National Park Service
U.S. Department of the Interior

CLIMATE*Friendly* PARKS

Cape Cod National Seashore Action Plan

CAPE COD NATIONAL SEASHORE BECOMES A CLIMATE FRIENDLY PARK

"As managers and visitors alike, we need to think about what impacts would or would not be acceptable in and around special places such as national parks. We also need to consider our responsibility as citizens to explore renewable energy options and protect our resources."

George E. Price, Jr.
Superintendent

As a participant in the Climate Friendly Parks program, Cape Cod National Seashore belongs to a growing network of parks nationwide that are putting climate friendly behavior at the forefront of sustainability planning. By conducting an emission inventory, setting an overall emission reduction target of 20 percent, developing this action plan, and committing to educate park staff, visitors, and community members about climate change, Cape Cod National Seashore strives to provide a model for climate friendly behavior within the park service and within the community.

This action plan identifies steps that Cape Cod National Seashore will undertake to reduce greenhouse gas (GHG) emissions and mitigate its impact on climate change. The plan presents the park's emission reduction targets, and associated reduction actions to achieve the park's goals. Strategies and action plan items were developed by working groups at the Cape Cod National Seashore Climate Friendly Parks Workshop.[1] The overall goals developed at the workshop included quantifiable goals, leadership and education goals, and internal park goals. The goals developed within these categories were:

- Quantifiable Goals
  - Strive to achieve net zero energy use through conservation and renewable energy sources when buildings are rehabilitated;
  - Achieve practical car-free visits to Cape Cod;
  - Meet or exceed the mandates set forth in *Executive Order 13514 (Federal Leadership in Environmental, Energy, and Economic Performance)*.

- Leadership and Education Goals
  - Be a leading voice on the impacts of climate change;
  - Demonstrate successes to be an example in the community;
  - Promote the concept of "Do Your Part" to visitors and surrounding communities.

- Internal Park Goals
  - Strive for continuous improvement internally;
  - Have ongoing recognition of the park's green achievements;
  - Integrate sustainability into park policies and trainings;
  - Reinforce the ideal: "One park, one team, be safe, be green."

While the plan provides a framework needed to meet the park's emission reduction targets, it is not intended to provide detailed instructions on how to implement each of the proposed measures. The park's Environmental Management System (EMS) will describe priorities and details to implement these actions. The team that has convened to lead the park's Climate Friendly Parks Action Plan initiative will serve as the EMS team to continue to create and advance detailed work plans to

[1]Original notes from these workshops, including detailed action items not presented in the final plan have been archived by Cape Cod National Seashore and are available upon request.

achieve the priorities that are set forth (see Strategy 3). The EMS plan will be used to track actions, responsible parties, and measurement of goals.

The targets established in this Action Plan take into account the goals laid out in Executive Order 13514. Signed by President Obama in 2009, the order requires federal agencies to meet a number of specific energy, water and waste reduction targets. In the energy sector, the order calls for the implementation of net-zero energy building design by 2030. In the transportation sector, the order calls for 30% vehicle fleet petroleum reduction by 2020. In the waste sector, the order calls for 50% recycling or waste diversion by 2015. NPS agency-wide goals are still under development.

The Department of the Interior has committed to a reduction target of 20% by 2020 for scope 1 and 2 GHG emissions relative to 2008, and a target of 9% for scope 3 GHG emissions. According to the EPA, scope 1 emissions are direct GHG emissions from sources that are owned or controlled by the entity, while scope 2 emissions are indirect GHG emissions resulting from the generation of electricity, heating and cooling, or steam generated off site but purchased by the entity. Thus, energy and transportation are considered scope 1 and 2 emissions. Scope 3 emissions are from sources not owned or directly controlled by a Federal agency, but related to agency activities, services, and employee travel and commuting, such as contracted solid waste disposal. Thus, waste is considered a scope 3 emission.

The park staff strives to meet DOI's 2020 reduction goals and believes it can exceed DOI's goals in the energy sector. We have therefore set the following emissions reduction targets for 2020.

Cape Cod National Seashore aims to:

- Reduce 2007 energy GHG emissions from park operations by 25 percent by 2020.
- Reduce 2007 transportation GHG emissions from park operations by 20 percent by 2020.
- Reduce 2007 waste GHG emissions from park operations by 10 percent by 2020.
- Reduce total 2007 park GHG emissions, including visitors and concessioners, by 20 percent by 2020.

To meet these targets, the park will implement strategies proposed in this plan that relate to the park's current and future emission inventories. Specifically, the plan recommends three strategies that organize the major activities:

Strategy 1: Identify and implement mitigation actions in energy use management, transportation management, and waste and wastewater management 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 with park staff, visitor outreach, and local community outreach.

Strategy 3: Evaluate progress in GHG reductions and Strategy 1 and 2 initiatives and identify areas for improvement via the Environmental Management System plan.

THE CHALLENGE OF CLIMATE CHANGE

Climate change presents significant risks and challenges to the National Park Service and specifically to Cape Cod National Seashore. Scientists cannot predict with certainty the general severity of climate change nor its impacts. 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 (CO_2), methane (CH_4), and nitrous oxide (N_2O) —which trap heat that otherwise would be released into space.

The continued addition of CO_2 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.[2] 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.

Potential changes predicted in New England due to climate change include:

- winter temperatures changing faster
- winter precipitation as rain instead of snow
- spring coming earlier
- increased frequency of heavy rain or snow events
- the expansion of oxygen depletion in coastal waters
- sea level rise

The Importance of Local Park Science and Advance Planning for Mitigation and Adaptation

The importance of climate change mitigation and adaptation cannot be overemphasized at this time. There is an ongoing need for park science and community planning to assess risks, develop contingency plans to reduce the impacts of probable risks, and engage in proactive changes in thinking to mitigate and adapt to climate change. In addition to focusing on GHG emission reductions, we need to be cognizant of climate future scenarios in budgeting, operating, and development decisions.

Significant shoreline change has occurred on Cape Cod through the ages, and sea level rise must now be strongly considered, as this is a place so vulnerable to storm damage. We constantly witness the ongoing loss of beachfront homes and are required to move lighthouses and take other costly actions, all caused by the draw of people to the edge of the sea. As the sea rises, our shores are less buffered by Georges Bank. Mitigation and adaptation measures must be at the forefront of future planning because storm damage frequency and intensity are expected to increase.

At Cape Cod National Seashore (CCNS), scientists currently study, or propose to study, climate change topics such as weather, surface water quality, hydrology, shoreline erosion, and species present in salt marshes. For example, CCNS scientists have been measuring surface elevation tables in salt marshes for 12 years, and are now examining the relationship of marsh elevation change to rates of sea level rise. While rates vary in different locations, the elevation of Nauset Marsh in Eastham is increasing faster than the current sea level rise rate (3.89 mm/y compared to 2.66 mm/y). Park scientists have also studied the water temperature in ponds within CCNS. Over the past 30 years, temperatures have increased 2 to 7.5 degrees Fahrenheit. Furthermore, 100-year storm events have occurred 10 times since 1978.

In July 2010, park staff participated in an expert elicitation to identify areas on Cape Cod, including CCNS, which are vulnerable to the anticipated impacts of climate change. The consensus-based expert elicitation evaluated vulnerability based on a location's elevation, susceptibility to erosion, and exposure to storm surges and sea level rise. Figure 1 below depicts areas within or adjacent to CCNS that were identified as vulnerable areas. In most cases, the areas identified as vulnerable overlap the Federal Emergency Management Administration (FEMA) Flood Insurance Rate Map risk areas. Figure 2 below depicts the vulnerability of Provincetown to coastal flooding based on the 100-year flood zone.

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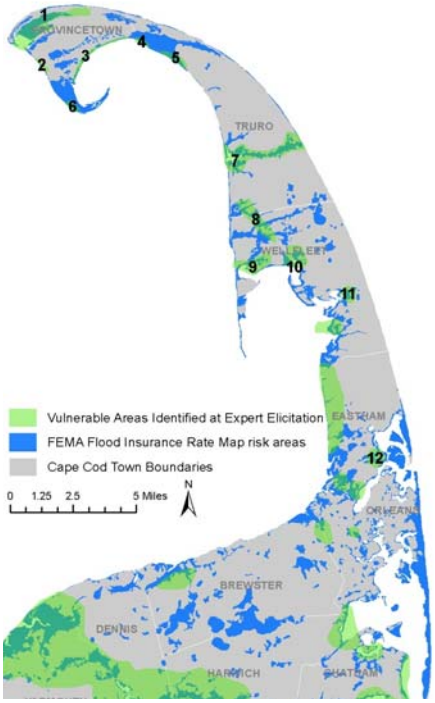
[2] IPCC 2007. Climate Change 2007: The Physical Science Basis. Intergovernmental Panel on Climate Change, Geneva Switzerland. Available online at < http://ipcc-wg1.ucar.edu/wg1/wg1-report.html>

FIGURE 1

*Areas Vulnerable to Climate Change Impacts in or Near CCNS**

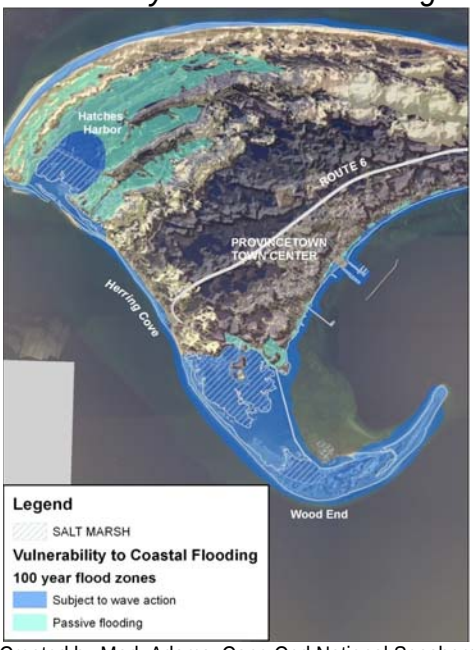


U.S. DOT Volpe Center, 2010

*See Appendix B for a description of the numbered areas.

FIGURE 2

Vulnerability to Coastal Flooding in Provincetown



Created by Mark Adams, Cape Cod National Seashore GIS Specialist

Increasing temperatures, coastal climate change impacts, and changing precipitation patterns may alter park ecosystems, changing vegetation communities, habitats available for species, and the experience of park visitors. These are changes that cannot be taken lightly.

Another important consideration for park management is that buildings, utility infrastructure, parking lots, beach facilities and cultural sites can become vulnerable due to these climate changes. In terms of adaptation, there are five primary actions to address vulnerable facilities and services:

- Repair and maintenance
- Reconstruction/strengthening
- Relocation
- Abandonment
- Improve redundancy

These actions differ in cost and capital investments required and have varying economic, social, and environmental implications. Ongoing park science along with tracking national and regional trends will help us focus on our vulnerabilities and resilience so that we may plan ahead to avoid risks and costly missteps in development. We also need to be storm ready and storm smart in preparing for increased storm events, such as keeping staff and the visiting public safe during hurricanes, nor'easters, high wind and wave action, and extreme heat events. Park science is crucial so that park management can use data to make responsible and informed resource protection and operations decisions.

GREENHOUSE GAS EMISSION INVENTORY AT CAPE COD NATIONAL SEASHORE

Cape Cod National Seashore Characteristics

Cape Cod National Seashore spans six towns, reaching as far north as Provincetown and as far south as Chatham, with a total land and water acreage of over 43,000 (Figure 3). The park owns and maintains over 23 miles of roads and highways. As of 2002, there were 290 structures owned and maintained by Cape Cod National Seashore. Of these, 140 were administrative structures and 69 were housing structures. The energy used to operate such buildings, including the 50 heating systems within park buildings, is a major factor in greenhouse gas emissions.

As of 2010, the park owned approximately 130 vehicles and equipment. Employees in the protection, maintenance, and natural resource divisions use vehicles daily throughout the towns to patrol the park, to make any needed repairs to park property, and to conduct scientific field research. Though not used as often, employees from the interpretation and cultural resources division, management and planning, and administrative divisions must also use vehicles for programs or to attend meetings at other facilities. In addition, most visitors to Cape Cod National Seashore travel by car due to the expanse of the park and the lack of convenient public transportation on Cape Cod. The energy used to operate the vehicles and equipment within the park is another key factor in Cape Cod National Seashore's GHG emissions.

FIGURE 3

Cape Cod National Seashore

Greenhouse Gas Emissions

Naturally occurring GHGs include CO_2, CH_4, N_2O, 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. GHG emissions result from the combustion of fossil fuels for transportation and energy production (e.g., gasoline for vehicles, coal for electricity generation, and propane for generators), the decomposition of waste and other organic matter, and the volatilization or release of gases from various other sources (e.g., refrigerants in building and car air conditioners and wood combustion in kilns and campfires).

GHG emissions are reported in Metric Tons of Carbon Dioxide Equivalent (MTCO2E). For interpretation, Table 1 provides the approximate amount of GHG emissions sources that produce 1 MTCO2E for the categories included in our 2007 emissions inventory. The sources provided in Table 1 are included to help readers understand what 1 MTCO2E relates to in units seen in everyday life, and thus do not represent the actual park's emissions figures. These figures were used to calculate approximate equivalencies for interpretative purposes in subsequent tables (i.e., Table 2, Table 3, and Table 5).

