



National Park Service
U.S. Department of the Interior



CLIMATE *Friendly* PARKS

Sequoia and Kings Canyon National Parks Action Plan

The Sequoia and Kings Canyon National Parks Action Plan was based on ideas generated at a multiday Climate Friendly Parks Workshop held in Three Rivers, California in February, 2008. Park staff and community members came together to develop realistic strategies for addressing climate change in the parks. These strategies serve as the foundation for this document and inform the document's stated goals. This document was prepared by ICF International with support from the National Park Service, Environmental Protection Agency, and National Parks Conservation Association.

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SEQUOIA AND KINGS CANYON NATIONAL PARKS BECOME CLIMATE FRIENDLY PARKS

As participants in the Climate Friendly Parks program, Sequoia and Kings Canyon National Parks belong to a network of parks that are putting climate friendly behavior at the forefront of sustainability planning in national parks. By conducting an emission inventory, setting an emission reduction target, developing this Action Plan, and committing to educate park staff, visitors, and community members about climate change, Sequoia and Kings Canyon National Parks are serving as models for climate friendly behavior within the park service.

Sequoia and Kings Canyon National Parks have committed to reducing greenhouse gas (GHG) emissions by 15% below 2006 levels by 2012. This Action Plan lays out the measures these parks will take to meet this goal. In addition to implementing these measures, Sequoia and Kings Canyon National Parks will:

- Perform subsequent emission inventories to monitor progress.
- Identify additional actions to reduce GHG emissions and inform the public on climate change.
- Include additional actions, and strengthen existing actions, to reduce GHG emissions in future Action Plans.

THE CHALLENGE OF CLIMATE CHANGE

Climate change presents significant risks and challenges to the National Park Service. Scientists cannot predict with certainty the general severity of climate change nor its impacts. 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 1.1°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 GHGs 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.

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> >



GOALS AND OBJECTIVES

This Action Plan identifies actions that Sequoia and Kings Canyon National Parks can undertake to reduce GHG emissions and thus address climate change. This plan presents the parks' emission reduction targets and associated reduction strategies designed to achieve the parks' emission reduction goals.

While the plan does not provide detailed instructions on how to carry out each of the proposed measures, it provides the essential framework needed to meet Sequoia and Kings Canyon National Parks' emission reduction targets. The plan presents an opportunity for the park to devote resources for climate action through a mandate from the park's superintendent. This mandate gives park staff the resources and authority to pursue the mitigation strategies contained in this plan.

Sequoia and Kings Canyon National Parks aims to:

Reduce GHG emissions from Sequoia and Kings Canyon National Parks operations to 15% below 2006 levels by the year 2012 by implementing emission mitigation actions identified in this plan.

In order to meet or surpass this goal, the park will implement strategies proposed in this plan that build from the park's current and future emission inventories. Specifically, the plan recommends two main strategies:

Strategy 1: Reduce GHG emissions resulting from activities within the park by increasing energy efficiency, reducing waste, increasing transportation efficiency, and promoting climate-friendly recreation.

Strategy 2: Increase climate change outreach and education efforts.

GREENHOUSE GAS EMISSION AND CRITERIA AIR POLLUTANT INVENTORY AT SEQUOIA AND KINGS CANYON NATIONAL PARKS

Naturally occurring greenhouse gases 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. Criteria air pollutants, which lead to numerous air quality and public health problems, include sulfur dioxide (SO₂), nitrogen oxides (NO_x), volatile organic compounds (VOCs), particulate matter (PM₁₀ and PM_{2.5}), and carbon monoxide (CO).² While GHGs contribute to climate change on a global scale, the impacts of criteria air pollutants are often local and regional in nature.

Greenhouse Gas Emissions

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

In 2006, Sequoia and Kings Canyon National Parks' GHG emissions totaled 2721 metric tons of carbon equivalent (MTCE). As Figure 1 and Table 1 demonstrate, the largest source of Sequoia and Kings Canyon National Parks' emissions is Transportation - totaling 1799 MTCE. The largest portion of this is from visitor vehicle miles travelled.

² Criteria air pollutants were calculated and are presented in the inventory section of this document due to their co-benefit relation with GHGs. However, it is important to realize that criteria air pollutants do not contribute directly to climate change.



