil.
 - The park is using re-refined oil.
- Use bio-based lubricants and greases.
 - The park is using bio-based lubricants and greases.

Improve transportation infrastructure

- Use reclaimed materials for new roads and paving.
 - The park is implementing a full-depth reclamation process at Cosby, Cherokee Orchard, Cades Cove and Foothills Parkway East which is reducing our carbon footprint, reducing use of virgin materials, and reducing impact at local landfills.

Transportation Management – Planned Actions

1 Decrease transportation impacts through behavioral changes

- Encourage staff carpooling.
 - Employees initiated carpooling on an ongoing, limited/as needed basis.
- Reduce visitor vehicle idling.

- Post signs and information with park idling rules.
- Reduce staff idling.
 - The park doesn't prohibit vehicle idling but does have procedures in place to remind employees not to let vehicles idle. Park will continue with these procedures.
- Reduce meeting travel.
 - Use webinars/conference calls to avoid excessive travel, both within and outside of the park.
 - Purchase necessary equipment for teleconferencing and videoconferencing.

2 Reduce visitor vehicle fuel consumption

- Promote accessible, front-country trails for hiking, biking, and walking.
 - The park has published maps and books of park trails. Currently there is one accessible, front-country accessible trail on each side of the park.
- Improve tracking of visitor transit data.
 - Could request ridership data for park route serviced by Gatlinburg's transit. The park collects some visitor use data annually.

3 Reduce NPS vehicle and equipment fuel consumption

- Exceed federal fleet performance requirements set by Energy Policy Act (EPAAct), Executive Order 13423, and the Energy Independence and Security Act (EISA).
 - The park purchases the most efficient vehicles for the intended use and purpose.
- Identify areas to reduce or eliminate mowing.
 - Currently evaluating maintained landscapes for opportunities to reduce mowing.
- Analyze fleet fuel-consumption patterns for efficiency improvements.
 - Use FAST to track fuel use and analyze fleet needs with efficiency improvements.
- Replace two-stroke engines.
 - Park is replacing the two-stroke engines with the more efficient four-stroke engines boats, snowmobiles, and other equipment.
 - Park is testing propane powered four-stroke engines

4 Replace NPS vehicles and equipment

- Increase fleet mpg.
 - The park will right-size vehicles as replacement opportunities arise.
- Right size the vehicle fleet by the number and type.
 - Use a Vehicle Allocation Methodology (VAM) to achieve a fleet that is the right size and type.
- Develop a vehicle replacement plan.
 - The park is in the process of converting its DOI fleet to GSA. No additional conversion was implemented in 2011 given budget shortfalls and the continuing resolution.
 - The park has a fleet of hybrids and uses biodiesel in its diesel engines. As available and practical alternative fuel vehicles (AFVs) will be considered as funds are available for vehicle/equipment replacement
- Replace aging fleet vehicles with alternative fuel or hybrid vehicles.
 - The park has a fleet of hybrids and uses biodiesel in its diesel engines. As available and practical AFVs will be considered as funds are available for vehicle/equipment replacement.
 - The park is in the process of converting its DOI fleet to GSA. No additional conversion was implemented in 2011 given budget shortfalls and the continuing resolution.

Working and partnering with the local Clean City organizations, the park is investigating converting its mowing fleet from gasoline to propane including installation of a propane fueling.
- Incorporate alternative fuel guidelines into fleet specifications.
 - Work with GSA to catalogue available AFVs and set minimum AFV goals.
- Use alternative fuel vehicles in demonstration projects.
 - The park has participated in AFV demonstrations in the past but nothing in the last two years (excluding hybrids).
- Replace four-wheel with two-wheel-drive vehicles.
 - The park will consider when the switch does not compromise employee safety, productivity, and efficiency.

5 Improve vehicle maintenance procedures

- Use bio-based lubricants and greases.
 - The park will use bio-based lubricants and greases in fleet maintenance.



- Operate all fleet vehicles using re-refined engine oil.
 - The park will continue to use re-refined oil in fleet maintenance.

6 Improve transportation-related infrastructure

- Improve parking lot designs to incorporate local vegetation.
 - The park will consider doing this with new construction projects using native vegetation.
- Plant trees and local grasses/shrubs in unused parking lots to sequester carbon.
- Use reclaimed materials for new roads and paving.
 - The park is implementing a full-depth reclamation process at Cosby, Cherokee Orchard, Cades Cove and Foothills Parkway East which is reducing its carbon foot print, reducing use of virgin materials, reducing impact at local landfills.
 - The park will consider using reclaimed materials for future projects.

Waste Management

Emission Reduction Goal: Reduce 2006 waste-related GHG emissions from park operations by 6 percent by 2020 (31 MTCO₂E) through waste diversion and reduction.

The connection between waste and GHG emissions may not be obvious. However, waste management—in the form of source and solid waste reduction—can dramatically reduce GHG emissions. Landfills are the largest human-generated source of CH₄ emissions in the United States. Reducing the amount of waste sent to landfills reduces CH₄ emissions caused by decomposition as well as the GHGs emitted from the transportation of waste. The less the park and its visitors consume in terms of products and packaging, the less energy is used and fewer GHGs are emitted. The park benefits from being able to dispose of wastes at the Sevier County Solid Waste Authority. Their state-of-the-art recycling center provides for 70 percent reclamation – meaning that 70 percent (or 97.5 MTCO₂E) of the solid waste collected within the park is recycled at the plant. Only 30 percent of the total volume goes into the landfill.