TABLE 1

GHG Emissions Source Equivalencies for Interpretation

	Approximate Equivalent of 1 $MTCO_2E$
Energy	
Stationary Combustion	98 gallons of diesel fuel[3]
Purchased Electricity	1393 kWh of electricity[4] (or the total energy consumption of 1 single-family home for 1 month[5])
Transportation	
Mobile Combustion	112 gallons of gasoline[6] (or 70 days of use of 1 passenger vehicle[7])
Waste	
Landfilled Waste	1739 lbs of mixed Municipal Solid Waste (MSW) [8] (or the total average amount of waste produced by 1 American in 1 year[9])
Other	
Refrigeration and Air Conditioning	1393 kWh of electricity (or the total energy consumption of 1 single-family home for 1 month)
Fertilizer Application	

2007 GHG Emissions for Cape Cod National Seashore

In 2007, GHG emissions within Cape Cod National Seashore totaled 3,303 $MTCO_2E$. This includes emissions from park operations, concessioner operations, and visitor activities, including vehicle use within the park. Park operations alone accounted for approximately 39 percent of the total emissions in 2007. For perspective, a typical single family home in the United States produces a total of approximately 11.75 $MTCO_2$ per year.[10] Thus, the combined emissions from park and concessioner operations, and visitor activities within the park, were roughly equivalent to the total emissions of 281 households in one year.

Total emissions for Cape Cod National Seashore in 2007 can be seen in Figure 4 and Table 2 below. Emissions by park operations only in 2007 are provided in Figure 5 and Table 3 below.

[3] Based on CLIP Module 2 energy calculator, which reports the emission factor for diesel fuel is 0.0101 $MTCO_2E$/gallon of diesel fuel
[4] Based on EPA's eGRID2007 Version 1.1, which reports the US annual non-baseload output emissions to be $7.18x10^{-4}$ $MTCO_2E$ per kWh (http://www.epa.gov/greenpower/pubs/calcmeth.htm)
[5] Based on EPA's Greenhouse Gas Equivalencies calculator methodology, which reports 11.75 $MTCO_2E$ per single family home per year (http://www.epa.gov/cleanenergy/energy-resources/refs.html#houseenergy)
[6] Based on EPA's Greenhouse Gas Equivalencies calculator methodology, which reports $8.89x10^{-3}$ $MTCO_2$ emissions per gallon of gasoline (http://www.epa.gov/cleanenergy/energy-resources/refs.html#gasoline)
[7] Based on EPA's Greenhouse Gas Equivalencies Calculator, which reports emissions of 5.23 $MTCO_2E$/vehicles/year (http://www.epa.gov/cleanenergy/energy-resources/refs.html#vehicles)
[8] Based on EPA's Waste Reduction Model (WARM), which reports emissions of 1.15 $MTCO_2E$ per short ton of mixed MSW landfilled assuming average landfill gas recovery practices and transportation distances (http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_Form.html)
[9] Based on EPA's "Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2008" report, which states that the average American produced 4.5 lbs of waste each day (http://www.epa.gov/waste/nonhaz/municipal/pubs/msw2008rpt.pdf)
[10] As reported in EPA's Greenhouse Gas Equivalencies calculations (http://www.epa.gov/cleanenergy/energy-resources/refs.html)

FIGURE 4

Cape Cod National Seashore 2007 Total Greenhouse Gas Emissions by Sector

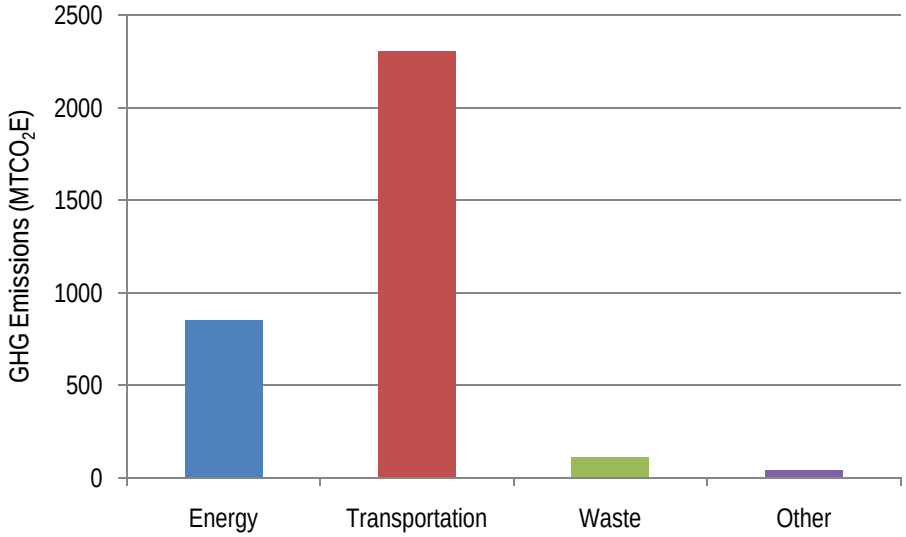


TABLE 2

Cape Cod National Seashore 2007 Total Greenhouse Gas Emissions by Sector and Source

	$MTCO_2E$	Approximate Equivalent
Energy	850	
Stationary Combustion	508	49,800 gallons of diesel fuel
Purchased Electricity	342	476,400 kWh of electricity (or the total energy consumption of 1 single-family home in 28 years)
Transportation	2,304	
Mobile Combustion	2,304	258,000 gallons of gasoline (or 1 year of use of 443 passenger vehicles)
Waste	110	
Landfilled Waste	110	191,300 lbs of mixed MSW (or the total average amount of waste produced by 110 Americans in 1 year)
Other	39	
Refrigeration and Air Conditioning	13	18,100 kWh of electricity (or the total energy consumption of 1 single-family home in 13 months)
Fertilizer Application	25	
Total	3,303	

Note - Totals may not sum due to rounding

FIGURE 5

Cape Cod National Seashore 2007 Park Operations Emissions by Sector

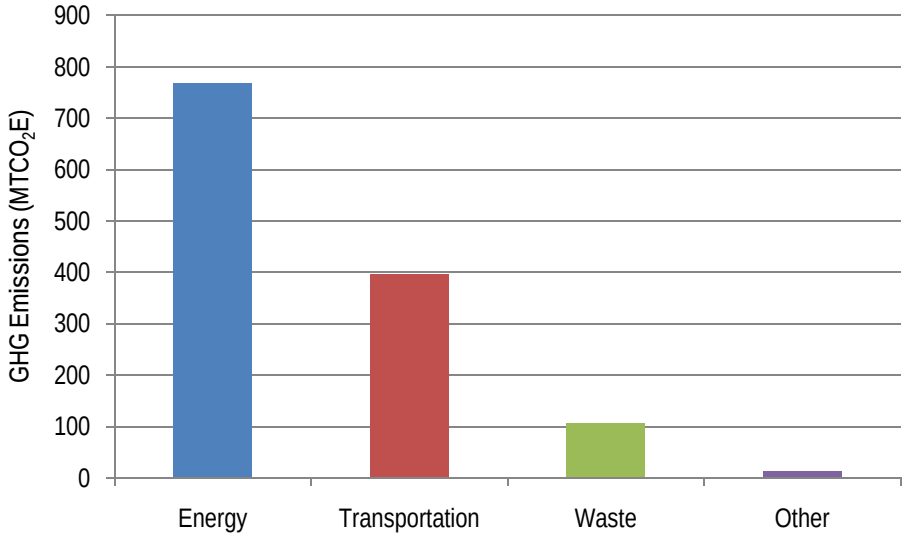


TABLE 3

Cape Cod National Seashore 2007 Park Operations Emissions by Sector and Source

	$MTCO_2E$	Approximate Equivalent
Energy	767	
Stationary Combustion	442	43,300 gallons of diesel fuel
Purchased Electricity	325	452,700 kWh of electricity (or the total energy consumption of 1 single-family home in 27 years)
Transportation	397	
Mobile Combustion	397	44,450 gallons of gasoline (or 1 year of use of 76 passenger vehicles)
Waste	107	
Landfilled Waste	107	186,100 lbs of mixed MSW (or the total average amount of waste produced by 107 Americans in 1 year)
Other	13	
Refrigeration and Air Conditioning	13	18,100 kWh of electricity (or the total energy consumption of 1 single-family home in 13 months)
Fertilizer Application	-	-
Total	1,284	

Note - Totals may not sum due to rounding

Not applicable data sources represented by "-"

FIGURE 6

Cape Cod National Seashore 2007 Emissions as Percentage of Total

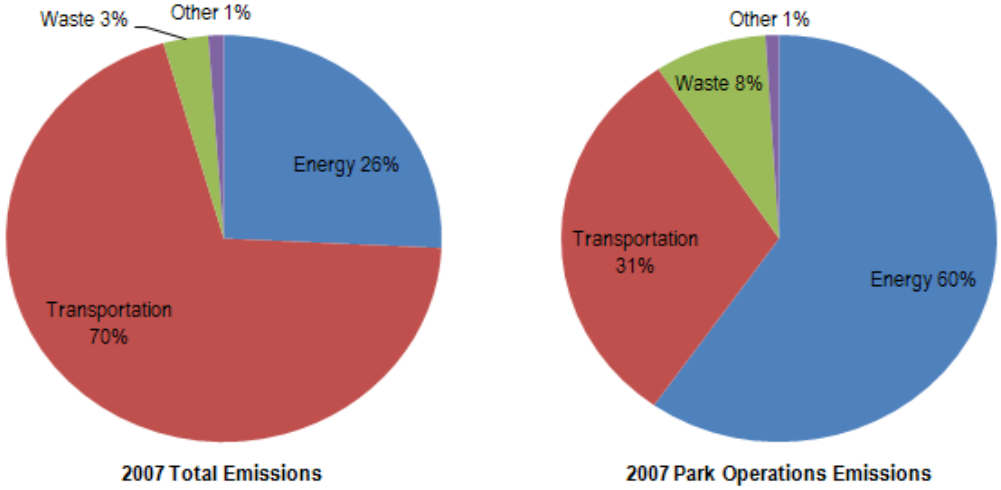


Figure 6 above shows how each sector contributed to overall emissions in 2007. For overall emissions within Cape Cod National Seashore, transportation was by far the largest emission sector, totaling 2,304 $MTCO_2E$, or 70 percent of the total emissions. Total emissions include those produced by the Park's visitors, who contributed an estimated 4.2 million vehicles miles traveled in 2007.

In contrast, energy was the highest contributing sector when considering only Park Operations, accounting for 60 percent of emissions in 2007. Emissions from stationary combustion (produced by the fuel used to heat buildings, for example) and mobile combustion (produced by the fuel used to heat cars, for example) were approximately equivalent during 2007.

2008 GHG Emissions for Cape Cod National Seashore

GHG emissions have also been calculated for 2010, but only include park operations. Concessioner and visitor activities are calculated every five years, which is the standard timeframe to calculate complete inventories within the Climate Friendly Parks Program. In 2010, park operation emissions for Cape Cod National Seashore totaled 1,213 MTCO2E as shown in Table 4; in 2007, park operation emissions were 1,284 MTCO2E.

Between 2007 and 2010, park operations emissions decreased overall due to the large decrease in energy consumption across the park and a small decrease in transportation emissions. Waste, and other emissions, however, increased between 2007 and 2010, as shown in Figure 7. The increase in $MTCO_2E$ between years in these sectors clearly demonstrates the challenge of successfully implementing GHG reduction strategies.

TABLE 4

Cape Cod National Seashore 2010 *Park Operations Emissions by Sector and Source*

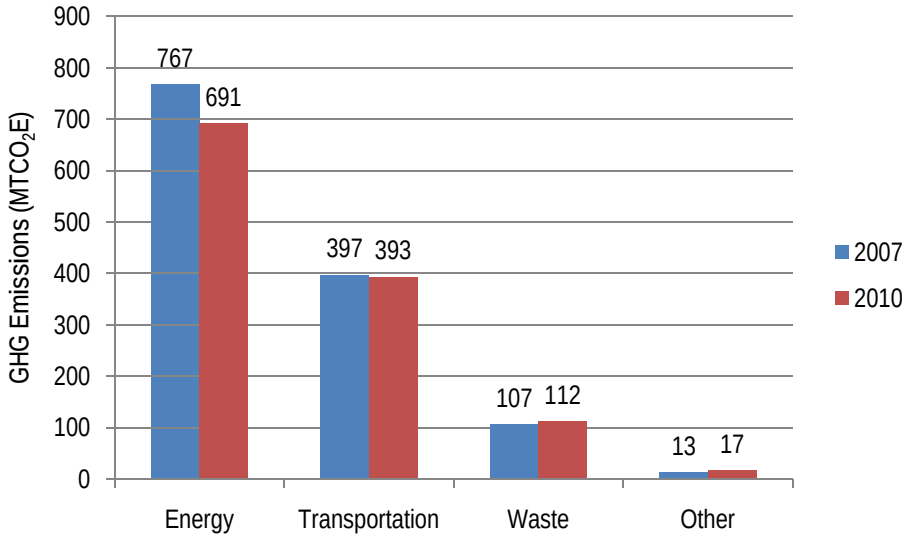
	$MTCO_2E$	Approximate Equivalent
Energy	691	
Stationary Combustion	325	31,900 gallons of diesel fuel
Purchased Electricity	366	509,800 kWh of electricity (or the total energy consumption of 1 single-family home in 30 years)
Transportation	393	
Mobile Combustion	393	44,000 gallons of gasoline (or 1 year of use of 75 passenger vehicles)
Waste	112	
Landfilled Waste	112	194,800 lbs of mixed MSW (or the total average amount of waste produced by 112 Americans in 1 year)
Other	17	
Refrigeration and Air Conditioning	17	23,700 kWh of electricity (or the total energy consumption of 1 single-family home in 17 months)
Fertilizer Application	-	-
Total	1,213	

Note - Totals may not sum due to rounding

Not applicable data sources represented by "-"

FIGURE 7

Cape Cod National Seashore 2007 vs. 2010 *Park Operations Emissions by Sector*



GHG EMISSIONS REDUCTION TARGETS

The emissions reduction targets established by this Action Plan are to reduce GHG emissions of Cape Cod National Seashore as follows:

- Reduce 2007 **energy** GHG emissions from park operations by **25 percent by 2020**.
- Reduce 2007 **transportation** GHG emissions from park operations by **20 percent by 2020**.
- Reduce 2007 **waste** GHG emissions from park operations by **10 percent by 2020**.
- Reduce **total** 2007 park GHG emissions, including visitors and concessioners, by **20 percent by 2020**.