FIGURE 1

Sequoia and Kings Canyon National Parks' 2006 Greenhouse Gas Emissions by Sector

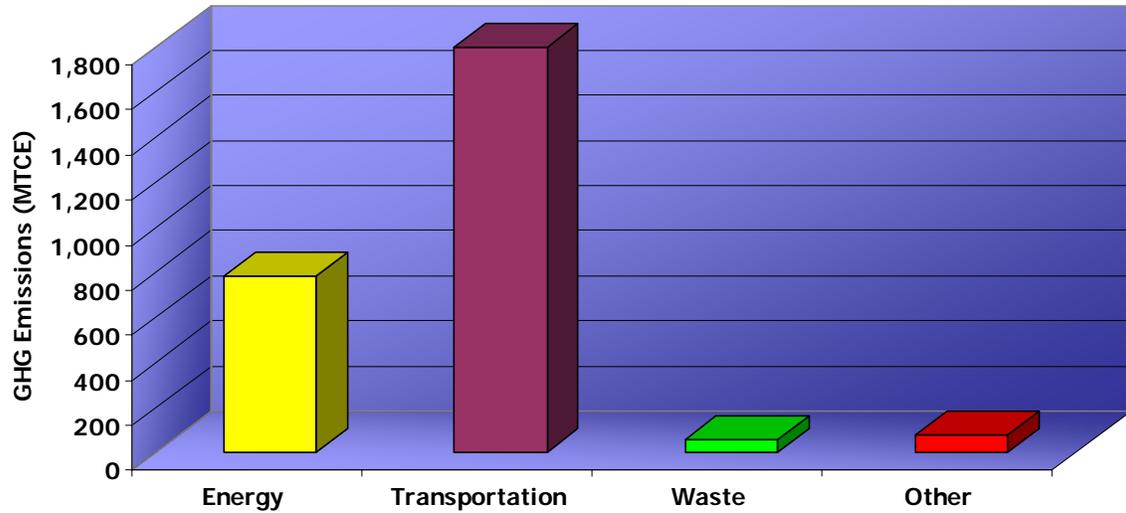


TABLE 1

Sequoia and Kings Canyon National Parks' 2006 Greenhouse Gas Emissions by Sector and Source

	Emissions (MTCE)	% of Total
Energy	781	28.7%
Stationary Combustion	452	16.6%
Purchased Electricity	329	12.1%
Transportation	1,799	66.1%
Mobile Combustion	1,799	66.1%
Waste	61	2.2%
Solid Waste Disposal	52	1.9%
Wastewater Treatment	9	0.3%
Other Emission Sources	81	3.0%
Fertilizer Application	7	0.2%
Refrigeration	75	2.7%
Total Emissions	2,721	
Forest Management	-154,839	
Forestry	-154,839	



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The management of forested land can result in emissions through burning or decay and can act to reduce emissions through carbon sequestration. These emissions result from ecologically responsible actions undertaken by the Park. As an example, by mimicking natural burns, prescribed burning helps to maintain forests in their natural state by preventing the buildup of biomass that, left unchecked, would ultimately result in larger, more destructive fires. Ultimately, larger burns would release emissions similar in quantity and type to those associated with prescribed burns. In the interest of performing a more targeted inventory that addresses, and seeks to reduce, emission sources that do not replicate natural events, the Park focuses on emissions associated with fossilized carbon and man-made materials.

Criteria Air Pollutants (CAPs)