GRSM park operation activities emitted 343 MTCO₂E (34 percent of overall park operations emissions) from waste management in 2006. The amount of waste sent to landfills—and the resulting emissions—will be reduced by diverting or reducing the park’s waste stream through increased recycling efforts and waste management. Presented below are the actions that are currently under way and which comprise the park’s progress to date as well as those actions that the park will pursue.

Progress to Date and Ongoing Actions

Decrease waste through behavior change

- Engage staff to reduce and manage waste at work.
 - Set up paper recycling bins parkwide.
- Train custodial staff in most efficient use of cleaning products.
 - The park will institute an annual and/or refresher training.

Establish new plans and policies that promote waste reduction.

- Measure the baseline solid waste generation (tons) at GRSM.
 - The park records waste management data in an EMS or a spreadsheet tracking system.
- Track and report landfill data to monitor reductions and success in diverting waste from the landfill.
 - Park administration tracks and records recycling data per contract.
- Incorporate waste reduction into Green Office Practices.
 - The park is implementing some actions: avoiding duplicate purchases, purchasing products with high recycled content, etc.

- Create a materials exchange program.
 - The park has started a limited, informal materials exchange program.
- Choose hand dryers over paper towels.
 - The park is conducting on-going replacement when and where building upgrades are undertaken and where power is available.
- Reduce waste generated at meetings and employee functions.
 - The park is implementing on a division-by-division, event-by-event basis.

Implement recycling and composting practices

- Continually increase the amount of waste material at your park that can be recycled.
 - The park has a recycling program in place for aluminum, scrap metal, white paper, plastic, and mixed paper.
 - The park is pursuing other recycling opportunities (i.e. glass).
- Install easy-to-use recycling containers throughout your park's facilities.
 - Recycling efforts focus on administration functions but not visitor-generated trash.
- Start a comprehensive recycling outreach campaign aimed at park visitors.
 - Leave No Trace and Pack it in/Pack it out programs and literature are in place.
- Assign at least one full time person to act as a park recycling leader/manager.
 - At this time there is not one person assigned full time. The responsibilities are shared among divisional personal.
- Recycle or donate old computers and electronics.
 - The park donates old equipment to schools, senior centers, etc.
 - The park recycles unusable computers and electronics; GRSM does not landfill these.
 - The park practices cradle-to-grave recycling to ensure toxic components are properly managed.
 - The park purchases electronics with less toxic components.

- Send used florescent bulbs to reclaim/recycle service center.
 - The park sends used florescent bulbs to reclaim/recycle service center.
- Use recycled oil and recycled coolant and other fluids in auto shop.
 - Recycled anti-freeze is used at the auto shop.
 - Contaminants such as oils and heavy metals are removed from the antifreeze through a variety of methods including: filtration, distillation, reverse osmosis and ion exchange.
 - Transmission fluid, power steering fluid and gear oil is also recycled, reconditioned or reused through similar processes.
 - Recycled oil is used in all DOI-owned equipment and vehicles.
- Recycle old asphalt pavement for use in ongoing road projects.
 - The park is implementing a full-depth reclamation process at Cosby, Cherokee Orchard, Cades Cove and Foothills Parkway East which is reducing our carbon foot print, reducing use of virgin materials, reducing impact at local landfills.
- Institute alkaline, lithium battery recycling locations in every office building.
 - The park has battery recycling locations in every office building.

Reduce waste through green procurement

- Adhere to Federal, NPS, and PWR “Guidance for Procurement.”
 - The park provides annual training.
- Develop a Green Procurement Plan.
 - The park is ensuring that purchasing decisions follow EPA's Comprehensive Procurement Guidelines (CPG).
 - Use the PWR or WASO model plan addressing preference for purchasing CPG and bio-based products. Use ROMAN (Recommended Materials Advisory Notice) for the % recovered content required. Manage new procurement by requiring purchase of products made of recycled materials or with reduced packaging and other “green” practices. Recycled content products include bathroom tissue, paper towels, and plastic trash bags. See EPA's CPG guidelines - <http://www.epa.gov/epawaste/consERVE/tools/cpg/index.htm>
- Adapt a list of pre-purchase questions for your park.
 - The park asks many of these questions as standard operating procedures: Is it really needed? Can the existing item be fixed? Can it be donated? Are renewable resources used in its production? Is it biodegradable? Biogases? Durable/reusable? Is it non-toxic? Does it have simple maintenance? Is it recyclable? Is it made from recycled content? Is it a CPG item? Is the product produced and sold locally?

- Evaluate current purchases and reduce redundant products.
- Develop a schedule for replacing existing materials.
 - Computers are on replacement schedule, GSA vehicles are on a replacement schedule, DOI vehicles as equipment replacement funding is available, and most electronics replaced when broken.
- Coordinate procurement practices so that surplus materials in one unit may be used by another.
 - Limited exchange practices are in place (depends on the type of surplus material).
- Purchase locally produced materials when possible.
 - The park is implementing whenever feasible.
- Use post-consumer recycled paper in all park publications.
 - Copiers use paper that has some percentage of recycled material.
- Manage waste associated with computers and FAX/printers.
 - The park is implementing shared copiers at all locations where feasible; all electronic equipment is ENERGY STAR qualified; recycle toner cartridges.
- Use low/no-VOC insulation, carpets, paints, adhesives, etc.
 - The park is implementing when and where feasible.
- Increase the use of bio-based products.
 - The park is implementing when feasible and practical.
- Implement a petroleum product substitution program.
 - The park is implementing when feasible and practical.
- Use carpet with high recycled content for any building projects.
 - The park is implementing as flooring is replaced in housing units and park buildings.
- Promote the use of recycled content products and materials procurement within the NPS.
 - GRSM uses an informal process.