Table 5 below presents these reduction targets in $MTCO_2E$ and approximate reduction equivalencies to illustrate the scope of the challenge the Park is committing to undertake.

TABLE 5

Cape Cod National Seashore Emissions Reductions Targets (2007 Baseline)

	2007 Emissions	Reduction Target		
	$MTCO_2E$	Percent	$MTCO_2E$	Approximate Reduction Equivalent
Park Operations				
Energy	767	25%	192	267,450 kWh of electricity, or the annual energy use of 16 homes
Transportation	397	20%	79	8,850 gallons of gasoline, or the annual GHG emissions from 15 passenger vehicles
Waste	107	10%	11	18,600 lbs of mixed MSW, or approximately the amount of waste a town with Wellfleet's year-round population produces in 1 day[11]
Total	3,303	20%	661	

[11] Assuming Wellfleet's year round population is 3500 (http://www.wellfleetma.org/Public_Documents/WellfleetMA_WebDocs/about.shtml), and the average waste production of 4.5 lbs/person/day (http://www.epa.gov/waste/nonhaz/municipal/pubs/msw2008rpt.pdf)

Cape Cod National Seashore Responds to Climate Change

The following actions were developed during the Cape Cod National Seashore Climate Friendly Parks workshop on May 19 and 20, 2010, in order to meet the park's climate change mitigation goals.

STRATEGY 1: IDENTIFY AND IMPLEMENT MITIGATION ACTIONS

Cape Cod National Seashore has developed a set of actions that the park is committed to taking in order to reduce emissions from activities both by and within the park. These strategies 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 of rapid implementation. Actions that Cape Cod National Seashore will take have been presented below in order from highest to lowest priority within each sub-category.

The Park staff will continue to track progress and priorities to keep implementation of the Action Plan routinely at the forefront of Park Operations and Planning.

ENERGY USE MANAGEMENT

Emission Reduction Target: Reduce park operations' energy use emissions to 25 percent below 2007 levels 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 60 percent of the park's GHG emissions from park operations are from energy consumption. Consequently, Cape Cod National Seashore 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.

Installation of double pane windows and recycled denim insulation at park ranger stations.

Progress to Date

- Adjusted thermostat settings throughout the park for energy conservation.
  - Replaced old mercury containing thermostats with programmable ENERGY STAR rated thermostats in some park buildings.
- Adjusted janitorial schedules for energy conservation.

- Implemented cleaning schedules at an earlier time in the day to reduce the energy used to keep buildings open.

- Installed energy efficient light fixtures in most public park buildings.
- Worked with Cape Light Compact to switch to Compact Fluorescent Light bulbs (CFLs) in public park buildings.
- Installed night-friendly sky lighting at Highlands Center.
- Ensured efficient use of Building Automation System (BAS) at SPVC. Commissioned heating systems at SPVC and the park's Atlantic Research Center laboratory to ensure more efficient operation and performance.
- Installed energy managers on boilers in all public buildings with oil-fired boilers for heating, including research housing, maintenance buildings, ranger stations, and visitor centers.
- Followed the Federal Energy Management Program guidelines for purchasing energy efficient appliances in accordance with federal procurement procedures.
  - Natural Resources division has established and implemented a procurement policy in accordance with FEMP guidelines.
  - CCNS has a Standard Operating Procedure (SOP) for purchasing energy efficient appliances.
- Inventoried all appliances and replaced ones 10 years or older with ENERGY STAR or better.
- Installed window shading in air conditioned buildings, including the ARC lab.
- Replaced single pane windows with double pane windows at Race Point Ranger Station and Headquarters building.
- Installed higher R-value insulation at SPVC and recycled denim insulation at the Race Point Ranger Station.
- Run stationary generators on liquid propane instead of conventional gasoline.
- Completed ASHRAE Level 2 Energy Audit in 2010 to identify opportunities to reduce energy, water and natural gas consumption in park buildings.

Planned Actions

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

Simple changes in daily practices can add up to a large savings in GHG emissions, especially when these behavioral changes are adopted park-wide. For example, adjusting one computer to enter system standby or hibernation mode after 30 minutes of inactivity and monitors to enter sleep mode after 15 minutes of inactivity can save approximately 1,100 kWh of electricity per year; for 50 computers, this is equivalent to 40 $MTCO_2E$ annually.[12]

- Increase energy efficiency in all park buildings and housing by encouraging conservation and efficiency behaviors.
  - Include messages or "Tip of the Day" on daily Safety/Environmental Minute documents.
  - Continue the efforts of the green building facilitators to track energy use in their buildings and promote awareness to other staff about high energy consumers and ways to conserve (e.g. turn off monitor, lights when not in room).
  - Weigh all planned capital investment actions against life cycle costs and total energy impact of replacement of equipment.
  - Increase energy conservation signage in park buildings and high visitation areas.
  - Include housing units in all energy conservation efforts, including annual cleaning and tuning of oil burners, weather stripping, and insulating.
  - Power off cash register at Salt Pond Visitor Center (SPVC) during off-season when not in use and make sure SPVC lights stay off until staff arrive at 9 am.
  - Create "energy challenge" between park buildings to see who can reduce the most and recognize the winners.

[12] http://www.energystar.gov/ia/products/power_mgt/LowCarbonITSavingsCalc.xls

- Add energy conservation measures to the closedown checkout process when housing units are vacated or seasonal facilities are shut down for the winter as part of the park's Operations and Maintenance (O&M) procedures.

- Develop a mandatory energy-saving training program.
  - Investigate opportunities through Cape Light Compact for training programs for Building Operators.
  - Instruct staff on how to turn off equipment when it is not in use and enable energy-saving settings for computers and monitors.
  - Incorporate an energy performance reward system based on success of energy conservation measures, such as carpooling, bicycling, and turning lights out.
- Establish an Operations and Maintenance (O&M) schedule that evaluates energy use across the entire park.
  - Continue to evaluate data from energy audit conducted in 2010 and Cape Light Compact building energy audits.
  - Conduct an energy audit of all maintenance activities, such as evaluating efficiencies of travel to dispersed work destinations and local building supply companies.
  - Institute scheduled maintenance of heating systems and HVAC.
  - Install weather stripping at Province Lands Visitor Center (PLVC) as a high priority. Establish a list of other priority buildings as most heated facilities could benefit from additional weather stripping.
  - Turn off heat at PLVC during off-season and explore heating system conservation opportunities in associated free-standing restroom building.
- Ensure all computers' power management settings follow current ENERGY STAR recommendations.
  - Set computers to enter system standby or hibernation mode after 30 minutes of inactivity and monitors to enter sleep mode after 15 minutes of inactivity.

2 Upgrade lighting options

The average American home has 30 light features; over their life cycle, 30 CFLs can save 13,500 kWh of electricity; this is equivalent to a total of 9.7 $MTCO_2E$.[13] As the Park currently has 69 housing structures in use as well as an additional140 administrative structures, upgrading lighting options has the potential to make a significant impact on GHG emissions.

- Upgrade all light fixtures and bulbs in park to energy efficient bulbs.
  - Optimize lighting fixtures in all park buildings.
  - Replace fluorescent fixtures with CFLs in the NEED building via the work order process.
  - Investigate LED and solar outdoor lighting opportunities throughout park.
  - Continue to replace incandescent light bulbs with CFLs where appropriate, particularly in seasonal housing units once a comprehensive safety procedure and education measures are put in place concerning proper disposal of broken and intact CFL bulbs due to their mercury content.
- Site new or replacement buildings to maximize passive solar energy, day-lighting, and natural ventilation.
  - Consider solar orientation for Herring Cove and Nauset Light bathhouses during replacement design phase.
  - Implement Highlands Center Solar Assessment recommendations as the site redevelopment progresses.
  - Seek grant opportunities for funding.
- Install dimmable ballasts and pair lighting with photo sensors to reduce electricity use as recommended by 2010 energy audit.
  - Investigate visitor center opportunities for installation of dimmable ballasts.
  - Use bi-level lighting to dim lights in areas of intermittent use such as stairwells.
  - Use ambient light, and take advantage of day lighting opportunities.

[13] http://www.energystar.gov/index.cfm?c=cfls.pr_cfls_savings

- Install lighting controls.
  - Investigate motion sensors for lighting in offices (e.g. hallways and SPVC).
  - Establish a re-commissioning schedule for motion sensors to ensure appropriate use.
- Install energy efficient outdoor lighting.
  - Investigate energy efficient outdoor lighting options for new and replacement lighting at relevant facilities throughout the park.
  - Consider night friendly lighting for park housing.
- Optimize task lighting for energy efficiency.
  - Use desk lamps instead of overhead lighting in administrative offices.
  - Install night friendly exterior lighting at the Highlands Center buildings as night-time occupancy of the Center expands.
  - Incorporate recommendations from 2010 energy audit regarding appropriate lighting, such as installing occupancy sensors and developing a de-lamping and lamp replacement strategy.

3 Improve Heating, Ventilation, and Air Conditioning (HVAC) Systems Efficiency

In 2007, 60 percent of GHG emissions from Park Operations were due to energy emissions including 442 MTCO2E emitted by stationary combustion, which is the primary source of energy for heating and cooling the Park's 229 in-use structures. Proper maintenance of these systems ensures both energy efficiency and equipment longevity, thereby reducing emissions associated with fuel consumption as well as premature equipment replacement.

- Develop and implement an annual or biannual HVAC inspection and maintenance schedule for coils, filters, dampers, and fans that ensures timely replacement and cleaning.
- Develop bi-annual scheduling for major public park buildings for boiler temperature adjustments in fall and spring to minimize fuel consumption for hot water use.
- Ensure efficient use of Building Automation System (BAS).
  - Investigate installation of BAS at Headquarters building.
  - Program BAS systems to adjust the cooling temperatures indoors based on the outdoor temperature, thereby minimizing building energy consumption.
- Install energy manager for boilers in non-public park buildings and permanent housing buildings.
- Increase the use of bio based fuels for park buildings instead of #2 oil.
  - Specify bio fuels in the next fuel contract for park housing and other park buildings.
  - Investigate bio fuels use for concessioners.
  - Investigate using bulk-purchase B20 Bioheat bio based fuels for park-wide seasonal housing where tanks are indoors.
- Optimize utility systems for energy efficiency.

4 Switch to more efficient electronics and devices

According to the US Department of Energy, household appliances account for 42 percent of annual residential energy use.[14] For the park's 69 housing structures, replacing old appliances in park housing with new models or alternative methods (such as installing a clothes line to be used instead of a clothes dryer) would reduce GHG emissions from purchased electricity, which accounted for 25 percent of park operation emissions in 2007.

[14] http://www.eia.doe.gov/emeu/recs/recs2001/enduse2001/enduse2001.html

- Establish and implement a green procurement policy that sets minimum energy performance standards for all electronic equipment.
  - Use the Natural Resources Management division example as the template for green procurement and expand to park-wide operations.
  - Refer to the Federal Energy Management Program guidelines for purchasing energy efficient appliances in accordance with federal procurement procedures.
  - Ensure that all new electronic/office equipment is ENERGY STAR qualified at www.energystar.gov.
- Default all computers to print double-sided.
  - Purchase printers that can print double sided when buying new printers.
  - Identify opportunities to replace printers that cannot print double sided with ones that can.
- Install energy meters to measure energy use and monitor big consumers.
  - Buy smart watt meters to pinpoint inefficient appliances and replace inefficient equipment that do not meet minimum performance standards.
- Install energy saving Smart Strip surge protector power strips that provide different outlet options and automatically turn off non-essential electronics when the device or switch is off.
- Replace park's existing boilers and furnaces with energy-efficient models.
  - Investigate age and performance of PLVC boiler and replace with energy-efficient model.
  - Prioritize other boilers and furnaces for evaluation and replacement as necessary.
- Develop an energy efficient hot water heating and delivery system.
  - Use subsequent energy audit to analyze hot water heating and cooling systems, and associated appliances.
  - Insulate hot water pipes.
- Explore installation of virtualization software where appropriate, such as the NAC Lab.
- Inventory all appliances and replace ones 10 years or older with ENERGY STAR or better.
- Install clothes lines in park housing.
- Identify and retrofit old motors and pumps for equipment such as water and wastewater systems, fire suppression systems, and heavy equipment.
- Include LED lighting specifications in all new building designs and retrofits.