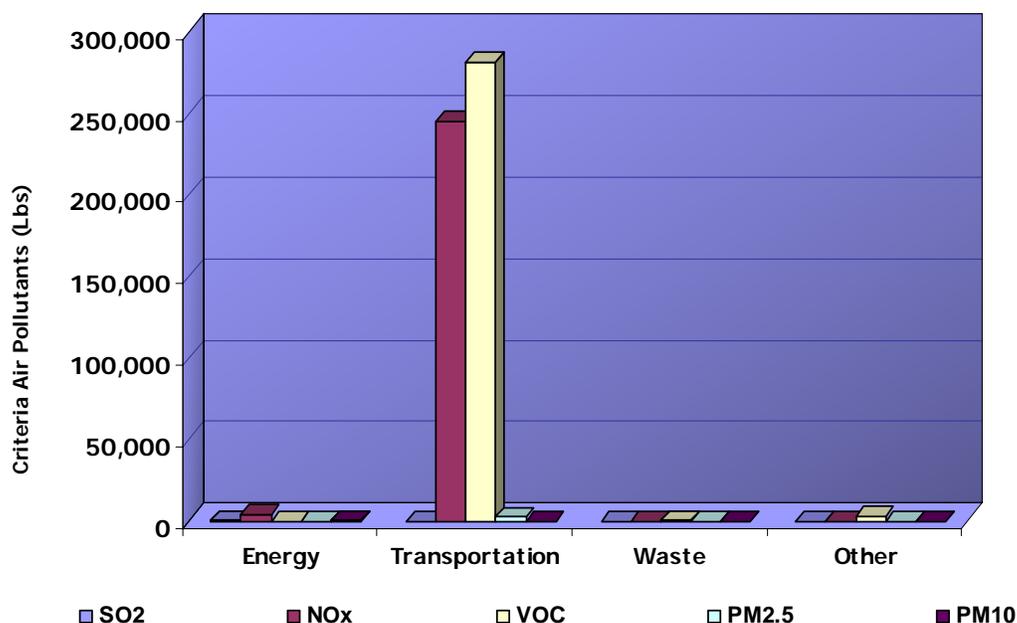
CAP sources include stationary sources (e.g. boilers), mobile sources, and area sources (e.g. campfires, solvent use). In 2006, Sequoia and Kings Canyon National Parks produced 2,227,966 lbs of CO, 144 lbs of SO₂, 248,963 lbs of NO_x, 284,394 lbs of VOCs, and 2,469 lbs of PM (Table 2). As Table 2 demonstrates, at 2,227,966 lbs, CO is the most emitted CAP, largely from Mobile Sources.

The same activities that generate GHGs often also generate CAPs. Therefore, addressing activities that generate GHGs also often has the added benefit, or co-benefit, of reducing CAPs.



FIGURE 2

*Sequoia and Kings Canyon National Parks' 2006 CAPs by Sector**



*CO omitted from Figure 2 due to high volume. See Table 2 for CO emissions.

TABLE 2

Sequoia and Kings Canyon National Parks' 2006 CAPs by Sector and Source

	CO (lbs)	SO ₂ (lbs)	NO _x (lbs)	VOC (lbs)	PM _{2.5} (lbs)	PM ₁₀ (lbs)
Energy	578	144	3,798	0	0	131
Boilers, Heaters, and Generators	578	144	3,798	0	0	131
Transportation	2,227,388	0	245,164	281,450	2,338	0
Mobile Sources	2,227,388	0	245,164	281,450	2,338	0
Waste	0	0	0	222	0	0
Wastewater	0	0	0	222	0	0
Other Emission Sources	0	0	0	2,722	0	0
Area Sources	0	0	0	0	0	0
Fuel Storage Tanks	0	0	0	2,722	0	0
Total Emissions	2,227,966	144	248,963	284,394	2,338	131
Forest Management	41,374,875	195,836	189,830	1	5,070,710	3,228,451



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How Sequoia and Kings Canyon National Parks are Responding to Climate Change

The following actions were developed during the CFP workshop hosted by Sequoia and Kings Canyon National Parks in February, 2008 in order to meet the parks' climate change mitigation goals.

STRATEGY 1: REDUCE GHG EMISSIONS RESULTING FROM ACTIVITIES WITHIN AND BY THE PARKS.

Transportation Management

Emission Reduction Goal: Reduce transportation emissions to 5% below 2006 levels by 2012.

Reducing vehicle miles traveled, upgrading the fleet to the latest green technology that will result in improved efficiency, and using alternative fuels can significantly reduce Sequoia and Kings Canyon National Parks' emissions. As the inventory results indicate, 66% of the park's GHG emissions are a result of transportation.

ESTIMATED ANNUAL GHG REDUCTION: 126 MTCE

ESTIMATED ANNUAL \$ SAVINGS: \$57,680³

The following strategies were developed to meet the park's transportation emission reduction goal:

1 Reduce fuel consumption by NPS and concession vehicles and vessels

- Rightsize the fleet. Replace entire GSA gasoline truck fleet with the best available technology in the next 5 years.*
- Reduce overall gasoline fleet size. *
- Replace entire GSA diesel fleet with the best available technology in the next 5 years.*
- Reduce the overall diesel fleet size. *
- Develop an electronic ride board. Mandate that all staff input travel schedules on a weekly master calendar.
- Conduct motor-pooling between districts.
- Reduce winter idling by providing windshield covers for gasoline buses.*
- Ensure that all employees are aware of 5 minute idling State Law for diesel buses.*
- Reduce gas truck idling by 50%.*
- Reduce diesel truck idling by 50%.*
- Reduce heavy equipment idling by 75%.*

2 Reduce Visitor Vehicle miles Travelled

- Close Crescent Road (seasonally) to private auto traffic.*
- Develop travel packages that include shuttle access to the park (Fresno).
- Reduce idling among park buses by 60%.