- Inventory and substitute all cleaning supplies with non-toxic products.
 - FMD custodial staff has switched to all green products except disinfectant (have not been able to find an effective product).

Reduce and reuse wastewater

- Replace toilets with low-flow models.
 - The park has an on-going program whereby existing toilets are being replaced with low-flow and waterless urinals and composting toilets as appropriate for the location and onsite utilities.
 - Where appropriate, the park is harvesting rainwater for flushing toilets.
- Install low-flow faucets.
 - The park has an on-going program whereby existing faucets are being replaced with low-flow faucets as appropriate for location and onsite utilities.
- Conserve water used in grounds maintenance.
 - Grounds staff does not catch cut grass and does not water grass or vegetation around buildings or parking areas.
- Manage non-point wastewater.
 - The park is doing all of the following activities as often as it can: Lay out surface parking lots to allow for sheet-like drainage to infiltration and bioremediation strips/swales. Minimize changes to topography. Provide warning labels on drains and catch basins. Maintain and clean grease traps and oil and water separators. Use permeable paving materials and permeable vegetated materials for roads and walks, curbless design, and porous gutters. Drain surface runoff into soil. Use bioengineering for treatment of runoff and sediment control. Comply with National Pollutant Discharge Elimination System. Use permeable paving. Conduct a stormwater analysis/plan and quantify pollutants. Consider green (vegetated) roofs.

Waste Management – Planned Actions

1 Decrease waste through behavior change

- Engage staff to reduce and manage waste at work.
 - Set up paper recycling bins parkwide.
- Train park’s maintenance staff on waste reduction initiatives.
 - Waste reduction initiatives are reviewed with seasonal hires, at safety meetings, etc.
- Enforce construction waste management/plan and job site recycling.
 - Require that construction contractors reuse or recycle materials used during building renovations and new site construction/remodeling projects.
 - As part of LEED certification for new facilities construction waste is minimized.

2 Establish new plans and policies that promote waste reduction.

- Reduce purchasing through reuse.
 - Specify materials recovery (reuse and recycling of materials and components) in both building-removal bidding and in property-redevelopment process.
- Incorporate waste reduction into green office practices.
 - Implementing some actions avoiding duplicate purchases, purchasing products with high recycled content, etc.
- Choose hand dryers over paper towels.
 - The park has a program to install energy-efficient hand dryers throughout park facilities, as feasible.
- Reduce waste generated at meetings and employee functions.
 - Establish guidelines for waste minimization: use durable, reusable utensils and mugs, buy in bulk, use items with reduced packaging, and provide recycling receptacles.
- Communicate park waste policy or ISWAP (Integrated Solid Waste Alternatives Plan) to staff and concessioners.
 - Create an orientation packet and provide information on policies and practices for recycling, green procurement, and other aspects of the park’s waste management policy.

- Conduct brown bag lunches and training seminars for all park personnel on topics related to waste reduction.
- Include information on park sustainability, green procurement, and recycling policy in new employee orientations.
- Create a materials exchange program.
 - Materials that can be repurposed should be catalogued and stored or exchanged, e.g., brick and wood waste. Old equipment that cannot be repurposed can be donated or recycled.
 - Limited, informal process started
- Manage solid waste with an ISWAP.
 - Incorporate the investigation of large scale composting opportunities into the ISWAP.

3 Implement recycling and composting practices

- Continually increase the amount of waste material at the park that can be recycled.
 - Currently have a recycling program in place for aluminum, scrap metal, white paper, and mixed paper. The park is pursuing other recycling opportunities.
- Start a comprehensive recycling outreach campaign aimed at park visitors.
 - Include waste prevention/recycling messages in park talks.
 - Provide recycling messages in brochures, trail guides, maps, and posters.
 - Use recycling messaging at waysides, campground display boards, and kiosks.
 - Continue to promote and use Leave No Trace and Pack it in/Pack it out programs and literature.
- Install easy-to-use recycling containers throughout park facilities.
 - Recycling efforts focus on administration functions and not visitor-generated trash.
 - In order to focus on visitor-generated trash, install easy-to-use recycling containers throughout park facilities.
- Implement a construction waste management/plan and job site recycling policy.
 - As part of LEED certification for new facilities construction waste is minimized.
- Practice environmentally responsible deconstruction.
 - The park has no formal plans but is implementing where practical and feasible.

- Institute alkaline, lithium battery recycling locations in every office building.
 - The park recycles batteries. Recycling batteries uses reclaimed materials and keeps heavy metals out of landfills and water supplies. Investigate battery recycling in your local area, or mail used batteries to be recycled (see <http://www.batteryrecycling.com/>).
- Partner with vendors to reuse and recycle park waste.
 - Develop recycling and waste reduction standards for hotels and food services.
 - Ensure that all lodges use water savings information cards about washing sheets and towels.
 - Choose non-rigid recycled-content or biodegradable food packaging.
 - Consider for concession operations.
- Eliminate non-recyclable Styrofoam/Food Serviceware.
 - Eliminate use of Styrofoam. Use biodegradable cornstarch utensils (Earthshell) and biodegradable foam “peanuts.” Some Styrofoam can be taken in for reuse at UPS Stores, or local businesses that ship items.
 - The park is just beginning to investigate Trash-Free Zones in the park.
- Use recycled oil and recycled coolant and other fluids in auto shop.
 - Antifreeze often can be recycled at an auto repair shop equipped with the proper filtration or distillation technology. Contaminants such as oils and heavy metals are removed from the antifreeze through a variety of methods such as include filtration, distillation, reverse osmosis and ion exchange.
 - Transmission fluid, power steering fluid and gear oil can also be recycled, reconditioned or reused through similar processes.
- Recycle old asphalt pavement for use in ongoing road projects.
 - The park has implemented a full depth reclamation process at Cosby, Cherokee Orchard, Cades Cove and Foothills Parkway East which is reducing our carbon foot print, reducing use of virgin materials, reducing impact at local landfills.