5 Improve building structures and envelopes

According to the US Environmental Protection Agency, space heating and air conditioning accounts for 54 percent of total energy consumption of the average US household.[15] *Retrofitting existing structures to minimize energy losses and designing new buildings according to sustainable building practices can reduce energy requirements and GHG emissions park-wide.*

- Weatherize park buildings by adding R-values to improve insulation effectiveness.
  - Review insulation needs identified by the building energy audits, such as roof insulation as recommended by 2010 energy audit.
  - Work with the Environmental Management Team to assist and target park housing for insulation improvement opportunities.
- Replace old windows with new more energy-efficient windows.

[15] http://www.epa.gov/greenbuilding/pubs/gbstats.pdf

- Look for spectrally selective glass, double-glazed, low-e systems, gas filled windows, and electrochromic windows that provide better insulation and solar selectivity.

- Install and practice window shading at the Headquarters building and where AC units are installed.
- Explore shading opportunities with native vegetation and trellis plants.
- Work with O&M staff to implement aggressive weather stripping and caulking where needed.
- Use modular/moveable facilities in areas that are prone to erosion.
- Incorporate sustainable building practices in future design of new buildings and major renovations.

6 Utilize alternative energy sources

Utilizing alternative energy sources which emit fewer emissions than conventional sources reduce the Park's indirect emissions and compound the savings of all the above efforts in reducing energy consumption. For example, using solar power as the source of electricity for newly installed CFLs will generate more GHG emissions savings than switching to CFLs alone.

- Purchase electricity from a renewable energy provider.
  - Examine renewable power options through Cape Light Compact.
  - Install photovoltaic panels on park buildings, parking lots, and open areas such as Herring Cove, Highlands Center, headquarters, bathhouses, and other park facilities.
- Install geothermal heating systems at select park facilities.
  - Evaluate feasibility of a geothermal heating system for Headquarters and other high traffic buildings.
  - Use geothermal installation as an opportunity for a demonstration project.
- Explore options for wind power.
  - Continue efforts to examine ways to implement wind energy.
  - Examine wind power opportunities for the Headquarters building.
- Switch to biomass and biofuel instead of conventional fuel to heat park buildings.

7 Other energy management actions

- Incorporate energy efficiency criteria into new contracts for park and concessioner construction.
- Partner with the local utility to conduct an energy audit for all park buildings.
  - Incorporate data from 2010 energy audit with previously conducted audits by Cape Light Compact.
- Explore installation of smart meters in all park facilities.
- Install building-level utility meters in existing buildings and in new major construction and renovation projects to track and continuously optimize performance.
  - Transfer all metered building data directly in web-based system and drop data directly in ENERGY STAR Portfolio Manager and Visible Energy.
- Review and implement the DOI Sustainable Buildings Implementation Plan.
- Incorporate efficiency in all growth plans as required in EO 13514.
- Implement sustainable building partnership for any new airport construction.
  - Ensure that the new terminal building meets the LEED standard for energy and environmental performance.

TRANSPORTATION MANAGEMENT

Emission Reduction Target: Reduce park operations' transportation emissions to 20 percent below 2007 levels by 2020.

Reducing vehicle miles traveled, improving vehicle efficiency, and using alternative fuels can significantly reduce the 2,304 $MTCO_2E$ that comprise Cape Cod's transportation emissions. As the inventory results indicate, GHG emissions from transportation comprise 31 percent of park operations emissions and 70 percent of the park's total emissions (including visitors, and concessioners). Accordingly, in addition to the park operations emissions reduction target of 20 percent, Cape Cod National Seashore set a target to reduce overall transportation emissions by 20 percent below 2007 levels by 2020. 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.

Biodiesel Flex shuttle bus provided for visitors and Toyota Prius hybrid provided for Park staff

Progress to Date

- Use conference calls and webinars to avoid excessive travel, both within and outside of the park.
- Replaced older vehicles with alternative fuel vehicles.
- Incorporate bicycle accommodations in road improvement projects.
- Working with the regional planning and transit authority and local chambers of commerce to develop a green car decal to be distributed to visitors who travel to the park in a green way, recycled their waste, or participated in a green interpretation program.
- Offer shuttle bus service for visitors during the high season.
    - Flex and Breeze shuttle buses purchased by the NPS and operated by the CC Regional Transit Authority have run on biodiesel.
- Posted no idling signs at visitor centers where tour buses park.
- Ask visitors to use private vehicles to carpool from visitor centers for certain interpretive programs.
- Promote car-free travel options via the SMARTGuide website
- Analyze fleet fuel consumption patterns for efficiency improvements.
- Switched from diesel to B-20 biodiesel for park vehicles.
- Promote efficient staff driving behaviors through staff training.
- Developed a vehicle replacement plan for the park fleet.

- Owns three hybrid cars currently in the fleet.
- Replace 4-wheel drive with 2-wheel drive vehicles where appropriate.

- Maintain a vehicle maintenance schedule and continue to promote the plan to all staff.
- Purchase and use retread tires as well as bio-based lubricants and greases in the auto shop.
- Use reclaimed materials for new roads and paving.
  - Use low VOC, water-based road striping paint.
  - Pulverize existing pavement for aggregate base and practice cold in-place recycling of existing pavement.
  - Use hot mix asphalt with recycled content (asphalt, glass, rubber tires) and work with vendors to specify road base aggregate from recycled concrete, asphalt, and brick.
- Improved parking lot designs to include local vegetation.
- Participated in Interagency Transportation, Land Use, and Climate Change pilot project scenario planning workshop.[16]

Planned Actions

1 Encourage Transportation-related Behavioral Changes

Cape Cod National Seashore spans the six towns of the Lower Cape from Chatham to Provincetown, which are approximately 40 miles apart. Due to the sprawling nature of the park, personal vehicles are currently the most viable and primary mode of transportation for both visitors and staff. Improving fuel economy through transportation-related behavioral changes, such as reducing idling and avoiding traffic, are simple, effective ways to reduce GHG emissions while other alternatives are not available.

- Reduce staff idling.
  - Educate and motivate employees to stop idling vehicles.
  - Prohibit staff vehicle idling unless required for vehicle maintenance.
  - Create dashboard idling guidelines and post in vehicles.
- Encourage staff to carpool to work.
  - Develop carpooling information and support services for staff.
  - Investigate web-based ride share systems through programs like Mass Rides and Cape Cod Commission.
- Encourage staff to bike to work.
  - Explore incentive program for bike commuters.
  - Ensure secure bike storage at park facilities.
- Encourage staff to carpool or use alternative modes of travel in the park.
  - Continue to promote carpooling in government and personal vehicles.
  - Consider incentives for staff carpooling and use of alternative modes of travel in the park.
- Continue to reduce meeting travel.
  - Continue to use webinars and conference calls to avoid excessive travel, both within and outside of the park. Purchase necessary equipment for teleconferencing and videoconferencing.
  - Implement a more comprehensive training program on virtual meetings.
  - Reduce meeting travel at the planning level by consolidating agendas.
- Create housing opportunities for staff to live closer to the park.

[16] See Appendix B for a description of the pilot project activities and outcomes.

- Create special use permit language for vehicle use by contractors.
  - Write no idling language into contracts.
- Promote efficient driving.
  - Conduct driver training that emphasizes fuel efficiency and trip planning.
  - Educate park employees on hyper-miling eco-driving practices.
- Broadcast highway travel advisories to encourage carpooling and use of shared transportation.
- Look at teleworking and flex work week scheduling for staff where appropriate.

2 Reduce visitor vehicle fuel consumption

In 2007, mobile combustion from visitors accounts for 82 percent of Cape Cod National Seashore's total mobile combustion emissions of 2,304 $MTCO_2E$. This emissions source presents both a significant challenge but also a unique opportunity to impact emissions beyond the park boundaries by coordinating with regional transportation systems and partnering with regional transportation organizations.

- Reduce visitor vehicle idling.
  - Educate and enforce five-minute state idling law to tour buses.
  - Post more signs and information with park idling rules.
  - Pursue Intelligent Transportation Systems (ITS) to enhance parking management system to decrease vehicle miles traveled (VMT) and improve traffic flow.
- Partner with surrounding state and local communities on developing alternative transportation opportunities for visitors.
  - Link in-park transportation systems to public transportation whenever feasible, through cooperation with public transportation agencies and gateway communities. In particular, pursue extending the existing Little Creek parking shuttle to the Visitor Center to allow visitors to access the beach by connecting to regional transit.
  - Implement town beach shuttles and jitneys in cooperation with local communities.
  - Research grant opportunities for community transportation plans using alternative fueled shuttles.
  - Participate in update of the regional transit plan.
- Provide additional alternative modes of visitor travel.
  - Increase the use of alternative fuel buses (using bio-based fuels) to areas of heavy use and traffic.
  - Implement bike shuttle on bio-diesel buses.
  - Explore funding opportunities for alternative fuel transit in park grant, such as FTA's Transit in Parks Program (TRIP).
- Provide information on alternative transportation options for park visitors.
  - Advertise comprehensive listing of transportation options on the park website.
  - Provide information on bike options with buses and real-time multi modal transfer data.
  - Explore partnership opportunities with transportation entities like the Cape Cod Regional Transit Authority (RTA) and the Cape Cod Commission (CCC) to promote car-free vacations to the Cape.
  - Explore partnership opportunities with lodging providers to encourage alternative transportation options for accessing the park.
- Provide incentives for visitor use of high efficiency and alternative fuel vehicles and hybrids.
  - Recognize those who are driving high efficiency (>40 mpg) or alternative fuel vehicles with reduced entrance fees or "climate friendly visitor" bumper stickers as feasible.
  - Provide better resources for alternative transport options through the distribution of schedules, including on website, "apps," and print.
  - Give incentives or discounts to those traveling by bike or on foot into the park.

- Continue to make Share the Road routes safer for bicyclists and pedestrians.
  - Implement complete street concepts within the park, including buffered sidewalks, marked/signalized crossings, and traffic calming measures.
- Encourage visitor carpooling.
  - Research opportunity of van carpooling from visitor centers for interpretive programs.

3 Reduce NPS vehicle and equipment fuel consumption

Mobile combustion from Park Operations decreased only slightly from 397 $MTCO_2E$ in 2007 to 393 $MTCO_2E$ in 2010. By analyzing and improving on established practices, the Park can improve its use of currently-owned vehicles and equipment. Additionally, implementing new technologies such as alternative fuels can further reduce emissions; for example, , biodiesel can reduce carbon dioxide emissions between 15 and 75 percent, compared to conventional diesel fuel, according to the US DOE.[17]

- Continue to analyze fleet fuel-consumption patterns for efficiency improvements.
  - Use Federal Automotive Statistical Tool (FAST) to track fuel use and analyze fleet needs with efficiency improvements.
- Continue to explore options for converting park fleet to biofuels, including options for biofuel shuttle bus.
- Substitute 2-stroke engines with 4-stroke engines.
- Investigate certification of all carriers under EPA's Smartway Transport Partnership.
  - Educate partners and bus tour operators about EPA Smartway program.

4 Replace NPS vehicles and equipment

- Continue to develop and improve the vehicle replacement plan.
  - Exceed federal fleet performance requirements set by Energy Policy Act, Executive Order 13423, and the Energy Independence and Security Act (EISA).
  - Investigate purchasing more efficient trucks.
  - Work with region to develop alternative fuel infrastructure to expand vehicle purchasing options.
  - Evaluate Alternative Fuel Vehicle (AFV) options, such as hybrid electric vehicles (HEVs), electric vehicles, compressed natural gas (CNG), and biodiesel.
  - Order alternative fuel vehicles where practical as older vehicles come up for replacement. Examine funding opportunities from DOE's Clean Cities initiative.
  - Examine funding opportunities from DOE's (Department of Energy's) Clean Cities initiative.
- Incorporate alternative fuel guidelines into fleet specifications.
  - Work with GSA to catalogue available AFVs and set minimum AFV goals.
  - Work with CO to establish guidelines for fleet specifications.
- Use alternative fuel vehicles in demonstration projects.
  - Install signs on alternative fuel vehicles.
- Examine options for replacing gasoline powered equipment with electric alternatives (i.e. blowers and lawn mowers).

5 Improve vehicle maintenance procedures

- Promote and educate staff about vehicle fleet maintenance schedules.

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[17] http://www.afdc.energy.gov/afdc/fuels/biodiesel_benefits.html

- Operate all fleet vehicles using re-refined oil.
- Continue to use bio-based lubricants and greases.
  - Inventory current stock of lubricants, flammables and adhesives in the auto shop and evaluate opportunities to add more environmentally friendly alternatives.

6 Improve transportation infrastructure

- Increase the use of reclaimed materials for new roads and paving.
- Improve bicycle infrastructure as recommended in the 2010 Bicycle Feasibility Study.
  - Improve existing bicycle facilities, such as installing more bike racks, wayfinding signage, and pavement markings.
  - Improve integration with the regional bicycle trail network by creating connections between existing trails and between park features and town centers.

7 Other transportation management actions

- Purchase local products to minimize fuel consumption.
  - Research local providers and supplies.
- Initiate a bike tour interpretive program.
  - Explore options for a bike tour guided by a ranger that would stop at significant cultural and natural resource sites (e.g. SPVC to Coast Guard Beach route).
- Offer a bus-lead interpretive program.
  - Propose biofuel bus route with an interpreter onboard: SPVC-Nauset-Marconi Station-Highland Light-Race Point-MacMillan Wharf-SPVC.
- Improve data collection on visitor transportation patterns, vehicle occupancy, and ridership.

