Everglades National Park
Everglades, Florida
June 2005

CLIMATE FRIENDLY PARKS

EVERGLADES NATIONAL PARK ACTION PLAN

Produced by the NPS Environmental Leadership Program, with technical assistance from EPA's Office of Air and Radiation/Office of Atmospheric Programs Climate Change Division/Program integration Branch and NPS's Natural Resources Stewardship and Science Division.

This document reports the accomplishments of Everglades National Park (NP) staff who participated in the joint NPS and EPA Climate Friendly Parks (CFP) Workshop in June 2005. In conjunction with their Environmental Management System (EMS) planning, Everglades NP developed the following commitments to reduce greenhouse gases and criteria air pollutants through the climate friendly management of transportation and facility operations, as well as increased outreach and education efforts.

The Challenge of Climate Change

Climate change presents significant risks and challenges to the National Park System. Imagine Glacier National Park without any glaciers, or vast sections of the freshwater Everglades submerged by rising seas. Imagine large-scale transformations of mangrove swamps and marshes as their range is shifted or significantly reduced by sea level rise. These scenarios are all potential consequences of future climate change. While climate change could benefit some parks, bringing longer seasons for camping and other temperate-weather pursuits, providing longer growing seasons for many plants, and improving conditions for species at the northern limits of their range, it is predicted that the Everglades will likely not be a beneficiary of these changes.

View of Florida Bay from the Flamingo Visitor Center.

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South Florida has experienced a 23 centimeter (9 inch) rise in sea level since 1930. The rising seas have led to increased erosion and flooding in some interior marshes of the Everglades. One of the main risks to coastal areas comes from increased flooding when storm surges are superimposed on higher sea levels. Coastline is lost unless it is rebuilt with transported sand and replanted with grasses to hold the dunes, or if the coast is artificially protected by bulkheads and/or revetments (which eventually results in the loss of

The Challenge of Climate Change *continued from page 1*

American Alligator (Everglades National Park Photo).

any beaches and marshes on the seaward side). Sea level rise could threaten the beaches, islands, marshes, mangroves, and cypress swamps that provide habitat for species such as key deer, panthers, manatees, sea turtles, storks, snail kites, alligators, and crocodiles. Also, as the sea rises, there is risk of saltwater intrusion into the Everglades and the Biscayne aquifer that lies beneath it.

Scientists cannot predict the severity of future climate change or its impacts with certainty. However, the current warming trend suggests that the problem is real and should be taken seriously. Average global temperatures on the Earth's surface have increased about 1.1ºF since the late 19th century, and the 10 warmest years on record have occurred since 1990. The single leading cause of this warming has been linked by scientists to the buildup of greenhouse gases in the atmosphere—primarily carbon dioxide, methane, and nitrous oxide—which trap heat that otherwise would be released to space.

Many scientists believe that the continued addition of carbon dioxide and other greenhouse gases to the atmosphere is likely to raise the Earth's average temperature more rapidly in the next century; a global average warming of 4-7ºF by the year 2100 is considered likely. Rising global temperatures would further raise sea level and would affect all aspects of the water cycle, including snow cover, mountain glaciers, timing of spring runoff, water temperature, and aquatic life. Climate change also could affect human health, alter crops, animal habitats, and many other features of our natural and managed environments.

Greenhouse Gas and Criteria Air Pollutant Emissions at Everglades National Park

Naturally occurring greenhouse gases (GHGs) include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Human activities (e.g., fossil fuel combustion in stationary and mobile sources, agriculture, and waste generation) lead to increased concentrations of these gases in the atmosphere. In addition, there are other more powerful GHGs—hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6)—called high-global warming potential (high-GWP) gases that are created in smaller quantities by industrial processes such as aluminum, iron, and steel production. GHGs contribute to climate change on a global scale. In contrast, the impacts of criteria air pollutants (CAPs), such as sulfur dioxide (SO_2), nitrogen oxides (NOx), volatile organic compounds (VOCs), particulate matter (PM_{10} and $PM_{2.5}$), and carbon monoxide (CO), are typically local and regional in nature.