4 Reduce waste through green procurement

- Incentivize contractors to practice green procurement practices.
- Continually increase the recycled content of purchased materials.
- Train staff on green procurement practices.
- Encourage employees to take OFEE’s online green purchasing training.

- Use post-consumer recycled paper in all park publications.
 - Copiers use paper that contains recycled materials.
- Adhere to Federal and NPS “Guidance for Procurement.”
 - The park provides annual training.
- Adapt a list of pre-purchase questions for your park.
 - The park will continue to ask many of these questions as standard operating procedures: Is it really needed? Can the existing item be fixed? Can it be donated? Are renewable resources used in its production? Is it biodegradable? Bio-based? Durable/reusable? Is it non-toxic? Does it have simple maintenance? Is it recyclable? Is it made from recycled content? Is it a CPG item? Is the product produced and sold locally?
- Develop a schedule for replacing existing materials.
 - Computers on replacement schedule, GSA vehicles on a replacement schedule, DOI vehicles as equipment replacement funding is available, and most electronics replaced when broken.
- Purchase locally produced materials whenever possible.
 - The park will continue implementing whenever feasible.
- Use carpet with high recycled content for any building projects.
 - The park will continue implementing as flooring is replaced in housing units and park buildings.
- Increase the use of bio-based products.
 - The park will continue implementing at all maintenance activities when feasible and practical.
- Develop a catalogue of sustainable products for purchasing department.
 - SERO has developed a list for the park’s use.
- Implement petroleum product substitution program.
 - The park will continue implementing at all maintenance activities when feasible and practical.
- Promote the use of recycled content products and materials procurement within the NPS.
 - The park has an informal process.
- Use low/no-VOC insulation, carpets, paints, adhesives, etc.

- The park is implementing at all maintenance activities when and where feasible.
- Manage waste associated with computers and FAX/printers.
 - The park will continue implementing shared copiers at all locations where feasible; all electronic equipment is Energy Star qualified; recycle toner cartridges.

5 Reduce and reuse wastewater

- Conserve water used in grounds maintenance.
 - Select grasses and plant materials that require little or no irrigation.
 - Irrigation is used only when establishing new vegetation.
 - Grounds staff will continue to not catch cut grass or water grass or vegetation around buildings or parking areas.
 - The park will only use native vegetation.
- Reduce storm and groundwater runoff.
 - Minimize changes to topography, which is standard practice in the park.
 - Provide warning labels on drains and catch basins, where appropriate and feasible.
 - Maintain and clean grease traps and oil and water separators (current practice at the park's auto shop).
 - Drain surface water into soil.
 - The park has established retention ponds at Oconaluftee Visitor Center, Smokemont Campground, and Sinks visitor areas.
- Monitor and reduce point source wastewater.
 - Inventory maintenance wastewater sources and discharge routes. The park samples and tracks maintenance of its wastewater systems in compliance with state regulations.
 - Use non-chlorinated chemicals, bleach-free, non-phosphate, non-toxic, and biodegradable dishwashing and laundry detergent and cleaners. Never discharge unknown liquids down the drain (e.g., low/high pH, oily and solvent wastes, fuels, antifreeze). Park implements as practical and feasible.
 - Plug floor drains. Label all storm drains and catch basins, where appropriate and feasible
 - Treat black water with on-site system.

STRATEGY 2: INCREASE CLIMATE CHANGE EDUCATION AND OUTREACH

Climate change is a complex and easily misunderstood issue. GRSM can play an integral role in communicating about climate change to a vast audience. A better understanding of the challenges and benefits of reducing GHG emissions can motivate staff, visitors, and community members to incorporate climate-friendly actions into their own lives. GRSM recognizes that the greatest potential impact the park can have on mitigating climate change is through public education. Thus, public education is a key end goal of any climate initiative. From increasing the efficiency of public transportation to developing a green purchasing program, the actions GRSM takes to address climate change serve as opportunities for increasing the public's awareness of climate change.

Presented below are the education-related actions that are currently under way and that comprise the park's progress to date, and those actions that the park intends to pursue. These actions have been prioritized within each sub-category based on a qualitative assessment of a set of criteria including: emission reduction potential, cost-effectiveness, feasibility, co-benefits, regional impact, and ability to rapidly implement.