WASTE AND WASTEWATER MANAGEMENT

Emission Reduction Target: Reduce park operations' waste emissions to 35 percent below 2007 levels by 2020 through waste diversion and reduction.

The connection between waste and GHG emissions may not be obvious. However, waste management—in the form of both source and solid waste reduction—can dramatically reduce GHG emissions. Landfills are the largest human-generated source of methane (CH_4) emissions in the United States. Reducing the amount of waste sent to landfills reduces CH_4 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.

Cape Cod's park operation activities emitted 107 $MTCO_2E$ from waste management in 2007. Diverting or reducing the park's waste stream through increased recycling efforts and waste management will reduce the amount of waste sent to landfills and resultant 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 will pursue.


A recycled plastic boardwalk and installation of recycled paper countertops at Race Point Ranger Station

Progress to Date

- Continuously train staff on basic green procurement practices.
  - Developed Green Procurement Plan for maintenance team and NRM.
  - Encourage contractors to practice green procurement practices.
- Created a materials-and-equipment exchange program.
- Minimize waste associated with paper towels in some park facilities using hand dryers.
- Continue to increase the amount of waste material at the park that can be recycled and/or reused.
  - Collaborate as able on large-scale community recycling efforts.
- Recycle propane cylinders and used fluorescent bulbs at local transfer stations.
- Established green yard waste practices of using mulching mowers and spreading out wood from chipping operations.
- Donate or recycle used computers and electronics.
- Use recycled oil, recycled coolant and other fluids in auto shop.
- Recycle old asphalt pavement for use in ongoing road projects.
- Instituted alkaline, lithium, lead acid, and nickel-cadmium battery recycling.
- Co-locate trash and recycling.
- Measured the baseline solid waste generation (tons) at the park; the park's Integrated Solid Waste Alternatives Plan (ISWAP) was completed in 2002.
- Continue to increase the recycled content of purchased materials.
  - Used recycled glass tiles and ceiling panels for ARC construction.
  - Use donated equipment, such as lab hoods and specialized lab furnishings at research labs.
  - Use high recycled content carpets.
  - Used certified sustainable wood products in the construction of the ARC.
  - Used recycled plastic lumber for the Race Point boardwalk, Highlands Center overlook, and Red Maple Swamp.
  - Used recycled blue jean insulation at Race Point Ranger Station.
- Substitute commonly used products for green products.

- Use almost all green and non-toxic janitorial products.

- Established a statement of policy (SOP) for purchasing energy efficient products.
- Park currently uses high recycled content carpets.
- Used certified sustainable wood products in the construction of the ARC.
- Require No-VOC paints for interior spaces.
- Increased number of low-flow toilets and waterless urinals in park facilities.
- Increased the number of low-flow faucets in park bathrooms and rest areas.
- Discontinued landscape watering at the park.
  - Installed rain barrels at the ARC.
- Increased amount of native plantings around Headquarters, SPVC, and the Highlands Center.
- Track and report solid waste data to monitor reductions and success in diverting waste from the town transfer stations, ultimately transported to an off-Cape cogeneration plant.
- Recycle cardboard, aluminum, scrap metal, glass, white paper, color paper, and no. 1 PET and 2 HDPE plastics.
- Purchased equipment to reduce volume of waste and recyclables, such as an aqueous parts washer and an aerosol can crusher.

Planned Actions

1 Decrease waste through behavior change

- Train staff on green procurement practices and waste reduction.
  - Implement training program for credit card holders and follow the Office of the Federal Environmental Executive's online green purchasing training.
  - Create a consistent green procurement process and training for office purchasing.
- Require that construction contractors reuse or recycle materials used during building renovations and new site construction/remodeling projects.
  - Ensure that construction contractors are aware of their roles and responsibilities to reduce waste. Continually inform contractor about recycling and composting policies at the park.
- Engage staff to reduce and manage waste at work.
  - Encourage park staff to be responsible at work by making it easy to recycle and compost waste; make sure containers fit environment (e.g., animal-proof, rust-proof/salt air -resistant/moisture resistant, and proper size).
  - Increase accessibility to ceramic plates, bowls, mugs, and silverware available for employee use in lieu of disposable products.
  - Institute paperless office practices: establish standards for double-sided printing and copying, electronic correspondence procedures, electronic file storage, elimination of colored paper, etc.
  - Consider the amount of packaging when making purchases.
  - Reuse paper in copiers/printers if practical and use the other side of used paper.
  - Identify and educate staff regarding fonts that use less ink.
  - Set default settings on computers and purchased copiers that print double-sided.
- Train park staff and contractors on waste reduction responsibilities.
  - Ensure that staff and contractors are aware of their roles and responsibilities to reduce waste. Conduct periodic trainings to inform all staff about recycling, composting, and waste reduction policies at the park.

- Encourage waste prevention and reduction at events and meetings.

2 Establish new plans and policies that promote waste reduction.

- Implement a comprehensive waste reduction and recycling outreach campaign aimed at park visitors.
  - Reexamine placement of trash and recycling containers.
  - Work with surrounding towns to provide recycling at town beaches.
  - Research grant opportunities for purchasing Big Belly trash compactors and continue to pursue NPS funding.
  - Educate visitors on waste reduction and recycling.
- Incorporate waste reduction into green office practices.
  - Integrate wording into purchase request process to remind staff to buy green and to purchase products that minimize packaging.
  - Reduce purchases where possible and avoid duplicate purchases.
  - Purchase durable, reusable supplies, and reuse office supplies when possible.
- Develop a schedule for replacing existing materials.
  - Consider replacing equipment with recycled equipment or new equipment that will enhance reuse and recycling (e.g., copiers that can make two-sided copies).
- Reduce waste generated at meetings and employee functions.
  - Evaluate the need for bringing materials to meetings.
  - Utilize electronic communication for agenda and notes tracking.
  - Use durable, reusable utensils and mugs.
  - Buy materials in bulk and use items with reduced packaging.
  - Provide easy-access to recycling receptacles in meeting spaces.
- Reduce disposable plastic water bottle use.
  - Implement signs promoting the use of tap water vs. bottled water.
  - Use interpretations' sign discouraging plastic bottles throughout the park, such as at recycling and water fountain areas.
- Eliminate non-recyclable Styrofoam/food serviceware.
  - Use biodegradable products.
  - Encourage staff to bring their own mugs/cups to meetings.
- Continue to expand and build on the park materials exchange program.
  - Catalogue and store or exchange materials that can be repurposed such as brick and wood waste.
  - Donate or recycle old equipment that cannot be repurposed.
- Choose hand dryers over paper towels.
  - Continue to install energy efficient hand dryers throughout park facilities.
- Work with concessioners to reduce packaging and material use.
  - Include language on waste policy when contracts are renewed or special permits are created.
- Continue to promote recycled product and material use.
- Encourage visitors to pack-in and pack-out waste at an appropriate facility as a pilot program.
- Maximize web-based communications to reduce use of paper and printing.
  - Evaluate which materials need to be produced in paper form and which publications can be distributed on the web.

- Order supplies in quantities appropriate for use, such as smaller supplies of publications so that when versions change, extras are not wasted.
- Hold a zero waste special event in the park to demonstrate waste management best practices.

3 Implement recycling and composting practices

Both recycling and composting reduce the amount of waste that is landfilled and represent significant potential GHG emission reductions. For example, the US EPA estimates that yard trimmings and food scraps accounted for as much as 25 percent of MSW produced in 2008.[18]

- Increase the amount of waste material at the park that can be recycled and educate others.
  - Find reuse opportunity or donate unwanted items.
  - Investigate cooperative waste disposal or recycling to increase volume and reduce costs/traffic.
- Improve waste collection and transportation efficiency.
  - Purchase a packer truck with recycling bins and eliminate unnecessary waste transport vehicles.
- 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.
- Assign a staff person to act as a park recycling leader/manager responsible for monitoring, assessing, and continually improving the park's recycling and waste reduction activities.
- Partner with vendors to reuse and recycle park waste.
  - Work with local chamber and county to develop community waste program.
- Initiate composting options at facilities where appropriate.

4 Reduce waste through green procurement

- Develop a green procurement plan.
  - Review plan done by Natural Resources Management Division (NRM) and implement park-wide.
  - Expand pre-purchase questions developed by NRM and implement park-wide.
- Evaluate current purchases and reduce redundant products.
  - Rather than purchasing individual copy, fax, print, and scanning equipment, consider a multi-function device.
- Purchase locally-produced materials and local vendors whenever possible.
- Use post-consumer recycled paper in all park publications.
  - Review current practices and implement where applicable.
  - Use 100% post-consumer (PC) content, processed chlorine-free (PCF) copy paper. Consider alternative fibers (i.e., non-wood) and water-based or vegetable-based ink.
- Reduce amount of packaging used in products sold and used in the park.
  - Let vendors know your packaging preferences and include in wording on purchase request forms.
- Establish Purchasing Requirements for low/no-VOC insulation materials, carpets, paints, and adhesives.
  - Merge requirements for high recycled content and include other environmental requirements including zero volatile organic compounds (VOC) emissions paint, adhesives, and carpets into green purchasing SOP.
- Expand FSC-certified wood purchasing from construction projects to routine park maintenance.

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[18] Yard trimmings 13.2% and food scraps 12.7% (http://www.epa.gov/waste/nonhaz/municipal/pubs/msw2008rpt.pdf)

5 Reduce water consumption and wastewater production, and reuse wastewater

The majority of wastewater treatment at Cape Cod National Seashore is accomplished through septic systems, which emit methane, carbon dioxide, and nitrous oxide. Decreasing wastewater production reduces these direct greenhouse gas emissions as well as indirect emissions associated with premature system maintenance.

- Install low-flow aerators and showerheads as recommended in 2010 energy audit.
- Replace all toilets with low-flow models.
  - Continue to install water efficient technology such as composting toilets.
  - Consider installation of composting toilets in Highlands Center.
- Purchase only native plants for landscaping that require little to no watering.
  - Continue to increase the amount of native plantings around park headquarters, SPVC, and the Highlands Center.
  - Capture rainwater to establish plantings.
- Reduce storm and groundwater runoff by investigating opportunities for upgraded storm water and runoff management.
- Investigate opportunities for hot water on demand systems and solar hot water for Highlands Center facilities.
- Manage non-point source wastewater.
  - Prevent pollution and use green products to keep storm drains clean.
  - Establish schedule for storm drain cleaner.

6 Other waste and wastewater management actions

- Continue to track and report solid waste ~~l~~data to monitor reductions and success in diverting waste from the town transfer stations, ultimately transported to an off-Cape cogeneration plant.
- Manage solid waste and recycling by developing an ISWAP (Integrated Solid Waste Alternatives Plan).
  - Complete PMIS for new ISWAP plan to build off the 2002 plan.
- Implement a Construction Waste Management/Plan and Job Site Recycling Policy.
  - Require a Construction Waste Management or Recycling Plan; track quantities of recyclables.
  - Ensure contract language addresses waste plan/recycling. Investigate “take-back” policies (e.g., ceiling tiles, cardboard, carpet, and drywall).
  - Reuse construction waste either on-site or elsewhere, or sell recycling materials of value including lumber/wood, drywall, metal, rubble, cardboard, fixtures, hardware, and wiring.
  - Require drywall contractors to recycle waste.
  - Work with haulers to prevent contamination of waste sorting. Ensure no illegal dumping occurs off job site.
- Purchase equipment to reduce volume of waste and recyclables, such as shredders for plastics and crushers for aluminum.

STRATEGY 2: INCREASE CLIMATE CHANGE EDUCATION AND OUTREACH

Climate change is a complex and easily misunderstood issue. Cape Cod National Seashore 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. Cape Cod National Seashore 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 Cape Cod National Seashore takes to address climate change serve as opportunities for increasing the public's awareness of climate change. Presented below are the actions that are currently under way and that comprise the park's progress to date, and those actions that the park will pursue.

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, Cape Cod National Seashore 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.

Progress to Date

- Develop and track current CFP initiatives and other climate friendly action opportunities at monthly Environmental Management Team meetings.
- Monitor and track GHG emissions continually, and disseminate results to park staff.
  - Completed GHG emission inventory for baseline year 2007.
  - Completed park operations inventory completed for 2008, 2009, and 2010.

Planned Actions

- Create a Park Climate Change Policy Memo specific to Cape Cod National Seashore.
  - Write press release on Climate Friendly Parks initiative when the Action Plan is finalized.
  - Present Action Plan to park staff, either through Squad meeting, an all-employee meeting, or other venue.
- Hold internal Climate Friendly Park discussions and workshops.
  - Devise new strategies to continually reduce greenhouse gas (GHG) emissions.
  - Distribute resources and tools to staff, and acknowledge success of current strategies, including giving awards to climate leaders.
  - Provide ongoing training programs for park staff.
    - Incorporate a "Did You Know" fact as often as possible into Safety Minutes and/or Squad Notes.
- Merge members of the Green Team and the Environmental Management Team and keep staff informed about climate-related issues.
  - Use materials, publications, and tools available from the U.S. Environmental Protection Agency (EPA) and other agencies and organizations to mentor fellow staff about climate change.
- Inform staff about climate friendly actions using intranet sites and tools like My Green Parks.
  - Send emails to all CACO employees with link to CFP sites.
  - Post links on bulletin boards and add them to messages in the Safety/Environmental minute.
  - Incorporate Environmental Management Team activities into Safety/Environmental minute.
- Incorporate climate change issues into the employee handbook.
  - Ensure all park staff trained to advocate reduced carbon footprints.
  - Include climate education materials in employee orientation packets.
- Include the science and impacts of climate change into park education tools.
  - Incorporate sessions on climate change into seasonal staff training.