Everglades NP is the fourth park to complete an inventory of its GHG emissions and the twenty-fifth park to complete an inventory of its CAP emissions. However, the GHG and CAP inventory completed for Everglades NP is unique in the sense that this was the first Climate Friendly Parks inventory that was developed using the Climate Leadership in Parks (CLIP) tool. A draft version of the tool was completed in the spring of 2005, and EPA and NPS agreed to use Everglades to pilot-test the tool. The purpose of the Excel-based

THE CLIMATE LEADERSHIP IN PARKS (CLIP) tool is an interactive, user-friendly spreadsheet model that will be distributed to the National Parks. The CLIP tool gives park staff the information they need to calculate and reduce GHG and CAP emissions that result from various park activities including, among others, energy consumption, visitor transportation, and waste management.

GHG and CAP *continued from page 2*

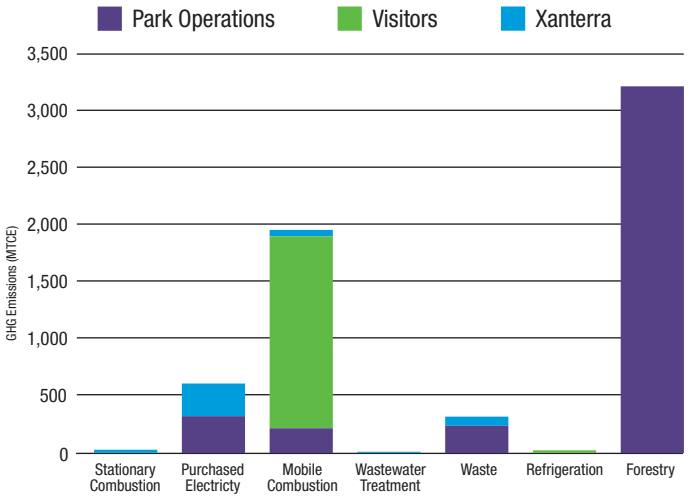
tool is to enable park personnel to complete GHG and CAP inventories themselves. Currently, the Climate Friendly Parks program is limited in the number of parks it can reach due to the significant resources required to put on a workshop and conduct a comprehensive inventory. The CLIP tool allows park personnel to prepare their own inventories by guiding them through the steps involved in estimating emissions, automating the calculations, and generating summary reports and reduction targets for the park. By enabling parks to develop their own inventories and action plans, EPA and NPS hope to expand the Climate Friendly Parks program to many more parks than would otherwise be possible.

Greenhouse Gas Emissions

In 2004, Everglades NP's GHG emissions totaled 6,160 metric tons of carbon equivalent (MTCE). As Figure 1 demonstrates, these emissions were estimated for stationary combustion, purchased electricity, mobile combustion (i.e., highway vehicles, non-road equipment, watercraft, aircraft), wastewater treatment, landfilled waste, air conditioning and refrigeration, and forestry (i.e., burning of forested land).

As Figure 2A depicts, burning of forested land represents Everglades NP's greatest source of GHG emissions (52 percent of total). However, these emissions are the result of ecologically responsible actions undertaken by the park that are necessary to restore and maintain forests in their natural state. Therefore, in the interest of performing a targeted inventory that helps to identify actions the park can take to reduce emissions, it is worth setting aside the issue of forestry-related emissions and focusing on other sources.

Figure 1
Everglades National Park's 2004 GHG Emissions by source and park emitting entity



Mobile combustion accounts for nearly two-thirds of Everglades NP's non-forestry- related emissions (Figure 2B). Emissions from purchased electricity (21 percent) are the second largest non-forestry source and are distributed almost evenly between park operations and Xanterra – the park's primary concessionaire[1]. Solid waste sent to landfill by the park and Xanterra accounts for approximately 5 percent of non-forestry emissions, while the remaining sources (i.e., stationary combustion, wastewater, and refrigeration) each account for no more than one percent of non-forestry GHG emissions.