Progress to Date

- Incorporate climate-friendly information into interpreter programs and talks.
 - Included in performance expectations for permanent and seasonal interpretive staff in 2010.
- Communicate with local communities, park visitors, and local media about actions they can take to reduce GHG emissions.
 - Participating in the area events that promote climate change education.
 - Distribute brochure about GHG reduction strategies that accompanies portable air quality exhibit.
 - Created two climate change videos that are available on the park's website.
- Create demonstration projects and exhibits to convey park sustainability message to visitors.
 - Sustainability messages included in exhibits at public facilities.
 - Taking the portable air quality exhibit to overlooks and other high traffic areas during the busy summer months.
 - Developed a curriculum-based Climate Change unit, with pre- and post-site activities and citizen science field activities to be piloted in September 2011.
 - Developed an "adopt-a-phenology plot" program for volunteers, which allows them to assist in data collection on key life cycle events for trees, wildflowers, birds, and salamanders.
 - In 2011, developed "phenology trails" that give interpreters the option to collect data on life cycle changes on trees and birds along the Sugarlands Nature Trail and the Oconaluftee River Trail.
- Incorporate sessions on climate change into new staff training.

- “Climate Change in the Smokies” seminar occurred in May 2010.
- “Climate Change in the Smokies” talking points are available to staff at anytime via the shared U: drive. Current research findings are updated annually.
- Set climate change priorities and host climate change education workshops.
 - Conducted “Teacher Workshop on Climate Change” in conjunction with Great Smoky Mountains Institute at Tremont in November 2010, February 2011 and June 2011.
- Incorporate sessions on climate change into seasonal staff training.
 - Included in seasonal training June 2010 and will continue to include in subsequent years.

Visitor Outreach

Understanding climate change and its consequences is essential to initiating individual behavioral change. GRSM realizes that it has a unique opportunity to educate the public in a setting free from many of the distractions of daily life. By using existing materials, developing park-specific materials, highlighting what the park is currently doing about climate change, and encouraging visitors to reduce emissions, GRSM can play an important role in educating the public about climate change.

Park staff recognizes the many different audiences that visit the park, including recreational and non-recreational park visitors, “virtual visitors” who visit the park online, school-aged visitors, local and out-of-town visitors, local tribes, and external audiences. Reaching these various audiences with climate change information and engaging them in the park’s efforts requires appropriately focused messaging. The park has developed a number of actions to reach these various audiences effectively, which include:

- Educate visitors about climate change.
 - Messages will be included in Junior Ranger programs, guided walks, and evening programs.
- Develop curriculum for high school climate change program.
- Incorporate climate change messages into existing programs where appropriate.
- Create and distribute previously produced information on climate change and its effects on national parks in general and on GRSM in particular.
 - Gather information on climate change and make it available on the park network for all staff parkwide to have access to for research and program development.
- Develop video on climate change in the park.
- Incorporate climate-friendly information into interpreter programs and talks.
 - Continue to add climate change-related information in to interpreter programs and talks.



- Provide opportunities for visitors to assist in research efforts through phenology monitoring.
- Communicate with local communities, park visitors, and local media about actions they can take to reduce GHG emissions.
 - Participate in area special events that show case climate change and greener living.
- Create interpretive programs at the park.
 - Integrate CFP and climate change information specific to the Southern Appalachians into public education and curriculum-based education programs.
- Develop phenology trails that can be used by interpretative staff.
- Create demonstration projects and exhibits to convey park sustainability message to visitors.
 - Developing demonstration solar array and signage at Tremont Education Center.
- Develop and distribute Do Your Part! materials.
 - Distribute at community events.
- Incorporate climate change information into existing park brochures.
 - Include messages on climate change in Smokies Guide each quarter.
- Include the science and impacts of climate change into park education tools.
 - Develop talking points specific to climate change in the Southern Appalachians to provide at staff training and update with current research findings yearly
- Post climate change in the Smokies videos to park website.

Park Staff

Developing a climate change education program for park staff is vital to increasing awareness about climate change among park visitors and fostering a sense of collective responsibility among staff to help reduce park emissions. By incorporating climate change education into staff development programs, GRSM will enable its staff to demonstrate their commitment through leading by example, and providing visitors with the tools and resources they need to reduce GHG emissions in the park and in their own communities. Actions the park intends to take include:

- Incorporate education on the science and impacts of climate change into concessionaire training.
 - Make climate change in the Southern Appalachians talking points available to concession specialist.



- Start a climate change employee Brown Bag series.
 - Encourage staff to participate in Climate Change Webinars broadcast monthly.
- Set climate change priorities and host climate change education workshops.
 - Conducted Teacher Workshop on Climate Change in conjunction with Great Smoky Mountains Institute at Tremont in November 2010, February and June 2011; continue to host similar workshops.
- Incorporate sessions on climate change into seasonal staff training.
 - Continue to include in seasonal trainings.

Local Community Outreach

The gateway communities, agencies, vendors, and volunteers surrounding GRSM can play a significant role in supporting the park's climate change mitigation goals. As such, when appropriate, park staff will assist local communities with incorporating climate change messages into community events, find partners to promote climate change education at those events, and engage with surrounding agencies to coordinate effective outreach and education efforts. Actions the park intends to take include:

- Develop and leverage relationship with other agencies and entities to create opportunities for workshops on climate-friendly activities etc.
 - Climate-friendly activities now incorporated into Wildflower Pilgrimage programming and includes keynote speakers on Climate Change in the Southern Appalachians.
- Plan a community event for Earth Day.

STRATEGY 3: EVALUATE PROGRESS AND IDENTIFY AREAS FOR IMPROVEMENT

By taking the actions established in Strategies 1 and 2 above, GRSM plans to reduce its emissions to the specified goals. Achieving these goals will require an ongoing commitment by the park, which may include subsequent emission inventories, additional mitigation actions, and reevaluation of goals. As part of this strategy, GRSM will:

- Monitor progress with respect to reducing emissions. This will include subsequent emission inventories to evaluate progress toward goals stated in this action plan.
- Develop additional emission mitigation actions beyond those listed in this plan.
- Periodically review and update this plan.
- GRSM will track climate-friendly actions through its environmental management system.