- Tailor seasonal staff handbook to include Climate Friendly Parks information.

- Incorporate sessions on climate change into new staff training.
  - Add a Climate Friendly Parks session at the annual beginning of summer all employees meeting.
- Develop a brown bag series for park staff including concessioners, partners, and occasionally visitors, to educate about current climate change science, the park's efforts, and what everyone can do to bring about change.
- Create visual reminders for park employees with climate change information and tips on how employees can help reduce emissions.
  - Use CFP logo for messages pertaining to green practices.
  - Increase signage that conveys climate friendly best practices for energy use, waste management, transportation, and water conservation, such as Do's and Don'ts signage near staff recycling centers in park buildings.
- Publicize monthly webinars hosted by the NPS Climate Change Steering Committee; management staff and environmental management team will identify webinar opportunities and make announcements.
- Compile more accurate, detailed figures of GHG emissions that are accessible to staff and clearly highlight progress towards meeting emission reduction targets.
  - Track heating oil, electricity and vehicle fuel consumption by park division and/or major facilities to increase awareness of high emitters and opportunities for reductions.
- Create personal incentives for staff to reduce GHG emissions in park and at home.
  - Create Climate Friendly categories for staff environmental awards.
- Incorporate education on the science and impacts of climate change into concessioner training.
  - Include educational component in contract language at renewals.
- Investigate the inclusion of a mandate for concessioner contracts to educate concessioner employees and park visitors on the science and impacts of climate change.
- Disseminate information about climate friendly actions the park is taking at conferences, meetings, and regional workshops.
  - Prepare staff so they can present on mitigation actions the park is taking.

VISITOR OUTREACH

Understanding climate change and its consequences is essential to initiating individual behavioral change. Cape Cod National Seashore 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, Cape Cod National Seashore can play an important role in educating the public about climate change.

Cape Cod National Seashore staff recognize the many different audiences visit the park, including recreational and non-recreational visitors, school-aged visitors, local residents, seasonal residents, out-of-town visitors, local tribes, and "virtual visitors" who visit online,. 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 strategies to reach these various audiences effectively.

Progress to Date

- Incorporate climate change/climate friendly information into existing park publications and brochures.
  - Feature content on environmental issues and climate change in park newspaper.
  - Established an environmental corner with climate change literature in the SPVC lobby.

- Encourage re-use of folders through trail guides.

- Disseminate climate change and climate friendly information to interpretivestaff for incorporation into programs.
  - Ensure consistent and accurate messaging by providing interpreters with the information needed to educate the public about climate change.
- Created climate change-themed programs at the park. Products to date include:
  - Interpretative walk titled "A Rising Tide: Global Warming and Climate Change on Cape Cod;" PowerPoint program for park and off-site audiences; "Portrait of a Coast – 21st Century" film and discussion.
  - Temporary exhibits that incorporate climate change themes include: "Healthy Oceans, Healthy Humans"; "One Ocean Now-One Ocean Forever;" "Are We Trashing Our Oceans?"
- Created demonstration projects and exhibits to convey park sustainability message to visitors.
  - Installed interpretive signage at SPVC bathhouse to educate public about alternative wastewater treatment system.
  - Installed waysides at Race Point Ranger Station and Herring Cove bathhouse.
  - Held NRM division-sponsored guest lecture series on climate change in 2009.
  - Held NRM division program on effects of climate change in the park in 2010.
- Distribute previously produced literature at the visitor centers and park headquarters on climate change and its effects on national parks in general and on Cape Cod region in particular.

Planned Actions

- Educate visitors about climate change.
  - Link climate change and national parks preservation with actions like using mass transit and alternative forms of transportation.
  - Develop cell phone interpretation stops relating to climate change in the park.
  - Develop video clips for use on the park website.
  - Place educational information and signage at transportation locations such as the tram pick up, Nauset Light Beach parking lot fee booth area, and the Race Point ORV oversand station, in addition to the usual locations.
- Educate visitors about their recycling options in the park and at home.
  - Provide clear signage to identify recycling locations and information on materials that can be recycled and make bins accessible.
- Continue to create and distribute new and previously produced information on climate change and its effects on national parks in general, and on Cape Cod National Seashore in particular.
- Develop a strategy for climate change interpretation on park trams and local public transportation systems.
  - Include interpretation messages on shuttle and ferry announcements with facts on how visitors can reduce their CO2 footprint by using public transportation. (e.g., "you helped avoid XX metric tons of CO2 from entering the atmosphere by riding the bus").
- Continue to integrate climate change themes into interpretive products.
  - Integrate Climate Friendly Parks program with school programs using educational kits, wayside exhibits, posters, etc. Look for opportunities to educate with resources like the Climate Change Wildlife and Wildlands Toolkit. For more information, visit: http://www.globalchange.gov/resources/educators/toolkit
  - Incorporate climate friendly information into interpreter programs and talks.
  - Create waysides on climate change and consider whether any of the interpretive cell phone stops can include a green message.
- Create signs promoting the park's efforts to curb emissions.

- Post signs saying "Entering Climate Friendly Park," and advertise consistent messaging on rugs, banners, etc.
- Develop consistent messaging for recycling, idling, and emission reduction posters. For example, install friendly reminder signs at bus idling locations that remind people of the law that limits idling to 5 minutes or less.

- Host distance learning events on climate change.
- Incorporate climate change information into existing park brochures.
- Educate visitors about their recycling options at the park and at home.
  - Create visitor ads about the park's recycling activities.
  - Create mini exhibits like "Did you know that the boardwalk you are on is made of recycled materials that are readily available at your local building center."
- Communicate with local communities, park visitors, and local media about actions they can take to reduce GHG emissions.
  - Encourage internal and external stakeholders to reduce their carbon footprints using tools like Do Your Part!
- Develop and distribute Do Your Part! materials.
  - Develop materials and distribute at visitor centers.
  - Provide Do Your Part! information and web links to the Friends of Cape Cod NS and work with the Friends to include Climate Friendly Parks messaging in their print and web materials.
  - Add Do Your Part! literature at community events (e.g., Highlands Fest and Wellfleet's Oyster Fest).
  - Add a link to the Do Your Part! Website on the park website, www.nps.gov/caco.
  - Continue to explore options for a Do Your Part! kiosk in the visitor centers.
- Create demonstration projects and exhibits to convey park sustainability message to visitors.
  - Install signage at renewable energy sources.
  - Showcase installation of environmentally-friendly technologies and materials.
- Create green "infomercials" to play at beginning of films for park visitors.

LOCAL COMMUNITY OUTREACH

The gateway communities, agencies, vendors, and volunteers surrounding Cape Cod National Seashore 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 and find partners to promote climate change education at those events, and engage with surrounding agencies to coordinate effective outreach and education efforts.

Progress to Date

- Participated in Interagency Transportation, Land Use, and Climate Change pilot project scenario planning workshop[19], as well as the advance planning and refining of the results of the workshop. The park will continue to disseminate results from the project as it progresses.

Planned Actions

- Work with the surrounding community to address climate change.
- Connect with community and park partners on Climate Friendly Park efforts.

[19] See Appendix B for a description of the pilot project activities and outcomes.

- Build relationships with park concessioners, Friends groups, local environmental groups, representatives from the local tourism/community business board, representatives from the state environment/energy departments, teachers, representatives from the regional transportation authority, and local university partners.
- Consider offering a Climate Friendly Park workshop to facilitate plan rollout with park partners and local towns. Work with the Friends of CCNS to make contacts and coordinate participation.
- Collaborate with the Cape Cod Interagency Transportation, Land Use, and Climate Change Pilot Project to integrate regional climate change adaptation and mitigation measures with the park's efforts.
- Work with Outer Cape communities to implement recommendations of the park's Integrated Parking & Transit Study, such as new bus stops, new transit bus loops, and formalizing satellite parking arrangements.

- Participate in Cape & Islands Renewable Energy Collaborative activities.
  - Work and comply with CIRenew as they implement their local community-based Go Green Action plan.
  - Host solar workshop or other educational event with CIRENEW and Self Reliance.
- Provide educational materials for Flex shuttle bus system.
  - Support Flex and other local public transportation to increase the use of alternative fuels and communicate information about climate change, CFP, and the Do Your Part! program.
- Participate in renewable energy siting discussions with the local community.
- Consider the local economy in procurement and other areas.
- Develop and leverage relationships with other agencies and entities to create opportunities for workshops on climate friendly activities.
  - Look for opportunities to host traveling exhibits focusing on the impacts of climate change as well as general awareness about climate change. Focus presentations on climate change priorities and talk about success stories.
  - Consider demonstrations of how climate change will affect Cape Cod National Seashore.
  - Continue partnering with WBNERR and other local agencies, e.g., Mass Audubon, Center for Coastal Studies, and Cape Cod Community College.
- Include community members in climate change discussions.
- Educate local community about what the park is doing to manage waste.
- Plan a climate-friendly community event for Earth Day.
  - Explore opportunities for 2012 and beyond.

STRATEGY 3: EVALUATE PROGRESS AND IDENTIFY AREAS FOR IMPROVEMENT

By taking the actions established in Strategies 1 and 2 above, Cape Cod National Seashore plans to reduce its emissions to the specified targets. Achieving these targets will require an ongoing commitment by the park, which will include subsequent emission inventories, additional mitigation actions, and reevaluation of targets.

As part of this strategy, Cape Cod National Seashore will:

- Monitor progress with respect to reducing emissions.
  - This will include subsequent emission inventories each year of park operations using the CLIP Tool. Every five years, a complete inventory will occur, taking into account concessioner and visitor use data. Members of the

Environmental Management Team will work to do these inventories, and if an AmeriCorps Cape Cod member is available, they will help complete this task.

- Evaluate progress towards goals stated in this action plan by assessing the figures within each emission sector.
  - The Environmental Management Team will undertake this task, and will also look at variables such as number of park visits and major construction projects which can skew figures in a given year. Throughout the year, team members can also look at the monthly electricity and fuel use data to help evaluate energy use in buildings, as this is input into data tracking sheets on a monthly basis.
- Review and update this plan on a yearly basis.
  - As mitigations and practices from the plan are achieved, they will be documented by moving them into the completed actions section. As this occurs and as new technologies and green practices become available, the team will identify additional emission mitigation actions not listed on the plan.
- Track climate friendly actions, timetables, and priorities through the Environmental Management System.
  - Actions determined to be the highest priorities will be listed in the "Environmental Goals, Objectives, and Targets" section in the park's Environmental Management Plan. When these actions are achieved, the Environmental Management Team will select the next highest priorities and put them in the Environmental Management Plan.

CONCLUSION

Cape Cod National Seashore has a unique opportunity to serve as a model for the more than approximately 4 million visits annually. The park also strives to be a model for the Cape Cod region, and for the 6 towns that it spans.[20] Staff understand the challenges of reducing emissions. The sprawling nature of the park and the car-centric nature of the Cape will make reducing transportation emissions difficult. Further, the park has already implemented mitigations throughout the years, which may make certain reduction targets from this point in time forward difficult to achieve. However, the park is prepared and excited to face such challenges, as evidenced by the planned actions that have been developed above.

This report summarizes the planning and 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, Cape Cod National Seashore will help adapt to and mitigate effects of climate change far beyond the park's boundaries.

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, Cape Cod National Seashore 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 Cape Cod National Seashore to the forefront of Climate Friendly Parks.

It is important that Cape Cod National Seashore staff all undertake CFP actions in a dedicated manner. The multi-disciplinary staff can make true advances in these directions as a collective effort. The park management and staff commit to approach the challenges and opportunities set forth in this plan with enthusiasm and vigor.