Figure 2
Sources of Everglades National Park's 2004 GHG emissions by percent of total GHG emissions and percent of non-forestry GHG emissions

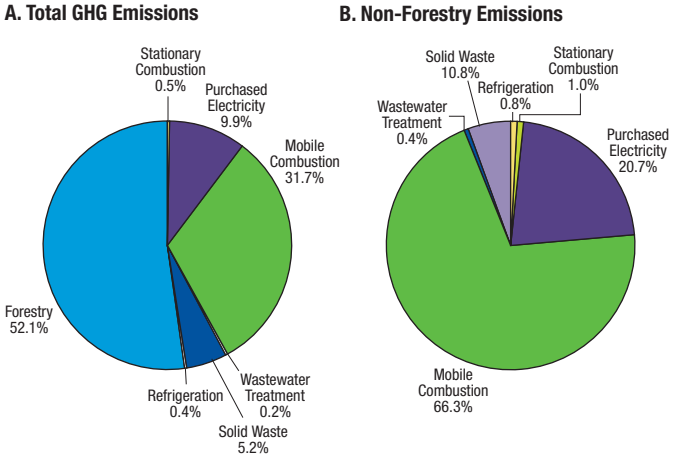
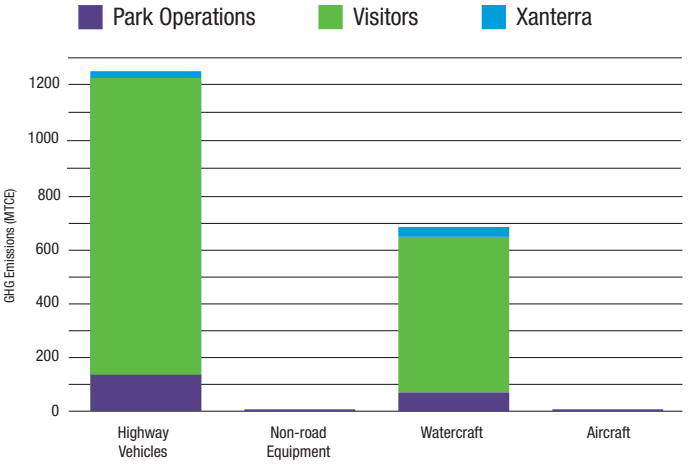


Figure 3
Everglades National Park's 2004 mobile combustion emissions by vehicle type and park entity



[1] Additional authorized concessionaires (e.g., Shark Valley Tram Tours and Everglades National Park Boat Tours) and commercial airboaters that operate within the park boundaries are not included in this inventory due to insufficient data. We estimate that their data would not significantly change the total amount of emissions represented in the inventory.

GHG and CAP *continued from page 3*

Sources of mobile combustion emissions at Everglades NP include highway vehicles, non-road equipment, watercraft, and aircraft. Highway vehicle and watercraft use among visitors account for 86 percent of total mobile combustion GHG emissions (Figure 3).

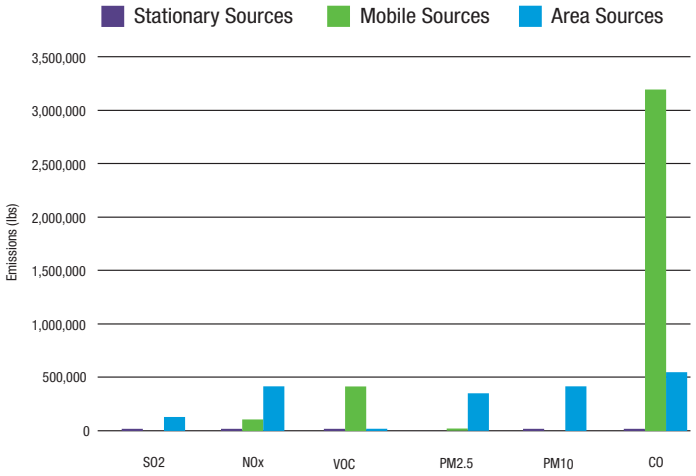
Criteria Air Pollutant Emissions

Sources of CAP emissions for this study included stationary sources (e.g., burning of fossil fuels for water heating, cooking, and electricity generation), mobile sources, and area sources (i.e., pesticide application and burning of forested land). Park entities responsible for these emissions include park operations, visitors, and the operations of Xanterra.

