



Rocky Mountain National Park
September 2007

CLIMATE FRIENDLY PARKS



ROCKY MOUNTAIN 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 on the commitment of Rocky Mountain National Park to reduce greenhouse gases (GHGs) and criteria air pollutants (CAPs) through the climate friendly management of park operations and increased outreach and education efforts. Developed using the Climate Leadership in Parks (CLIP) Tool, this Action Plan supports and builds upon existing sustainability efforts at the park and serves a guide for meeting concrete emission reduction targets through climate friendly behavior within the Park.

Rocky Mountain National Park Becomes a Climate Friendly Park

Rocky Mountain National Park (ROMO) belongs to a network of parks that are putting climate friendly behavior at the forefront of park planning and operations in national parks. By holding a Climate Friendly Parks workshop, conducting an emission inventory, setting an emission reduction target and developing this Action Plan, Rocky Mountain National Park is serving as a model for climate friendly behavior within the National Park Service.

This Action Plan specifically details 1) GHG emissions reduction measures at the park 2) park resource adaptation strategies and 3) visitor education and outreach measures the park will take to address climate change and meet their GHG emission reduction goal. The park has set a GHG reduction goal of 17 percent below 2005 levels by 2017. In addition to implementing these measures, Rocky Mountain NP will:

- Perform subsequent emission inventories to monitor progress.
- Identify additional actions to reduce GHG emissions, inform the public on the topic of climate change and include these actions in future Action Plans.



Solar Array on a Rocky Mountain Park building

The Challenge of Climate Change

Scientists cannot predict the severity of 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 1.1°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 oxides (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. Rising global temperatures present significant risks and challenges to the National Park Service. These include coastal flooding due to sea level rise; changes in snow cover, mountain glaciers, spring runoff, water temperature; changes in species habitat and migration patterns; and many other features of our natural and managed environments.

Goals and Objectives

The objective of this Action Plan is to identify actions that Rocky Mountain National Park can undertake to reduce GHG and CAP emissions and make progress toward adapting to climate change. It additionally outlines education and outreach strategies for communicating this information to the visiting public. This Plan presents the park's GHG emission reduction targets and associated strategies designed to achieve Rocky Mountain National Park's 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 Rocky Mountain National Park's emission reduction targets. The Plan presents an opportunity for the

park to devote resources for climate action and gives park staff the resources and authority to pursue the mitigation strategies contained in this Plan.

Rocky Mountain National Park aims to:

Reduce the park's GHG emissions to 17 percent below 2005 levels by the year 2017 by implementing emission mitigation actions identified by the Park.

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 emissions inventories. Specifically, the Plan recommends three main strategies:

- Strategy 1:** Reduce fuel use and GHG emissions from park facilities and operations.
- Strategy 2:** Increase climate change outreach and education efforts.
- Strategy 3:** Develop management strategies to adapt to climate change.

Greenhouse Gas Emission and Criteria Air Pollutant Inventory at Rocky Mountain National Park

Human activities (e.g., fuel combustion, waste generation, land management) lead to increased concentrations of GHGs, such as CO₂, CH₄, and N₂O, in the atmosphere causing climate to change. Criteria air pollutants (CAPs), which cause 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).¹ While GHGs contribute to climate change on a global scale, the impacts of CAPs are often local and regional in nature.

¹ 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 CAPs do not contribute directly to climate change.

Did You Know?

Emissions of GHGs are typically expressed in a common metric, so that their impacts can be directly compared, as some gases are more potent (have a higher global warming potential or GWP) than others.

The international standard practice is to express GHGs in carbon equivalents. Emissions of gases other than carbon are translated into carbon equivalents using global warming potentials.

Greenhouse Gas Emissions

GHG emissions result from the consumption of fossil fuels for energy (e.g., heating, electricity generation, internal combustion engine driven transportation), the decomposition of waste, and the volatilization or release of various other sources (e.g., fertilizers and refrigerants).