[20]Cape Cod National Seashore Park Statistics: Available online at: http://www.nature.nps.gov/stats/viewReport.cfm

APPENDIX A: LIST OF WORK GROUP PARTICIPANTS

ICF Consultants

1. Binns, Beth
2. Burns-Burg, Asher
3. Hamilton, Tara

Washington Office (WASO) Coordinators

1. Norton, Shawn, WASO Sustainable Operations and Climate Change Branch
2. Julie Corby, WASO Sustainable Operations and Climate Change Branch
3. Julie Thomas McNamee, WASO Sustainable Operations and Climate Change Branch

Northeast Region (NER) & CACO Organizers

1. Salazer, Holly, NER Air Resources Coordinator
2. McKean, Lauren, CACO Management Assistant/Planner
3. Taylor, Nicole, CACO Safety Officer/Environmental Protection Specialist
4. Modrak, Kaelyn, CACO - AmeriCorps Cape Cod Planning Assistant
5. Der-McLeod, Erin, CACO Planning Assistant

NPS and DOT Advisors

1. Holzheimer, Bob, Northeast Region (NER) Transportation Program Manager
2. Roman, Dr. Charley, NER CESU Coordinator
3. Rutherford, Amanda, Washington Office (WASO) Transportation
4. Ben Rasmussen, Department of Transportation (DOT) Volpe Transportation Center

CACO staff (plus 6 organizers above)

1. George Price, Superintendent
2. Sue Moynihan, Chief of Interpretation and Cultural Resources
3. Judith Oset, Laboratory Technician
4. Shelley Hall, Chief of Natural Resources Management
5. Krista Lee, Chemist
6. Jenna Sammartino, Park Ranger Interpretation
7. Jack Shields, Fire Program Management Assistant
8. Patrick Bird, Park Ranger Interpretation
9. Bill Burke, Branch Chief of Cultural Resources
10. Karst Hoogeboom, Chief of Maintenance
11. Kathy Tevyaw, Deputy Superintendent
12. Neil Cinelli, Buildings and Utilities
13. Thelma Blakely, North District Ranger Admin Asst.
14. Eva Ward, CACO – AmeriCorps Cape Cod Planning Assistant (edited Action Plan although did not attend workshop)

Park Partners

1. Cape Cod Commission—Ryan Christenberry
2. Cape Cod Commission - Clay Schofield
3. National Oceanic and Atmospheric Administration (NOAA)/National Marine Fisheries Service (NMFS)—Ellen Mecray
4. CIRenew—Chris Powicki
5. Waquoit Bay National Estuarine Research Reserve (NERR)—Joan Muller
6. Friends of Cape Cod National Seashore – Judy Parmalee
7. Provincetown Municipal Airport – Butch Lisenby, Manager
8. Provincetown Municipal Airport – Mike Garrity, Consultant

NER Participating Parks

1. Albert, Marc, Boston Harbor Islands National Recreation Area (BOHA)
2. Eustis, Meredith, BOHA Volunteer
3. Green, Bill, BOHA Partnership
4. Jacobson, Bruce, BOHA Superintendent
5. Kane, Susan, BOHA - MA DCR and/or Sarno-Bucca, Denise, MA-DCR
6. Kendall, Rick, Saint-Gaudens National Historic Site (SAGA) Superintendent
7. Walasewicz, Steve, SAGA Chief of Resource Management and Maintenance
8. Prigot, Emily, New Bedford Whaling National Historical Park (NEBE)

APPENDIX B: INTERAGENCY TRANSPORTATION, LAND USE, AND CLIMATE CHANGE PILOT PROJECT

Pilot Project Overview

In 2008, eleven Federal agencies joined an interagency working group on transportation, land use, and climate change. The group set out to identify opportunities to align Federal programs and resources to support stakeholders in achieving greenhouse gas (GHG) emission reductions and preparing for potential climate change impacts through transportation and land use planning decisions. The working group identified two focus areas where Federal agencies could begin to align efforts to address GHG emissions:

- *Integrated Regional Planning and Development*: This focus area recognizes the continuing need to link short and long-range transportation planning and corridor-level planning studies performed by state and local governments to the planning processes of local land use (primarily housing and economic development) and environmental agencies.
- *Intermodal Gateway Mobility Planning:* This focus area seeks to provide multi-modal transportation options to move both people and goods to, from, and through gateway communities, defined as areas traveled through to get to a destination such as a National Park, National Forest, National Wildlife Refuge, airport, beach or port. Federal involvement supporting more comprehensive planning for gateway community mobility, in both metropolitan and rural areas, can lead to better decisions that benefit communities and can lead to reduced growth of vehicles miles traveled (VMT).

In 2010, the Federal agencies selected Cape Cod, MA, as a pilot area to facilitate and enhance integrated regional and intermodal planning at the state, regional, and local levels. The resulting Interagency Transportation, Land Use, and Climate Change Pilot Project (Pilot Project) utilized a scenario planning process to develop a transportation- and land use-focused development strategy for Cape Cod that is informed by estimated climate change impacts and that is expected to lead to a reduction in future GHG emissions. From the various scenarios, a final refined scenario for the region was created to reflect the region's long-range transportation planning vision, as well as to support the coordinated development of other local, regional, and state plans, including those developed by Cape Cod National Seashore (CCNS).

Development of the preferred scenario involved several key steps, each of which CCNS contributed to, including:

- The identification of areas vulnerable to sea level rise (SLR) and other flood-related damages
- The identification of strategies to reduce GHG emissions from the transportation sector
- The development of possible transportation and land use development scenarios at workshops convened with the Pilot Project stakeholders

Identification of Vulnerable Areas

Climate change is expected to impact transportation infrastructure on Cape Cod in a variety of ways, including increased frequency and severity of flooding due to SLR and storm events. SLR projections for Cape Cod were not available at the scale and extent needed to inform the development and evaluation of the scenarios. For this reason, a consensus-based expert elicitation with coastal experts was conducted at Woods Hole Oceanographic Institute in Woods Hole, MA, to identify areas on Cape Cod that are vulnerable to the anticipated impacts of climate change. Staff from CCNS contributed geospatial data for and participated in the expert elicitation.

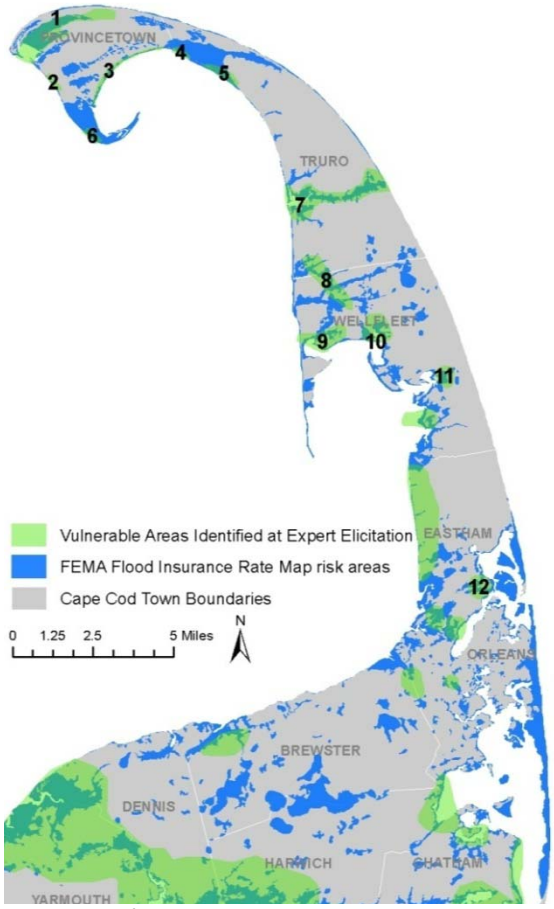
The initial goal for the expert elicitation was to develop SLR impact projections for specific areas on Cape Cod for 20-year, 50-year, and 100-year time horizons. If feasible, the projections were also going to be made for three SLR circumstances—a low, medium, and high estimate of SLR. However, participants acknowledged during the expert elicitation that this level of detail would not be possible due to many factors, including, but not limited to, the dynamic conditions influencing SLR at local levels, a lack of robust data, and the level of modeling required for such analysis would be beyond the scope and scale of the pilot project. Instead, the experts focused on identifying vulnerable areas, or "areas of concern," based on the following criteria:

- Elevation
- Exposure to storm surge
- Erosion
- Flooding history
- Lack of redundant transportation access
- Potential SLR impacts

The areas identified as vulnerable to climate change impacts (see Figure 8) were used to inform the scenario planning process and to evaluate the scenarios developed during the scenario planning workshop.

FIGURE 8

Areas Vulnerable to Climate Change Impacts



U.S. DOT Volpe Center, 2010

Vulnerable areas within and adjacent to CCNS include all areas that fall in the FEMA Flood Insurance Rate Map risk areas (blue on map above) and Areas 1-12 in green. Descriptions of the numbered areas are:

- Area 1: Vulnerable coastal zone. At the time of the expert elicitation, Hatches Harbor dike was open. Its ability to mitigate the impacts of SLR is limited. Experts discussed that the area could be safe for approximately 20 years but that it is likely vulnerable in any major storm.
- Area 2: Vulnerable due to erosion.

- Area 3: All of Provincetown's roads, especially Commercial Street, are likely vulnerable now. SLR is expected to make these locations more vulnerable. There are few additional lands to develop in this location, and coastal use issues are focused on how to address non-conforming coastal structures.
- Area 4: This area connects both sides of Cape Cod. It is in a low area and therefore subject to flooding.
- Area 5: The roadway is vulnerable to erosion and SLR impacts. The road is currently maintained through replacement of sand. Without continued replacement, the road would likely be lost. The steep area just south of this area supplies sand for other areas via erosion.
- Area 6: This is an area of concern due to the occurrence of overwash in the past. CCNS has initiated a restoration project in this area.
- Area 7: The coastal area will probably not be breached as a result of SLR. SLR will increase the rate of erosion on the bluff, but the waves will likely continue to form barrier beach. This area is vulnerable to overwash and will likely be increasingly vulnerable over time. Alterations to the roadway, Rte 6 or 6A, could help head off environmental problems. The road to the north of this area has a dike, so it is no longer a natural tidal system. The dike at this location would need to be opened to allow flow between the fresh and salt water side to maintain a natural tidal regime.
- Area 8: The golf course is already below sea level and is often flooded from ground water.
- Area 9: The area is located at low elevation and is vulnerable to SLR impacts from ground water elevation.
- Area 10: Mayo Creek. The most dense part of the town is at a very low elevation and is likely vulnerable to SLR.
- Area 11: Blackfish Creek Highway is diked across the marsh and is vulnerable to SLR.
- Area 12: This area is located in a low-elevation marsh system.

Identification of Strategies to Reduce Transportation Related GHG Emissions

CCNS conducted a GHG emission inventory, established GHG emission reduction targets, and identified associated reduction actions to achieve its reduction goals—all as part of its Climate Friendly Parks program activities. Similarly, as part of the Pilot Project, a multidisciplinary team of stakeholders developed a list of potential GHG mitigation strategies that local, state, and Federal partners could implement to reduce transportation-related emissions on Cape Cod. The potential GHG emission reduction strategies, which initially drew upon the mitigation strategies described in CCNS' Climate Friendly Parks Action Plan, are organized into seven categories:

- Pricing strategies. These strategies raise the costs associated with the use of some components of the transportation system relative to others.
- Land use and smart growth strategies. These strategies create more transportation-efficient land use patterns (i.e., fewer and shorter vehicle trips).
- Non-motorized transportation strategies. These strategies encourage greater levels of walking and bicycling as alternatives to driving.
- Public transportation strategies. These strategies encourage greater levels of use and expand the availability of public transportation.
- Regional ride-sharing, car-sharing, and commuting strategies. These strategies expand services and provide incentives to travelers to choose transportation options other than driving alone.
- Operational and intelligent transportation system strategies. These strategies improve the operation of the transportation system to make better use of existing capacity.
- Vehicle efficiency and alternative fuel strategies. These strategies improve the fuel efficiency of the transportation vehicles and increase the use of alternative fuels.

During the scenario planning workshop, described below, local stakeholders voted for the top two strategies that would be the most effective and feasible for Cape Cod as a whole and for each of the Cape's sub-regions (Upper, Mid, Lower, and Outer Cape).[21] The strategies that ranked highest for the Lower and Outer Cape were:

[21] Voters from Cape Cod participating in the poll include one from Upper Cape, three from Mid-Cape, and three from Lower Cape. No representatives from the Outer Cape participated in the poll.

- Public transportation strategies, which received 42 percent of votes for both locations
- Non-motorized transportation strategies, which received seven and 30 percent of votes, for the Lower and Outer Cape respectively
- Land use and smart growth strategies, which received 36 and 7 percent of votes, for the Lower and Outer Cape respectively

Early versions of CCNS' Climate Friendly Parks Action plan outlined a number of mitigation actions within these top-scoring groups. Additional strategies that were developed by the pilot project were subsequently integrated into the Climate Friendly Parks Action Plan.

Scenario Development

The project resulted in a number of scenarios that reflected various housing and jobs growth distributions and transit investments. Under the direction of the project team, a scenario planning consultant team using CommunityViz, an interactive, GIS-based decision support tool, developed these preliminary scenarios. The scenarios all used the same growth projection assumption for jobs and housing over a 20 year time period and all were evaluated based on the following indicators:

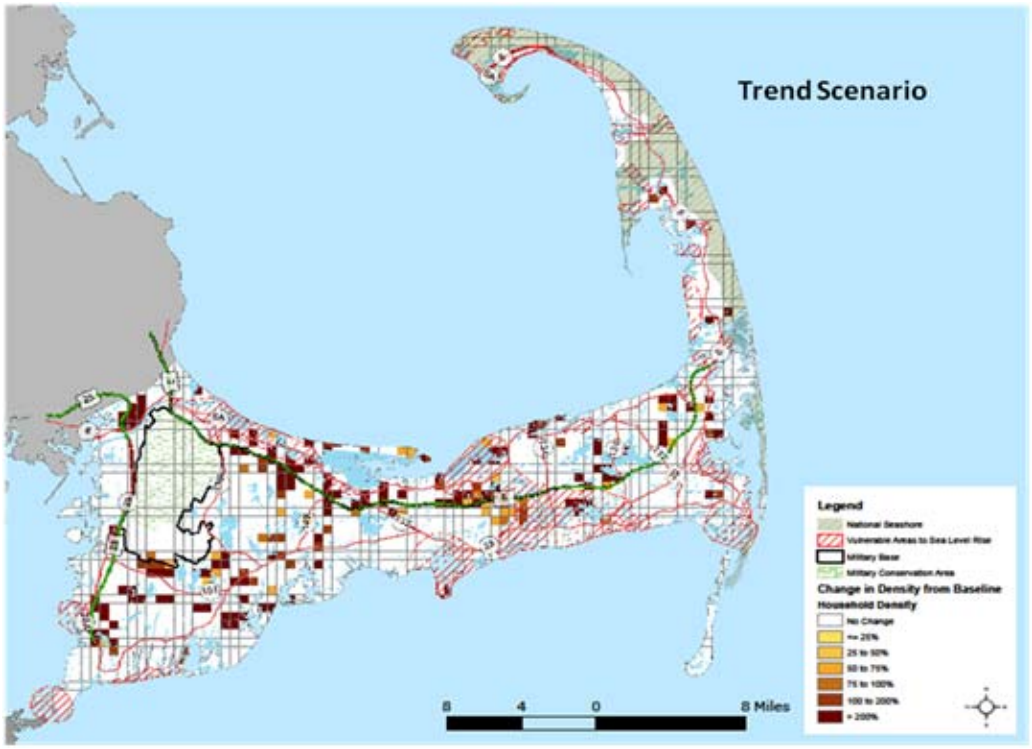
- Percent change in GHG emissions
- Percent of new population located in areas vulnerable to climate change impacts
- Regional percent change in peak vehicle miles traveled (VMT)
- Percent of new population located in wellhead protection areas
- Percent of new population located in priority habitat
- Percent of new population located in historic preservation areas
- Percent of previously undeveloped land area developed
- Percent of new employees served by transit
- Percent of new population served by transit