³ Based on best available data. Only those strategies denoted by an asterix were included in this estimate.



- Upgrade shuttles with best available technology.
- Support a paradigm shift in how best to visit SEKI: Public Transportation. Coordinate effort between agencies (through a third party partner) to get information out at key points for public transportation access.
- Make sure that all materials (maps) include shuttle routes.
- Use websites to prominently display available systems.
- Educate hikers on how to use existing public transportation to do a trans-sierra trip.
- Encourage use of the existing shuttle system by employees. Explore subsidies to support this effort.
- Explore possibility of new transportation between museum and crystal cave.
- Work with Fresno public transportation to develop a shuttle that connects Kings Canyon with Sequoia Shuttle.

3 Other

- Explore car and van pool possibilities for employees. Develop a ride board to assist with this effort.
- Explore purchasing land to develop a new visitors' center and transportation hub.
- Promote commuting through bicycling for both visitors and park staff who live within the park.
- Form a transportation work group that meets quarterly from the different agencies.
- Integrate concessionaire employees into staff public transportation.
- Promote flexiplace and flexitime scheduling.

Energy Use Management

Emission Reduction Goal: Reduce energy use emissions to 15% below 2006 levels by 2012.

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. As the inventory results indicate, 29% of the park's GHG emissions result from energy consumption. The following strategies were developed to meet the park's energy use emission reduction goal:

ESTIMATED ANNUAL GHG REDUCTION: 77 MTCE

ESTIMATED ANNUAL \$ SAVINGS: \$15,534⁴

1 Implement energy efficiency and energy conservation measures

- Replace existing diesel boilers with high-efficiency propane boilers. Currently the boilers consumed 30,000 gallons of diesel fuel. Two are already funded. Two planned for 2014.*

⁴ Based on best available data. Only those strategies denoted by an asterix were included in this estimate.



- Consider dedicating about \$500,000 dollars to PV (not necessarily on site). Providing 500W of electricity to park. Assumes 1.2 million kWh annually. 6.5 hours/day/365/year.*
- Reduce loads to boilers by 10%.*
- Run LEED rehab on Administrative building to use as example for other buildings and for park staff. Ask LEED-certified staff from the Denver office to assist with this effort.
- Revamp water heating systems to include solar hot water heating. Downsize water heating tanks in tandem with this effort and install PV systems to run the pump.
- Reduce electricity consumption by 15% by installing multiple switches in one room so that one can turn on just a few lights, installing egg crate covers for fluorescent lighting to increase the amount of lighting that reaches the room, and installing solar tubes.*
- Use the results of the Park Asset Management Plan to improve efficiencies of utilities systems.
- Inventory of monitors, desktops, printers, etc. to use more flat screens, laptops, etc.
- Improving efficiencies of the water and wastewater treatment plants to replace the older systems. Use computerized controls to turn pumps on/off as needed, etc. Pumps are oversized at Clover Creek (primary WW treatment plant). May reduce electricity bill by \$5,000/month.
- Create a Climate Change Task Force that will unite efforts across disciplines (e.g. maintenance, interpretation, facilities, fleet management). Reinstate energy monitors/police. Have the energy police work with facilities to conduct energy audits of HVAC, lighting, etc. Place authorities in charge of buildings.
- Install guidelines for purchasing energy saving appliances. Promote energy star appliances.
- Consolidate printers. Remove excess personal printers.
- Replace hand towels with World Dryer Accelerator.
- Install vendmiser on the vending machines.
- Write into contract that road team contractors have to use a certain % biodiesel while working within the park.
- Continue efforts for smart growth/space saving. Institute shared office space, reduce computer use (hot bunking), alternative work schedules and flexispace. Seek control over housing.
- Determine whether meters are charging the correct rate for buildings, etc. Have consultation with the energy provider to make sure they are being tariffed properly for metering.
- Convert all urinals to waterless urinals.



Waste Management

Emission Reduction Goal: Reduce waste emissions to 45% below 2006 levels by 2012 through waste diversion.