CONCLUSION

GRSM has a unique opportunity to serve as a model for more than 9 million recreational visitors annually.³ This report summarizes the operational actions the park commits to undertake to address climate change. Specifically, the park realizes its ability to educate the public and serve as a valuable model for citizens. By seriously addressing GHG emissions within the park and sharing its successes with visitors, GRSM will help mitigate climate change far beyond the park's boundaries.

This Action Plan will help meet Secretarial Order 3289 – Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources (09/14/2009) and Executive Order 13514 –Federal Leadership in Environmental, Energy, and Economic Performance (10/05/2009) which calls for GHG emission inventory baselines, reduction goals, and outreach activities. The National Park Service Climate Change Response Strategy (2010) lays out a strategy and bold goals and objectives under mitigation, adaptation, and communication. Much of these components can be addressed with the use of this Climate Action Plan.


This Action Plan also serves as an important enhancement mechanism for the park's established Environmental Management System. Realistic environmental commitments created by GRSM staff and approved by the park's Superintendent will significantly reduce the park's GHG and likely, criteria air pollutants (e.g. SO₂, NO_x, PM) in the coming years. The mitigation actions included in this plan have been developed in order to be directly transferable to the park's EMS. GRSM Climate Action Plan thus provides an effective way to help meet EMS goals.

The National Park Service faces an uncertain future due to the possible effects of climate change. However, by seriously addressing climate change impacts and reducing emissions, GRSM will reduce its contribution to the problem while setting an example for its visitors. The park's Vital Sign monitoring data will also add to the body of science about climate change and inform management actions here locally and elsewhere. The strategies presented in this action plan present an aggressive first step toward moving GRSM to the forefront of Climate Friendly Parks.


³ Great Smoky Mountains National Park: Park Statistics. Available online at: <http://www.nature.nps.gov/stats/viewReport.cfm>

APPENDICES

APPENDIX A: SAVE-THE-DATE CLIMATE FRIENDLY PARKS WORKSHOP FLYER AND AGENDA



CLIMATE FRIENDLY PARKS



Save the Date!

You are invited to the
**Climate Friendly Parks Workshop at
Glenstone Lodge, Gatlinburg, Tennessee**
on Tuesday, December 5, 2006 from 8:00 a.m. to 4:30 p.m.

**Sponsored by the National Park Service's Washington Office,
the Environmental Protection Agency, and
Great Smoky Mountains National Park**

Please join us for this day long seminar to learn about climate change and strategize with colleagues, community, government and business leaders/stakeholders, and climate change experts on how we can reduce greenhouse gas emissions and institute solid environmental practices within the gateway communities, adjacent to Great Smoky Mountain National Park.

RSVP by contacting
Sharon Williams at 865-436-1205 or via email at sharon_p_williams@nps.gov

Great Smoky Mountains Climate Leadership Conference
Partnering for Solutions
Glenstone Lodge, Gatlinburg, Tennessee
Tuesday, December 5th, 2006

8:00 – 8:30	Registration with coffee
8:30 – 8:45	Welcome: Great Smoky Mountains NP and the Challenge of Climate Change (Dale Ditmanson, Superintendent, Great Smoky Mountains National Park)
8:45 – 9:00	Welcome and Overview of National Park Service/ Environmental Protection Agency Climate Friendly Parks Program (Shaun Norton, Environmental Leadership Coordinator, NPS)
9:00 – 10:15	Panel Discussion: What does Climate Change Mean for the Great Smoky Mountains economy and ecology? What are the co-benefits of addressing Climate Change and Air Quality? The Environmental Implications (Jennifer Moore Myers, Resource Specialist, USDA Forest Service) The Co-benefit Implications of Addressing Climate Change (Liana Reilly, Environmental Protection Specialist, NPS and Julie Thomas, Air Resources Liaison, NPS)
10:15– 10:30	Break
10:30– 11:00	Climate Change “GEO-pardy” (Your Host: Karen Scott, Outreach and Education Specialist, US EPA)
11:00 – 12:00	Panel discussion: You Manage What You Measure Strategies for inventorying greenhouse gas and CAP emissions for parks, municipalities, businesses and individuals. Implementing an environmental management plan. Local Municipal Initiatives (Timothy Burroughs, Program Officer, ICLEI) Business Initiatives (Geoffrey Wolpert, President, Gatlinburg Gateway Foundation) Available Tools Including the CLIP Tool (Cbris Steuer, GHG Emission Expert, ICF International) GHG Reduction Program for Individuals (Beth A. Binns, Vice President, ICF International and Karen Scott, Outreach and Education Specialist, US EPA)
12:00 – 12:45	Lunch on site Exhibits and materials, demonstration of emissions inventory tools
12:45 – 2:00	Panel Discussion: Local Case Studies of Climate Friendly Actions <ul style="list-style-type: none"> • Transportation – the role of transportation alternatives in reducing negative impacts to air resources. (TBD) • Energy – methods for reducing and greening energy consumption (David Doane, Energy Research director, University of Tennessee Knoxville) • Solid Waste Reduction and Environmental Purchasing (EP) – improving trash, recycling, and composting practices and developing an EP Plan (William Park, Dept. of Agric. Econ., University of Tennessee Knoxville) • Water Conservation – improving water use efficiency and promoting conservation (Gary McGill, Principal, McGill Associates) (Moderator: Shawn Norton, NPS WASO)
2:00 – 2:20	Coffee Break/Networking.
2:20 – 3:20	Success Stories for Government, Business and National Parks <ul style="list-style-type: none"> • Government—Climate Protection Partnership Programs including State/Local program, Energy Star, Green Power and Climate Leaders (Andrea Denny, Environmental Protection Specialist, US EPA) • Business—Sustainable t-shirt company that provides apparel solutions through innovation and sustainability (Eric Henry, President, TS Designs) • National Parks—Working on sustainability initiatives in the National Park Service (Brad Hill, President, Evelyn Hill Inc)
3:20 – 3:50	A Community Success Story <ul style="list-style-type: none"> • Frost Rollins, Long Range Planner, Chapel Hill, NC
3:50 – 4:30	Facilitated Discussion about Developing Climate Friendly Initiatives for the Region (Julie Thomas, Air Resources Liaison, NPS and Shawn Norton, Environmental Leadership Coordinator, NPS)
4:30 – 4:45	Closing (Shawn Norton, Environmental Leadership Coordinator, NPS and Kevin Fitzgerald, Assistant Superintendent, Great Smoky Mountains NP)