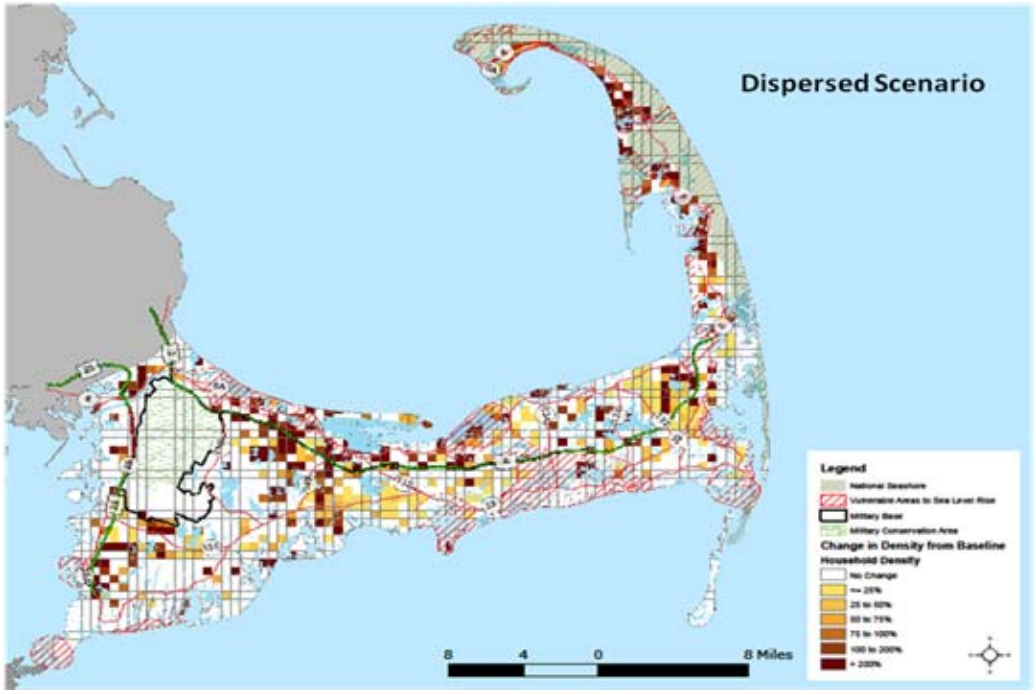
Preliminary Scenarios

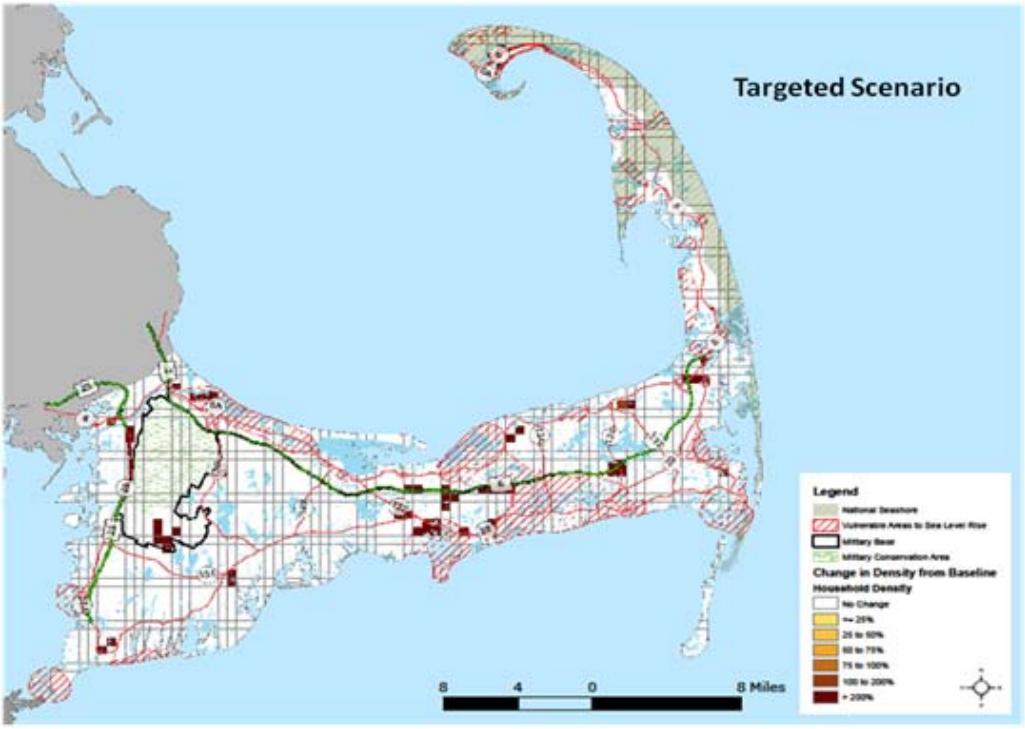
The project first developed five preliminary scenarios in preparation for the scenario planning workshop. These five preliminary scenarios included a trends scenario, which represented "business as usual" in growth and transportation options, and four scenarios that represented variations on development intensity (dispersed and targeted) and transportation alternatives (standard and enhanced) (see Figure 9). The trends scenario provided a benchmark for scenario effectiveness on the indicators outlined above.

FIGURE 9

Preliminary Scenarios







The trend scenario (top) depicts "business as usual" growth projections. The preliminary dispersed scenario (middle) depicts a future of unconstrained growth while the preliminary targeted scenario (bottom) demonstrates the impact of restricting growth to existing town centers. Courtesy of PlaceMatters.

The targeted scenario had the greatest reduction in VMT/GHG emissions, and the greatest percentage of new population served by transit. However, compared to the trends and dispersed scenarios, the targeted scenario had a larger percentage of the population located in vulnerable areas. This was because many of the existing higher density areas of the towns, where additional density was added, are located in vulnerable areas.

Scenario Planning Workshop

The preliminary scenarios and the additional information outlined above provided input into a scenario planning workshop, which resulted in additional draft scenarios and eventually a refined transportation and land use development scenario for Cape Cod. For the workshop, over 30 participants from Federal, state, regional and local agencies[22] convened in November 2010 in Falmouth, MA. During the workshop, participants heard about and discussed issues around climate change, development, and transit on the Cape, became familiar with the CommunityViz tool, and participated in a scenario planning exercise. For the exercise, participants were divided into four work groups, with each group identifying suitable areas on Cape Cod to locate a given amount of new population and employment and determining potential new transit stops and increased frequencies. The scenario planning process required workshop attendees to evaluate complex tradeoffs among land use, conservation, and climate change mitigation and adaptation through their placement of new housing and employment units.

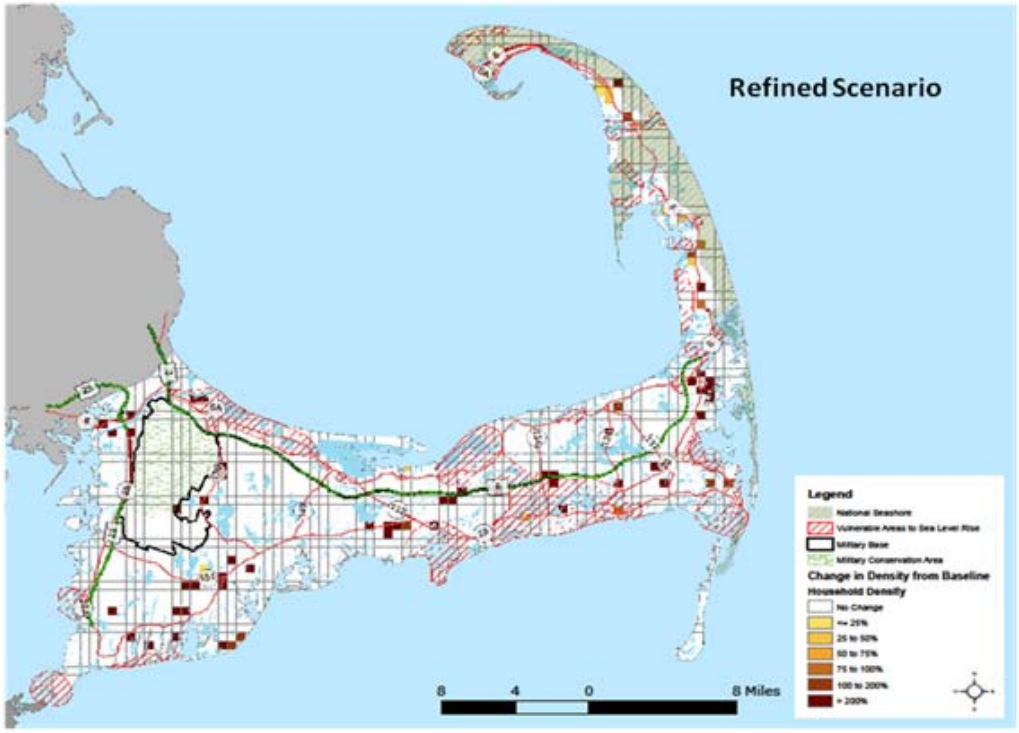
[22] Workshop participants included representatives from the following: FHWA, FTA, Federal Lands Highway, EPA, FEMA, USFWS, NOAA, NPS, USGS, Massachusetts Army National Guard, Massachusetts Executive Office of Energy and Environmental Affairs, Cape Cod Commission, Cape Cod Regional Transit Authority, Mashpee, Truro, Harwich, Barnstable, Falmouth, Brewster, Chatham, Nantucket, and Martha's Vineyard.

Refined Scenario

A group of local stakeholders consolidated these breakout scenarios into a single comprehensive scenario, which was refined and validated by CCNS, the Cape Cod Commission, Cape Cod Regional Transit Authority, and town planning staff during subsequent meetings. The resulting refined scenario (see Figure 10) had a greater percentage reduction in VMT and GHG emissions as compared to the trend and dispersed scenarios, but had lower reductions than the targeted scenario. The refined scenario had the lowest percentage of population located in vulnerable areas as compared to the preliminary scenarios.

FIGURE 10

Refined Scenario[23]



Descriptions of the preliminary scenarios and the refined scenario, including their performance on the indicators above, will be included in a final report, which will be available at www.volpe.dot.gov/publiclands/projects/capecod5_interag.html.

Next Steps

The refined scenario developed during the Pilot Project will serve as a basis for further evaluating tradeoffs and provides a baseline for future planning efforts on Cape Cod. As CCNS, the region, and towns consider future investments, the information can be incorporated into the CommunityViz model to evaluate impacts on key indicators and assess performance compared to other development scenarios. Future development and transit investments on Cape Cod will impact CCNS's GHG emissions and its ability to mitigate those emissions. Development in adjacent areas could provide potential housing for employees, and thus reduce commutes, while development in more distant areas could have the opposite effect. Increased transit services could help reduce the transportation-related GHG emissions of CCNS staff and visitors; again, reduced transit services might have the opposite effect. CCNS will continue to participate in the development and refinement of the regional transportation and land use development vision and will use the refined scenario to inform future project proposals and short- and long-range plans. Otherwise, the ability of CCNS to meet GHG reduction goals and targets might be compromised.

[23] The refined scenario is subject to change in the final report.

APPENDIX C: CAPE COD NATIONAL SEASHORE ENVIRONMENTAL COMMITMENT STATEMENT

Cape Cod National Seashore preserves nationally significant beaches, ponds, marshes, bays, heathlands, inlets, and dunes, along with historic landscapes and other natural and cultural features on Outer Cape Cod. As the steward of these diverse and special resources, our goal is to become a leader in protecting the coastal environment. Therefore, Cape Cod National Seashore will:

- Comply with all applicable Federal, State, and local environmental laws, regulations, Executive Orders, and Department of the Interior environmental policies;
- Integrate and implement environmentally sensitive Best Management Practices including pollution prevention into all of our operations;
- Consider the environmental impacts in planning, purchasing and operating decisions;
- Provide environmental training and educate our staff on how to comply with environmental laws and be environmentally responsible on and off the job;
- Assign clear responsibility to our staff for environmental activities and hold them accountable for their environmental performance, recognizing superior effort when it is demonstrated;
- Seek opportunities to promote environmental compliance and stewardship to the visitors and neighboring communities we serve;
- Monitor our environmental compliance performance regularly at both operational and organizational levels and seek and implement opportunities for environmental improvement in how we do business.

signed/ George E. Price, Jr.
Superintendent
Cape Cod National Seashore