In 2005, Rocky Mountain National Park's GHG emissions totaled 3,540 metric tons of carbon equivalent (MTCE). As Figure 1 and Table 1 demonstrate, the largest source of Rocky Mountain National Park's emissions is mobile combustion, which totaled 2,768 MTCE. Mobile sources include both a) park operated vehicles and b) visitor vehicle travel within the park. The second largest source of GHG emissions was in the energy sector, which contributed 719 MTCE. This source relates to electricity consumption and fuel use to generate heat at the park.

Figure 1

Rocky Mountain National Park's 2005 GHG Emissions by Sector

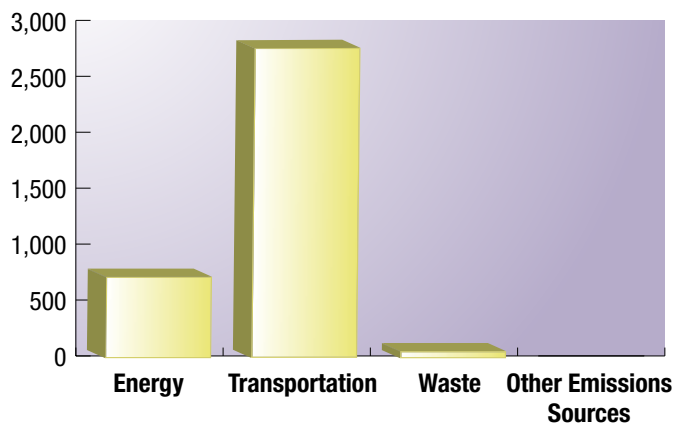


Table 1

Rocky Mountain National Park's 2005 GHG Emissions by Sector and Source

	Emissions (MTCE)	% of Total
Energy	719	20.3%
Stationary Combustion	123	13.5%
Purchased Electricity	595	16.8%
Transportation	2,768	78.2%
Mobile Combustion	2,768	78.2%
Waste	53	1.5%
Solid Waste Disposal	109	1.4%
Wastewater Treatment	4	0.1%
Other Emission Sources	0	0%
Refrigeration	0	0%
Total Emissions	3,540	100%

Criteria Air Pollutants

Sources of CAP emissions included stationary sources (e.g., boilers, heaters, and generators), mobile sources (e.g. buses, cars, heavy duty equipment) and area sources (e.g. campfires, solvent use). Transportation sources contributed the largest amounts of CO and NO_x, while stationary sources produced the greatest amounts of VOCs.

In 2005, Rocky Mountain National Park emitted:

- 1,882,670 lbs of CO,
- 863 lbs of SO₂,
- 121,555 lbs of NO_x,
- 691,214 lbs of VOCs,
- 76,936 lbs of PM, and
- 34,149 lbs of NH₃² (Figure 2).

² NH₃ (ammonia) is not a CAP and is presented here for informational purposes at the request of the park. Ammonia results from transportation and energy sources; however, these estimates exceeded the scope of the inventory.