Table 1 and Figure 4 present the results of Everglades NP's 2004 CAP emission inventory. Mobile sources are the largest source of emissions, and carbon monoxide (CO) accounts for the largest share of emissions (3,724,832 pounds). Visitor boating and highway vehicle use produce most of the carbon monoxide (80 percent) and volatile organic compounds (VOCs) (93 percent) emitted. The burning of forested land accounts for most of the sulfur dioxide produced; however, in relation to other pollutants, the emissions of this gas are low. The burning of forested land also accounts for most of the oxides of nitrogen (79 percent), and particulate matter (93 percent) emitted.

In summary, while the burning of forested land represents the largest source of GHGs and CAPs for Everglades, these emissions are the result of ecologically responsible actions undertaken by the park, necessary to restore and maintain forests in their natural state. For non-forestry-related emissions, the use of highway vehicles and watercraft dominate emissions for both GHGs and CAPs. Emissions from these sources are high because more than 1 million individuals enter the park annually via highway vehicles and, according to park estimates, approximately 60,000 boaters visit the park each year. The fact that visitors are responsible for the most non-forestry related emissions underscores the park's popularity. Within that popularity resides the inherent opportunity for Everglades NP to reduce emissions both inside and outside of park boundaries through education and outreach.

Figure 4
Everglades National Park's 2004 CAP emissions by gas and source



Note: In comparison to other source, stationary sources were negligible. Please refer to Table 1 for exact values.

Everglades NP will use the statistics generated by the CLIP tool to target the greatest sources of GHG and CAP emissions within the park. The mitigation strategies outlined during the CFP workshop in June 2005 represent the first steps the park has taken to acknowledge its part in reducing GHG and CAP emissions.

Table 1
Everglades National Park's 2004 CAP emission results by gas and source (lbs)

	SO_2	NO_x	VOC	PM2.5	PM10	CO
Stationary Sources	4	956	5,628	NA	13	4
Mobile Sources	NA	105,607	418,546	53,536	NA	3,182,668
Area Sources	115,720	400,000	5,149	351,300	414,180	542,160
Total	**115,724**	**506,563**	**429,323**	**404,836**	**414,193**	**3,724,832**

How Everglades Is Responding To Climate Change

Recognizing the significance of climate change and the potential it has to alter so many aspects of the park, including the long-term sustainability of park resources and land, workshop participants proposed three areas where climate change mitigation and air pollution reduction actions could be incorporated and the effects could be realized within a relatively short timeframe: transportation, facilities operations, and outreach and education. Based on these three areas, the group broke into three teams which then developed "climate friendly" objectives and targets that would be undertaken by the park's employees and overseen by the Everglades Environmental Management Team (EMT). After the objectives and targets were established, each team determined the project(s) that would achieve those objectives and targets as well as the associated actions, timelines, parties responsible, and desired results comprising each project. These objectives and targets were also integrated into the Everglades EMS, and the park elected to include greenhouse gas reduction as an important component of its EMS. Everglades NP's goals as a Climate Friendly Place bring more visibility to this issue while serving as a statement of the park's commitment to reducing human-caused threats to the natural environment.

THE CLIMATE FRIENDLY PARKS PROGRAM is funded through an interagency agreement between the U.S. Environmental Protection Agency and the National Park Service. The program encourages and enables national parks and, in the future, entities such as state and local parks, refuges, schools and universities, zoos and aquariums, and science museums, to develop both short- and long-term, comprehensive strategies to reduce their greenhouse gas (GHG) and criteria air pollutant (CAP) emissions. Furthermore, the program entails a commitment on the part of each participating park to educate the public about what actions the park is taking to mitigate its GHG and CAP emissions.