The connection between waste and GHG emissions may not be obvious. However, waste management—in the form of source reduction and solid waste reduction—can dramatically reduce GHG emissions. The less we consume in terms of products and packaging, the less energy is used and fewer GHGs are emitted. Additionally, reducing the amount of waste sent to landfills reduces CH₄ emissions caused by decomposition.

Diverting or reducing the parks' waste stream through increased recycling efforts and waste management procedures will reduce the amount of waste sent to landfills, which are the largest human-generated source of CH₄ emissions in the United States. Sequoia and Kings Canyon National Parks' activities emitted 61 MTCE from waste management in 2006. The following strategies were developed to meet the park's waste emission reduction goal:

ESTIMATED ANNUAL GHG REDUCTION: 27 MTCE⁵

1 Manage waste through source reduction, composting, recycling, and combustion

- Increase recycling of cardboard by 20 tons annually by adding cardboard recycling in campgrounds.*
- Increase recycling of mixed recyclables by 7 tons annually by adding more recycling containers, and location of containers.*
- Increase number and size of recycling containers (assumes 2% waste reduction).*
- Relocate how trash centers are setup (i.e. place recycling containers near trash cans) (assume 2% waste reduction).*
- Develop mechanisms to track the type and amount of materials being sent to the waste stream.
- Designate recycling coordinators.
- Reevaluate disposal site usage and redesign the sites around campground use.
- Increase signage on recycling containers (in multiple languages).
- Create interdivisional participation/agreements in meeting waste reduction and recycling goals.
- Host a brown bag series on green procurement, warehouse products, waste reduction and greening offices.
- Educate visitors to use existing facilities to recycle.
- Partner with the community to reduce the amount of waste/packaging entering the park (i.e. waste is kept at store, or not used on products).
- Educate visitors about wastewater conservation in hotels, campgrounds, etc.

⁵ Based on best available data. Only those strategies denoted by an asterisk were included in this estimate.



STRATEGY 2: INCREASE CLIMATE CHANGE EDUCATION AND OUTREACH

Emission Reduction Goal: Motivate 10% of visitors to reduce their household emissions by 10% annually by 2012

Climate change is a complex issue that the park can help communicate to the public. A better understanding of the problem and the benefits of reducing GHG emissions can motivate staff, visitors, and community members to incorporate climate friendly actions into their own lives. Sequoia and Kings Canyon National Parks recognizes that the greatest potential impact the park can have on mitigating climate change is through public education. Thus, the park sees public education as an end goal of any climate initiative. From increasing the efficiency of public transportation to developing a green purchasing program, the actions Sequoia and Kings Canyon National Parks takes to address climate change serve as opportunities for increasing the public's awareness of climate change.

Park Staff

Developing a climate change education program for park staff is vital to increasing awareness about climate change among park visitors. By incorporating climate change education into staff-development programs and creating new opportunities for staff to learn about climate change, Sequoia and Kings Canyon National Parks will reduce park emissions and provide visitors with the tools and resources they need to reduce GHG emissions at home and in their own communities.

- Develop and maintain knowledge of what all partners' climate friendly actions are through Intranet park/partner newsletter.
- Add a staff position or portion of a staff person's time dedicated to sustainability.
- Make an attempt to change the work culture of SEKI by enabling seasonal employees to have a greater impact.
- Develop a unified message on Global Climate Change (GCC) among SEKI staff and concessioners.
- Develop the park as a center of knowledge about GCC by inviting outside speakers (e.g. John Morris) to come into the park and lecture, and having staff attend GCC training sessions.
- Develop annual climate change/sustainability training for all staff.
- Create outreach program that informs park staff, etc. of the electricity cost to promote reduction. As an example, the Administrative building costs X amount of dollars to run, and that equates to X amount of seasonal rangers.

Visitors

Understanding climate change and its consequences is essential to initiating individual behavioral change. Sequoia and Kings Canyon National Parks 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, Sequoia and Kings Canyon National Parks can play an important role in educating the public about climate change.