Figure 2
Rocky Mountain National Park's 2006 CAP³ Emissions by Sector

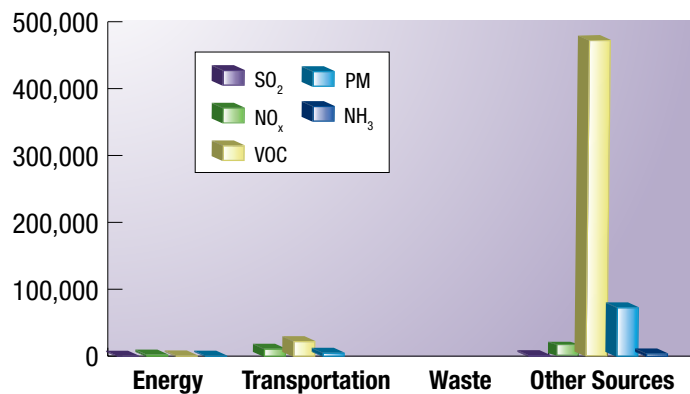


Table 2
Rocky Mountain National Park's 2005 CAP Emissions by Sector and Source

	CO (lbs)	SO ₂ (lbs)	NO _x (lbs)	VOC (lbs)	PM (lbs)	NH ₃ (lbs)
Energy	518	22	1,696	461	90	NE
Boilers, Heaters, and Generators	518	22	1,696	47	90	NE
Fuel Storage Tanks				414		
Transportation	1,877,931	NA	104,619	218,133	4,440	NE
Mobile Sources	1,877,931	NA	104,619	218,133	4,440	NE
Waste	NA	NA	NA	NA	NA	NA
Other Sources	4,221	841	15,240	472,619	72,406	34,149
Campfires and Pile Burning	4,221	841	5,370	472,619	72,406	34,149
Elk			9,870			34,149
Total Emissions	1,882,670	863	121,555	691,214	79,936	34,149

NA – not applicable
Total may not sum due to rounding

How Rocky Mountain National Park is Responding to Climate Change

The following actions were developed by park staff during Rocky Mountain NP's CFP Workshop in order to meet the park's climate change mitigation goals.

STRATEGY 1: Reduce Fuel Use and Greenhouse Gas Emissions from Park Facilities and Operations

Energy Management

Emission Reduction Goal:

Reduce Energy Use Emissions by 122 MTCE below 2005 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, 20.3 percent of the park's GHG emissions result from energy consumption. In addition, energy consumption produces 518 lbs of CO, 22 lbs of SO₂, and 1,696 lbs of NO_x. The following strategies were developed to meet the Rocky Mountain energy use emissions reduction goal:

Install energy efficient light fixtures

- Continue upgrading to energy efficient lighting in park Headquarters (70% current, 30% future).
- Install motion sensor lighting for remaining areas (roughly 50%).
- Inform park staff of the benefits of energy-efficient lighting.
- Replace incandescent lighting in residential units with compact fluorescents.
- Continue to encourage light tube use in remodeled buildings.

³ CO is excluded due to scale

Promote the use of alternative energy.

- Contact regional coordinators when renewing contracts with Platte River and water suppliers to investigate and include green energy and supplies in future contracts.
- Fuel a steam-powered turbine generator on pine beetle wood for pumping electricity into the grid at Grand Lake.
- Investigate potential for biomass energy (pine beetle wood) at the visitor center. Work with Grand County to investigate their actions and consider hooking into the grid.
- Install a hydrogen-powered generator station at Trail Ridge Store (80% of 125 kva).

Develop park policy that promotes energy efficiency and energy conservation

- Replace electric baseboard heaters with oil-filled electric heaters in 100 buildings. Assume 3 oil-starters at present, and a 10% increase in efficiency.
- Improve building energy efficiency by 15% through continual commissioning.
- Perform energy audits of existing boilers to make sure they have the appropriate capacity.
- Install smart thermostats and freeze-alarms in remaining areas (roughly 50%).
- Ensure that future boiler installations have capacity ratings appropriate for buildings.
- Work towards Silver/Gold LEED certified buildings for future development with significant stakeholder involvement from facility staff.
- Replace Moraine Park well with connection to the Estes Park City water supply.
- Work with the state to provide incentives for alternative fuel in tour buses.

Transportation Management

Emission Reduction Goal:

Reduce Transportation Emissions by 469 MTCE below 2005 levels by 2017.

Reducing vehicle miles traveled, improving vehicle efficiency, and using alternative fuels can significantly reduce Rocky Mountain National Park's emissions. As the inventory results indicate, 78.2 percent of the park's GHG emissions are a result of mobile combustion. In addition, mobile combustion produces 1,877,931 lbs of CO, 104,619 lbs of NO_x, and 218,133 lbs of VOCs.

The following strategies were developed to meet the Rocky Mountain transportation emissions reduction goal:

Reduce Visitor Vehicles Miles Traveled (VMT)

- Develop and expand the Park's shuttle system to provide shuttle service for 575,000 annual visitors (21%)⁴.
- Develop a pricing structure for vehicles entering the park. Consider increasing the entrance fee for large vehicles and reducing the entrance fee for hybrids and carpooling.