Strategy 1

Reduce Fuel Use and GHG Emissions from Transportation Sources

As the inventory results indicate, thirty-two percent of greenhouse gas (GHG) emissions within Everglades National Park are due to mobile combustion. In addition, the largest source of criteria air pollutant (CAP) emissions are mobile sources and the most emitted CAP gas is carbon monoxide (CO) at 3,724,832 pounds/year. Consequently, the reduction of fuel use and GHG emissions from transportation within the park is a significant environmental aspect on which Everglades staff chose to focus their climate friendly efforts.

Reduce Park Marine and Automotive Fleets and Explore Visitor Transportation Alternatives

As North America's only subtropical preserve, with 137 miles of coastline and the largest acreage east of the Rocky Mountains, Everglades NP is heavily traveled by marine and automotive vehicles transporting park visitors and staff.

Everglades staff will assess visitor marine transportation and reduce the size of the park's marine fleet.

Strategy 1 *continued from page 5*

In an effort to curb the park's annual GHG and CAP emissions, Everglades has committed to reduce both the staff marine fleet and the staff automotive fleet (including equipment) by twenty percent at the end of the 2005 calendar year. Also, to reduce emissions and expose the public to alternative forms of transportation, the park will begin to transition the automotive fleet to include smaller, more fuel-efficient vehicles and hybrid models. In an effort to lead by example, members of the park staff have agreed to reduce personal vehicle use through the promotion of a carpooling program and reduce staff vehicle idling through education, monitoring, and enforcement.

To address visitor watercraft travel, the park will complete a study to determine the extent of marine travel and types of fuel use by guides and visitors by May 2006, with the intent of establishing a baseline for future emissions reduction. In regards to visitor highway transportation, the Everglades staff will begin investigating three emissions reduction programs as possibilities:

- Implementing visitor shuttles between the Coe Visitor Center and Royal Palm and/or Shark Valley and the Miccosukee parking lot;
- Promoting increased bicycle and non-motorized boat use; and
- Encouraging a decrease in visitor and tour bus idling.

Increase the Use of Lower GHG Emitting Alternative Fuels and Alternatively Fueled Vehicles

In addition to visitor and park staff transportation sources of emissions, there are three other groups of emitters that Everglades will involve in reduction efforts: concessionaires, RV users, and external contractors. The park's commitments regarding these three groups are as follows:

- Everglades will incorporate alternative fuel terms of reference into future concessionaire contracts and partnerships with the target of x% of park concessionaires using alternatively fueled or hybrid vehicles.
- Everglades will complete an investigation into the possible reduction in noise, fuel use, and GHG emissions from RVs in the park by using alternative fuel sources for RV power generation at camp sites.
- Everglades will begin to implement a plan to reward external contractors that have at least fifty percent of the vehicles in their fleets running on alternative fuels.

Strategy 2
Reduce GHGs Through Buildings and Facilities Management

Improving energy efficiency and implementing alternative energy sources reduce park-based fuel use, lower GHG emissions, decrease electricity consumption, and offer monetary benefits for the park. Everglades NP has made energy efficiency a priority in building and facilities management decisions.

Perform an Energy Audit and Employ Energy Saving Alternatives

In 2004, Everglades NP's purchased electricity accounted for ten percent of the park's total GHG emissions. In order to reduce emissions from purchased electricity, the park will complete an energy audit and incorporate the results into the service contract with Utility Energy. The park's goal is to maximize reduction in electricity consumption from the 2004 baseline inventory by the year 2010. In addition, neighboring Dry Tortugas NP will replace casemate employee housing, and upgrade appliances and power generation units, to reduce diesel fuel consumption by fifty percent from the 2004 baseline inventory by the year 2010. A few of the actions Dry Tortugas is taking to achieve this goal are:

- Completing a Florida Power and Light energy audit;
- Monitoring energy consumption annually;
- Replacing appliances and HVAC equipment with ENERGY STAR® products; and
- Replacing diesel power generation with on-demand power generation.