APPENDIX B: WORKSHOP SUMMARY AND LIST OF PARTICIPANTS FOLLOW-UP LETTER



IN REPLY REFER TO

United States Department of the Interior

NATIONAL PARK SERVICE
1849 C Street, N.W.
Washington, D.C. 20240

Great Smoky Mountains National Park Stakeholder,

We would like to thank you for attending the **Great Smoky Mountains Climate Leadership Conference** held on December 5, 2006. Over 80 people from the park and surrounding Gateway communities attended this important conference, contributing their time, energy and their ideas. The Great Smoky Mountains Climate Leadership Conference was hosted by Great Smoky National Park and sponsored by the National Park Service's Climate Friendly Parks Program and the US Environmental Protection Agency. The conference brought together a wide range of stakeholders from the community including park staff, municipality officials and business owners. The overall objective of the meeting was to open a discussion on the impacts of climate change on the Great Smoky Mountain area, as well as to begin the identification of potential solutions both within and outside park boundaries.

Among the many important goals that planners and participants established for the workshop, the more prominent ones included:

- Bringing awareness of climate change, its local impact and strategies for addressing it to the National Park's employees and gateway communities.
- Developing a basic emissions inventory for the National Park.
- Identify the potential for creating a local task force composed of workshop attendees responsible for pursuing climate friendly actions and partnerships in the Community and Park.
- Provide workshop attendees with the tools, resources and contacts needed to take action.

Workshop Summary

The conference began with a welcome from Park Superintendent Dale Ditmanson, who highlighted the importance of the park and the Community coming together to formulate collaborative solutions to address climate change. Presentations on the science and impacts of climate change followed. These presentations demonstrated that reducing climate causing greenhouse gases have multiple benefits that include reducing air pollutants and saving money.

Panelists then spoke about strategies for inventorying greenhouse gas (GHG) and criteria air pollutant (CAP) emissions and setting GHG reduction goals at the park and in other communities around the country. The focus of the discussion then shifted to the management of GHG emissions through the use of alternative transportation systems, energy efficiency, alternative energy and solid waste reduction. The final group of panelists

presented a series of success stories from government, business and park perspectives. Workshop participants concluded by developing strategies that could be implemented locally.

Specific Action Items Identified:

- The Gatlinburg Chamber of Commerce will work with ICLEI – Local Governments for Sustainability to find effective means for educating area businesses about the issue of climate change and conservation efforts that can make a difference.
- The UT Center for Industrial Services (CIS) will work with the ARROWMONT School of Arts and Crafts on performing an energy and water audit at the facility.
- The Town of Chapel Hill, North Carolina will provide examples of collaboration between the Town and the Chapel Hill-Carrboro Chamber of Commerce to Great Smoky Mountain municipalities and assist them in identifying similar opportunities in their areas.
- Sevier County, Tennessee has a new zoning plan but needs help modeling cost/benefits of climate action activities. ICLEI – Local Communities for Climate Change Action will help put the county in touch with ICLEI members that can offer advice.
- Evelyn Hill, Inc. and TS Designs, Inc. will connect about adding triple-bottom-line produced tee-shirts to Evelyn Hills supply chain.

Follow-up: Get involved!

Many important ideas were identified that can be the basis for a Community Climate Change Action Plan. In order to ensure that momentum generated by the conference continues, it was suggested that a local task force composed of representatives from the community be formed with the charge of pursuing climate friendly actions in the community and park. If you are interested in participating in this task force please contact Asher Burns-Burg at: Aburns-burg@icfi.com.

We want to thank you again for your participation in this important conference. By attending the Conference you helped the park and the Gateway Communities take the first important step toward becoming climate change leaders. For more information about Climate Change and What You Can Do please go to www.epa.gov/climatechange. For more information on the Climate Friendly Parks program please visit www.nps.gov/climatefriendlyparks.