Replace existing park, concessionaire, and other vehicles with alternative fuel vehicles and hybrids.

- Replace 50% of gasoline cars with best available technology.
- Replace 50% of gasoline trucks with best available technology.
- Replace 50% of diesel heavy duty vehicles with best available technology.
- Review guidelines for enforcement vehicles to see if energy efficient alternatives exist.
- Investigate biodiesel for park vehicles.

Work with partners to improve efficiency of transportation systems

- Increase shuttle capacity that brings visitors from the town of Estes Park to the park.
- Work with surrounding counties to get reliable and frequent bus service from the Front Range to the park.
- Draft a memo for the park Superintendent to send to county commissions expressing interest in partnering on developing alternative transportation solutions.

⁴ This figure was developed using the following assumptions:

- 50 percent of those who fly into Denver will use the shuttle to visit the park.
- 20 percent of those who drive to the park from destinations beyond the Front Range will use the shuttle system to visit the park.
- 5 percent of local visitors (including those who drive from the Front Range) will use the shuttle system to visit the park.
- 2.7 million annual visitors (public use statistics database: 2006).

Waste Management:

Emission Reduction Goal:

Reduce Waste emissions by 21 MTCE below 2005 levels by 2012.

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 tons of GHGs are emitted. Additionally, reducing the amount of waste sent to landfills reduces CH₄ gas emissions caused by decomposition. Waste sent to landfills is the largest source of human-generated CH₄ emissions in the United States.

Diverting the park's waste stream through increased recycling efforts and waste management procedures will reduce the amount of waste sent to landfills. Diverting or reducing the park's waste stream will reduce the amount of waste sent to landfills, the largest human-generated source of CH₄ emissions in the United States. Rocky Mountain National Park activities emitted 53 MTCE from waste management in 2005. The following strategies were developed to meet the Rocky Mountain waste emission reduction goal:

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

- Replace aluminum only containers in campgrounds with co-mingled containers.
- Investigate composting opportunities, and potential opportunities with Xanterra.
- Investigate biomass burning as source of energy. Ask departments at CSU, CU (Dr. Brian Wilson).
- Work with EPA Region 8 to hold a green procurement training session for area parks and land management agencies.
- Add recycling information and tips to staff All Hands meetings.
- Add recycling information and locations to campground maps and brochures.

Reduce the amount of wastewater sent to wastewater treatment plants

- Install low flow devices for domestic areas (for toilets, showers, and faucets).

- Install low flow devices for campground areas (for toilets, showers, and faucets).
- Decrease other water use for dust control, irrigation, line loss (i.e. fix leaks).

STRATEGY 2:

Increase Climate Change Education And Outreach

Emission Reduction Goals:

- **50% of park staff participate in Do Your Part by 2012**
- **10% of ROMO visitors participate in Do Your Part 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 greenhouse gas emissions can motivate staff, visitors, and community members to incorporate climate friendly actions into their own lives. Rocky Mountain National Park 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 Rocky Mountain National Park 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, Rocky Mountain National Park will reduce park emissions and provide visitors with the tools and resources they need to reduce greenhouse gas emissions at home and in their own communities.

Did You Know?

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

Incorporate climate change into park staff trainings

In an effort to provide Rocky Mountain National Park staff with the knowledge and tools to educate visitors, the park will:

- Incorporate climate change education into staff training in all divisions by 2008.

Visitors

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

Incorporate Climate Change awareness into visitor education

Park interpretive staff have the opportunity to introduce the issue of climate change to many visitors. Rocky Mountain National Park encourages staff to include messages about climate change in their visitor talks. Rocky Mountain National Park will:

- Introduce climate change messages into Estes Park Visitor Center and NPS Visitor Center messaging.
- Incorporate climate change into campfire talk messages.
- Work with the lodging association to incorporate climate change messaging into area lodging.
- Develop a climate change component for the Junior Ranger program.
- Incorporate climate change messaging into International Migratory Bird Day celebration.