Strategy 2 *continued from page 6*

Incorporate Sustainable Design and Construction into all Park Projects

To ensure that all future design and construction projects incorporate sustainable principles, Everglades NP will develop and implement a checklist that will assess new projects on environmental standards. Recognizing that the U.S. Green Buildings Council's Leadership in Energy and Environmental Design (LEED) standards provide a useful framework for energy efficiency, Everglades will investigate these and other standards to apply to all new assets, rehabilitation, and repair projects.

Implement Waste Management Practices and Eliminate Hazardous Waste

Diverting the park's waste stream through increased recycling efforts and waste management procedures will reduce the amount of waste sent to landfills, the largest human-generated source of methane emissions in the United States. Everglades NP's solid waste in 2004 accounted for eleven percent of non-forestry related GHG emissions. Through implementing an Integrated Solid Waste Alternative Plan (ISWAP) by 2006 and training employees in new waste management practices, the park is targeting a fifty percent reduction in solid waste sent to landfills by 2010 (percentage reduction based on 2006 baseline).

Similar to many parks in the United States, Everglades NP manages hazardous waste within park boundaries. Although this waste is well contained and managed, the optimal choice for Everglades NP is to eliminate all hazardous waste, which the park aims to accomplish by the year 2010.

Reduce Non-Transportation Fuel Use

Although most of the park's fuel use is a result of highway or marine transportation, there is a certain amount of fuel consumption that does not include transportation. Fire management practices and mowing of the park grounds are two areas where Everglades can decrease fuel use and emissions. Steps to reduce non-transportation fuel use by fifty percent by 2010 (based on 2004 baseline) include:

- Creating and implementing a protocol for fire operations;
- Training staff on fire best management practices;

Everglades staff will work to make park buildings such as this visitor's center, more energy efficient.

- Identifying areas to reduce or eliminate mowing and establish the most efficient method for mowing; and
- Using bio-diesel fuel in place of diesel for the mowers.

Institute Green Procurement Processes

An effective method of reducing the waste stream is to manage new procurements by requiring purchase of products made of recycled materials or with reduced packaging and other "green" practices. To meet the target of using 100% green products by 2010, Everglades NP will take the following steps:

- Complete a Green Opportunity Replacement Assessment;
- Use non-toxic chemicals that reduce bulk waste and result in best value for custodial operations;
- Train staff on green procurement practices; and
- Replace hand towels with hand dryers.

Strategy 3
Increase Climate Change Outreach and Education

Climate change is a complex issue, often ignored and minimally understood by the public. With a thorough understanding of the benefits of reducing greenhouse gas emissions in the park, Everglades staff can serve as demonstrators of the park's climate change efforts, and as interpreters and educators for the public.

EPA's Karen Scott discusses climate friendly education and outreach options with Flamingo District Interpreter, Maureen McGee-Ballinger and Xanterra Concessionaire, Ken Kroll.

Incorporate Climate Change Issues Into Educational Programs for Staff

By establishing an employee climate change education program, Everglades empowers park staff to integrate climate change knowledge and mitigation actions into their daily routines at all levels and provides more opportunity for climate friendly communication with the public. The park's target is to train eighty-five percent of all park employees about climate friendly actions in their area of control by December, 2006. The components of the training program are as follows:

- Incorporate education on the science and impacts of climate change into training for seasonal employees and concessionaires;
- Incorporate a mandate into concessionaire contracts to educate concessionaire employees and park visitors on the science and impacts of climate change;
- Create an Everglades Policy Memo;
- Attend EPA Green Procurement Training and offer it to other Everglades staff;
- Develop a list of sustainable products for purchasing;
- Create visual reminders for employees; and
- Send educational materials to supervisors that can be distributed to staff in monthly safety meetings.