Sincerely,

Shawn Norton
NPS Environmental Leadership Coordinator

Enclosures

Workshop Speakers

Name	Affiliation	Email
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William Park	University of Tennessee	wpark@utk.edu

Workshop Participants

Name	Affiliation
Andrea Wilson	
Ann Froschauer	National Parks Conservation Assn.
Ann Schlichting	Great Smoky Mountains National Park
Ben Dieterle	Great Smoky Mountains National Park
Bob Booker	DENSO Manufacturing Tennessee, Inc.
Bob Miller	Great Smoky Mountains National Park
Brian Cook	NPS – SERO
Caroline M. Runser-Turner	Land-of-Sky Regional Council
Carolyn Jensen	Office of Senator Frist
Cathy Cook	Great Smoky Mountains National Park
Cindy Cameron Ogle	City of Gatlinburg
Dana Soehn	
Dave Jones	Department of Tourism Development
David Ball	City of Gatlinburg
David Perella	Gatlinburg Dept of Tourism
David Willard	Arrowmont School of Arts & Crafts

Donna Losson	Great Smoky Mountains National Park
Erik Plakanis	A Walk in the Woods
Gary Jacobs	Oak Ridge National Laboratory
Gil Melear-Hough	Southern Alliance for Clean Energy
Glen Cardwell	Pittman Center
Gregg Marland	Oak Ridge National Laboratory
Hal Varnedoe	Great Smoky Mountains National Park
Heather Grossnickle	Great Smoky Mountains National Park
Herb Handly	Smoky Mountains Convention and Visitors Bureau
Holly Burcham	Friends of the Smokies
Iloff McMahan	Cocke County Mayor
Ira Lapides	
J.J. Stambaugh	Knoxville News - Sentinel
Jan Lapides	
Jeff Welch	Metropolitan Planning Commission
Jennifer Moore Myers	Southern Research Station, USDA Forest Service
Jim Coykendall	Pittman Center Planning Commission
Jim Renfro	Great Smoky Mountains National Park
Jim Scully	
John Bowers	Great Smoky Mountains National Park
Karen Ballentine	Great Smoky Mountains National Park
Karen Houck	
Keith Bamberger	NC Department of Environment and Natural Resources
Kelley Segars	Metropolitan Planning Commission
Ken Voorhis	GRSM Institute at Tremont
Kevin Tierney	Gatlinburg Chamber of Commerce
Kim McKean	
Lance Lewis	Great Smoky Mountains National Park
Leon Downey	Pigeon Forge Department of Tourism
Madeleine Weil	
Mark Penland	TN Department Environment and Conservation
Mason Clinton	
Mickey Robbins	
Micky Roberts	Blount & Sevier County Health Dept.
Mike Tomkosky	Great Smoky Mountains National Park
Nancy Gray	Great Smoky Mountains National Park
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Rick Joyce	Gatlinburg Chamber of Commerce
Ron Greene	
Shawn Benge	Great Smoky Mountains National Park
Stan Johnson	
Stan Wullschleger	Oak Ridge National Laboratory
Sue Bock	Gatlinburg Gateway Foundation
Susan Sachs	Great Smoky Mountains National Park
Theresa Tyler	Gatlinburg Chamber of Commerce
Travis Blake	
Treff Alexander	Great Smoky Mountains National Park
Vesna Plakanis	A Walk in the Woods
Vicki Simms	Gatlinburg Chamber of Commerce

APPENDIX C: ESTIMATED ANNUAL CRITERIA AIR POLLUTANT EMISSIONS¹ FROM GREAT SMOKY MOUNTAINS NATIONAL PARK

Estimated Annual Emissions at GRSM (Source: 2000 Air Emissions Inventory. 2004. Table 15. pp 18)

Source	PM ₁₀ (tons/yr)	SO ₂ (tons/yr)	NO _x (tons/yr)	CO (tons/yr)	VOCs (tons/yr)
Point Sources					
Space and Water Heaters	0.02	0.07	0.39	0.08	<0.01
Generators	0.03	0.30	0.78	0.19	0.04
Gasoline Storage Tanks	--	--	--	--	1.72
Subtotal	0.06	0.37	1.16	0.27	1.77
Area Sources					
Campfires	10.67	0.12	0.80	77.93	70.65
Prescribed Burning	3.21	--	--	8.22	0.77 ¹
Subtotal	11.01	0.12	0.80	86.15	71.42
Mobile Sources					
Road Vehicles	178.17	--	185.09	1,741.64	186.86
Nonroad Vehicles	0.31	--	1.07	0.62	0.36
Subtotal	178.48	--	186.16	1,742.26	187.22
Totals	189.55	0.49	188.12	1,828.68	260.41

¹ As methane

Estimated Annual Mobile Source Emissions at GRSM (Source: 2000 Air Emissions Inventory. 2004. Table 14. pp17.)

Activity	Particulates ¹		SO ₂		NO _x		CO		VOCs	
	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
Road Vehicles										
Park Visitor Vehicles	354,834 ¹	157.10	--	--	368,436	184.22	3,468,631	1,734.32	372,217	186.11
NPS Road Vehicles	1,497 ¹	0.75	--	--	1,738	0.87	14,649	7.32	1,512	0.76
Vehicle Emissions Subtotal	356,331	178.17	--	--	370,174	185.09	3,483,280	1,741.64	373,729	186.86
Nonroad Vehicles										
NPS Nonroad Vehicles	628	0.31	--	--	2,140	1.07	1,248	0.62	714	0.36
Totals										
Totals	Particulates ¹		SO ₂		NO _x		CO		VOCs	
	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr	lbs/yr	tons/yr
	356,959	178.48	--	--	372,314	186.16	3,484,520	1,742.26	374,443	187.22

¹ Includes vehicle exhaust PM₁₀ and road dust

¹ Criteria air pollutants were calculated for GRSM and are presented in the inventory section of this document due to their co-benefit relation with greenhouse gases. However, it is important to realize that criteria air pollutants do not contribute directly to climate change.