1 Incorporate climate change awareness into visitor education

- Increase GCC educational efforts for visitors through signage showing environmental costs of actions and advice about better actions to take, talks, workshops, use of park's radio station on impacts of GCC and actions individuals can take, and a GCC exhibit in July 08.
- Increase variety and accessibility of educational efforts through multi-cultural/multi-media outreach, e.g. Univision, producing international signage for recycling, free daily text messaging with climate friendly advice, and a web newsletter with climate friendly actions.
- Encourage education of youth about GCC through outreach efforts to Boy and Girl Scouts and other back country users through citizen science initiatives.
- Increase youth GCC educational efforts by incorporating these messages into various programs including Ranger in Classroom partnership, CAVES in Classroom, and Wildlink, including "how to make a difference" pledge cards in the existing Junior Ranger Program.
- Host Resource Rendezvous / Brown Bag to educate visitors.
- Host a park open-house to show public examples of alternative energy sources.

2 Develop park-specific interpretive materials for visitors

Educating visitors about the tangible effects of climate change is a powerful way to encourage visitors to reduce GHG emissions. The park will use existing climate change interpretive resources, and promote the development of climate change materials specific to impacts in Sequoia and Kings Canyon National Parks. The park will:

- Increase variety of educational resources by producing interpretive pod casts – possibly location specific – available through download on a wireless network throughout the park.
- Include a Climate Friendly Parks informational page on website (e.g., SEKI/NPS, The Bark, and Sequoia Seeds).
- Increase education about how GCC affects park's natural resources (water, weather, meadows, etc.) through website that is linked to I&M inventory monitoring, and a website that shows 1 page briefs on information from monitoring of water, weather, meadows, etc..

3 Highlight what the park is doing to address climate change

Sequoia and Kings Canyon National Parks have already taken many climate friendly actions. In an effort to lead by example and demonstrate climate friendly behavior for the public, the parks will increase education and outreach efforts related to sharing the successes they have already achieved. The parks will:

- Develop signage and messaging that highlight emission reduction activities so that visitors are aware of the climate-friendly actions the parks have taken. Focus on signage on hybrid/electric vehicles, and shuttles showing GHG emissions saved by utilizing these alternative methods of transportation.

The Do Your Part! program provides easy actions people can take every month to reduce emissions in their everyday lives.



4 Encourage visitors to reduce greenhouse gas emissions

Perhaps the greatest potential for Sequoia and Kings Canyon National Parks to help reduce GHGs is to increase visitors' awareness of how they can reduce their personal GHG emissions. The parks will:

- Incorporate Do Your Part! materials including kiosk, poster and brochures into park materials.
- Investigate local partnerships to secure the needed funding and support for the Do Your Part! program.

Local Community

The communities that surround Sequoia and Kings Canyon National Parks play a significant role in supporting the parks GHG reduction goals. As such, when appropriate, Sequoia and Kings Canyon National Parks staff will assist local communities with incorporating climate change messages into community events and find partners to promote climate change education at those events. Park staff will use their knowledge of climate change resources to help local communities engage in climate friendly actions.

1 Encourage climate change awareness in the community and region

Sequoia and Kings Canyon National Parks realizes that climate change does not adhere to geographic or political boundaries. The park will:

- Increase awareness of SEKI's involvement in CFP program among external groups through Annie speaking at Three Rivers, REI in Fresno, and eventually hire person to conduct CFP speaking tour in gateways.
- Increase education about resources available to partners through use of Intra/internet.
- Develop partnerships with and increase the role of the park within gateway communities through holding collaborative events such as Earth Day, and having weekly CFP column/advertisement in local papers.
- Collaborate to hold a Three Rivers green building workshop.
- Develop understanding of gateway community's impact on GCC through community footprint exhibits.
- Involve park staff in other classroom presentations.



CONCLUSION

Sequoia and Kings Canyon National Parks have a unique opportunity to serve as a model for over 1.5 million visitors annually. This report summarizes the operational actions the parks commit to undertake to affect climate change. Specifically, the parks realize their 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, Sequoia and Kings Canyon National Parks will help mitigate climate change far beyond the park's boundaries.

This Action Plan also serves as an important enhancement mechanism for the parks' established Environmental Management System (EMS). Realistic environmental commitments created by Sequoia and Kings Canyon National Parks staff and approved by the parks' superintendent will significantly reduce the park's GHG emissions and CAPs 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. Sequoia and Kings Canyon National Parks' Action Plan thus provides an effective way to 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, Sequoia and Kings Canyon National Parks will reduce their contribution to the problem while setting an example for their visitors. The strategies presented in this Action Plan present an aggressive first step towards moving Sequoia and Kings Canyon National Parks to the forefront of Climate Friendly Parks.