Integrate Climate Change Issues Into Visitor Education Programs

As a national park that is facing human health and biodiversity impacts caused directly or indirectly by sea-level rise, hurricanes, and salt water intrusion, Everglades NP is in a unique position to educate the public about climate change. By integrating climate change education into its ongoing visitor outreach programs, the park expects to provide 100% of visitors to the park with the opportunity to be exposed to climate change issues. Everglades will take the following steps to increase climate change awareness among park visitors:

- Interpreters will incorporate climate friendly information into their programs;
- Climate change education will be posted onto the park web site;
- A sidebar on climate friendly activities will be included in the South Florida National Parks newspaper;
- Climate change resources/materials will be ordered from NPS headquarters;
- Energy efficiency information will be incorporated into the existing boater brochure; and
- The boater brochure will be translated into Spanish.

Strategy 3 *continued from page 8*

Incorporate Climate Change Issues Into State Education Curriculum

The inclusion of climate change curricula into state standards promotes responsible citizenship in this nation's future leaders and causes an indirect education of community households through their children. Everglades staff will conduct a study into the means and effectiveness of instituting climate change education into the Florida State Sunshine Standards with the goal of eventually influencing the incorporation of climate change issues into state standards.

Conclusion

Everglades NP is on the forefront of efforts to address climate change. This report summarizes the operational actions that the park has committed to in response to this important challenge. Important among these actions are those to significantly reduce fuel use in the transportation area, improve energy conservation in buildings, and the implementation of a green purchasing program. Everglades NP recognizes that these actions alone will not prevent the changes predicted from climate change, and so has incorporated education and outreach into its efforts. The greatest impact Everglades NP will have on climate change is the effectiveness and extent of the climate change education available to the public.

The ultimate objective, in addition to directly reducing its own emissions, is to have Everglades NP model climate friendly behavior for its visitors. The more climate friendly information that the park can convey to the public, the more likely the public will respond through direct action. Addressing the issues of climate change and air pollution through direct action and education can have far-reaching, positive consequences for the park's future.

Climate Friendly Parks Spotlight: **Zion National Park Shuttle System**

The shuttle system at the Zion National Park was established to eliminate traffic and parking problems, protect vegetation, and restore tranquility to Zion Canyon.

For more information regarding the Climate Friendly Parks Program, please see a list of program contacts below:

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EVERGLADES NATIONAL PARK (NP) is the only subtropical preserve in North America and is considered a crown jewel of the national park system. The park spans the southern tip of the Florida peninsula and most of Florida Bay, and boasts a rich environment of cypress swamps, mangrove forests, a highly productive estuary, coral reefs, and the Florida Keys, which provide habitat for species such as manatees, snail kites, storks, sea turtles, key deer, and panthers. The park is known for its rich bird life and is the only place in the world where alligators and crocodiles exist side by side.

Everglades NP has been designated a World Heritage Site, an International Biosphere Reserve under UNESCO, and a Wetland of International Importance. President Harry S. Truman formally dedicated Everglades National Park on December 6, 1947. This event culminated years of effort by a dedicated group of conservationists to make a national park in the Florida Everglades a reality.

South Florida's natural areas provide visitors and residents with some of the nation's best fishing, diving, canoeing, camping, birding, and nature study opportunities. In 2004, Everglades NP recorded 1,181,355 visitors entering the boundaries of the park, and it contributes $120 million each year to the local economy through tourism revenue. During the peak season in 2004, Tthe park's peak season employee population in 2004 was employed 283 full-time and seasonal employeesstaff, along with another 120 full- and part-time staff employed by and Xanterra, the park's largest concessionaire, had a peak season employee population of 120 full-time and seasonal staff members. With a vast land area of 1,508,538 acres, Everglades NP contains 137 miles of coastline and is the largest federally owned preserve, in terms of acreage, east of the Rocky Mountains. The park is home to fourteen endangered species and recognized as one of the most threatened national parks in our nation.

For more information regarding Everglades National Park, please visit the park web site: http://www.nps.gov/ever/ or call the park's Visitor Information line at (305) 242-7700.