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. While Rocky Mountain National Park will use existing climate change interpretive resources, the park will promote the development of climate change materials specific to impacts in Rocky Mountain. Rocky Mountain National Park will:

- Develop a page on the Rocky Mountain National Park website dedicated to climate change that will be linked to Climate Friendly Parks website as well as the Do Your Part Program.
- Partner with local, state, and national partners to develop region specific interpretation materials.
- Develop a climate change segment for Channel 8.
- Include climate friendly messaging on appropriate park signage.

Highlight what the park is doing to address climate change

Rocky Mountain National Park has already taken many climate friendly actions. In an effort to lead by example and demonstrate climate friendly behavior for the public, Rocky Mountain National Park will increase outreach and education efforts related to sharing the successes it has already achieved. Rocky Mountain National Park will:

- Develop a display and poster that details what the park currently does and what the park is planning on doing to address climate change.
- Work with science research centers to develop a display on climate change impacts in the Rocky Mountain region. Develop signage and messaging for climate friendly park features so that visitors are aware of the actions the park has taken. This includes but is not limited to signage on shuttle buses and recycling bins.

Encourage Visitors to reduce GHG emissions

Perhaps the greatest potential for Rocky Mountain National Park to help reduce GHGs is to increase visitors' awareness of how they can reduce their personal GHG emissions. Rocky Mountain National Park will fully participate in the Do Your Part program with the goal of having 50 percent of staff and 10 percent of visitors participate in the program by 2012.

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

Local Community

The communities that surround Rocky Mountain National Park play a significant role in supporting the parks GHG reduction goals. As such, when appropriate, Rocky Mountain National Park staff will

assist local communities with incorporating climate change messages into community events and find partners to promote climate change education at those events. Rocky Mountain National Park staff will use their knowledge of climate change resources to help local communities engage in climate friendly actions.

Encourage climate change awareness in the community

Rocky Mountain National Park recognizes that climate change does not adhere to geographic or political boundaries. In an effort to reach out to the community, the park will engage in strategies such as:

- Develop partnerships with the town of Estes Park and Larimer County on Do Your Part Program

STRATEGY 3: Develop Climate Change Adaptation

National park managers face many challenges, from protecting ecosystems and visitors to balancing budgets and public interests. As regional climates change, national parks will need to modify their current management strategies to address new, existing, and changing stressors. The better understandings park staff possess about current stressors, potential stressors, and adaptive management strategies, the better equipped they will be to plan for, and adapt to the possible futures created by a changing climate. With this in mind, the staff of Rocky Mountain National Park have developed the following action items relating to climate change adaptation:

- Hold a workshop for area scientists and managers to identify species and ecosystems at risk.
- Step up ROMO's existing resource monitoring programs
- Hold a scenario planning process workshop to develop specific management strategies designed to address adaptation to the effects of climate change.
- Develop adequate administrative flexibility to deal with management strategies developed in the scenario planning process workshop.
- Build internal capacity to address management strategies developed in the scenario planning process workshop.

Conclusion

Rocky Mountain National Park has a unique opportunity to serve as a climate friendly model for almost three million visitors annually. This report summarizes the management and operational actions to which Rocky Mountain National Park has committed in response to the challenge this opportunity presents. Specifically, the park will realize the potential it has to serve as an educator and the actions it can take to serve as a valuable model for citizens. By addressing GHG emissions within the park and sharing its successes with visitors, Rocky Mountain National Park will help mitigate climate change far beyond the park's boundaries.

This Action Plan also serves as an important enhancement mechanism for the park's established Environmental Management System (EMS). Realistic environmental commitments created by Rocky Mountain National Park staff and approved by the park's Superintendent will significantly reduce the park's GHGs 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. Rocky Mountain National Park's Climate Action Plan thus provides an effective way to meet EMS goals.

Rocky Mountain National Park faces a changing future due to the effects of climate change. However, by reducing GHG emissions, and identifying the adaptation strategies needed, the park will reduce its contribution to the problem while setting an example for its visitors. The strategies presented in this Action Plan present an aggressive first step toward moving Rocky Mountain National Park to the forefront of Climate Friendly Parks.



Rocky Mountain National Park hybrid vehicle