

Climate Change – GMP Subcommittee

Meeting Agenda

November 5, 2007 1:00 -3:30 PM

- 1:00 – 1:30** Updates from DSC and GGNRA
- Discussions with Leigh Welling and Julie Thomas
 - Status of Climate Change Action Plan and EMS work
 - NOAA climate change summit
 - Others
- 1:30 – 2:30** Review and discuss draft climate change narrative
- Recap of July 30 workshop
 - Presentation of content of draft narrative
 - Q&A
 - Suggestions for improvement
- 2:30 – 3:00** Outline strategy for moving forward
- Outstanding issues; Participants; Process, Etc.

Flip Chart Notes from July 30 Workshop

Subcommittee Goals:

- 1) Identify the potential impacts of climate change on park resources.
- 2) Develop goals and guidelines for responding to and managing the effects of climate change, including the role of education and interpretation.
- 3) Develop guidance for minimizing the park's carbon footprint.

1. Potential Impacts from Climate Change

- Sea-level rise
- Temperature change
- Change in precipitation
- Increased coastal erosion
- Ecosystem disruption
 - Shifting habitats (spatial and temporal)
 - Lifecycle disruptions
 - Prey-predator relationships
 - Invasive species
 - Habitat fragmentation
 - Fire danger – extended fire season
- Pressure on park resources due to social pressures, changes, etc.
 - Increased pressure to serve as place of refuge
 - Park response should stay true to NPS Organic Act

How will we assess impacts from climate change?

- Develop Climate Change Advisory Board (partner with NOAA)
- Conduct inventory and monitoring efforts
- Seek outside assistance on issues other than sea-level rise (i.e., biological response)
- Develop an indicator that evaluates risk and helps inform management responses
- Seek advice on priorities for long-term monitoring (incl. coastal erosion)

2. How will we respond to the effects of climate change?

- Reduce; educate; adapt (Action Plan)
- Employ adaptive management based on the importance of the resource, the best available science, and allowance of natural processes; for cultural resources, give deference to site and location, goal is to retain integrity, but need to retain flexibility for standards on historic properties

How will we educate and interpret with respect to climate change?

- Interpret the conflicts; inspire and provoke people to action

3. How will we reduce CO2?

- Commitment; accept responsibility (see Action Plan)

Guiding Principles

Protect resources (NPS significance: Organic Act)

Adaptive management

Apply managed retreat philosophy for resources that are not FRV

Partnering with local universities on research, best practices, etc; Demonstrate environmental leadership

Commitment to reduction; lead by example; goal of carbon neutral

- Efficiency
- Renewable energy projects
- Land and water use (managing the stock of carbon output vs. buffer)
- Purchase CO2 offsets

Influencing park visitors and staff

- Incentives
- Park partners and concessionaires
- Business agreements; sustainability

Alcatraz as self-sustaining Island; demonstration project (leadership)

Replace existing bad energy with renewable projects

Climate Change and the GMP

Chapter 1

Planning Issues

The GMP needs to address the issue of climate change because law and policy requires the NPS to do so and because climate change is likely to affect the park and its visitors during the planning horizon of this GMP (15-20 years). The effects of climate change are described in more detail in Chapter 2, but include variables that could have direct implications to resource management and park operations and could influence the way visitors use and experience the park.

Relevant Law and Policy

Executive Order 13423 - Issued on January 24, 2007 by President George W. Bush, it requires federal agencies to “conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner.” It includes requirements for the reduction of greenhouse gases and other energy and water conservation measures. The order requires agencies to reduce greenhouse gas emissions by 3 percent annually through the end of fiscal year 2015, or 30 percent by the end of fiscal year 2015, relative to the baseline of the agency’s energy use in fiscal year 2003.

DOI Secretarial Order 3226 – Issued on January 19, 2001, the order ensures that climate change impacts are taken into account in connection with Departmental planning and decision making.

NPS Management Policies 2006 –

Section 4.7.2 states that “Parks containing significant natural resources will gather and maintain baseline climatological data for reference.” Management Policies also state that “The Service will use all available authorities to protect park resources and values from potentially harmful activities...NPS managers must always seek ways to avoid, or minimize to the greatest degree possible, adverse impacts on park resources and values.”

Section 9.1.1.6 discusses sustainable energy design, requiring any facility development to include improvements in energy efficiency and reduction in greenhouse gas emissions for both the building envelope and the mechanical systems that support the facility. Additionally, projects that include visitor centers

or major visitor services facilities must incorporate LEED (Leadership in Energy and Environmental Design) standards to achieve a silver rating.

Section 9.1.7 requires the NPS to interpret for the public the overall resource protection benefits from the efficient use of energy, and to actively educate and motivate park personnel and visitors to use sustainable practices in conserving energy.

NPS Pacific West Region Directive PW-047 – Adopted on October 31, 2006, this managerial directive encourages the use of renewable energy to minimize the contribution of greenhouse gases by parks.

Other Recommendations

As an environmental leader, the park plans to make an effort to go above and beyond legal requirements in greenhouse gas emissions, and therefore takes into consideration the goals set forth by other relevant agencies and advisory boards.

San Francisco's Climate Action Plan (2004) – San Francisco's Department of the Environment and Public Utilities Commission completed a Climate Action Plan in 2004. The reduction target established in this plan is 20 percent below 1990 levels by 2012.

California Global Warming Solutions Act of 2006 (AB32) – California has committed to reducing its global warming emissions to 2000 levels by 2010 (11 percent below business as usual), to 1990 levels by 2020 (25 percent below business as usual), and 80 percent below 1990 levels by 2050.

Western States Initiative (2007) – The states of Arizona, California, New Mexico, Oregon, Utah, and Washington, as well as the Canadian provinces of British Columbia and Manitoba agreed to a regional greenhouse gas emissions target of 15 percent below 2005 levels by 2020, (33 percent below business-as-usual levels).

The GMP will provide guidance on how the parks will assess, respond to, and interpret the impacts of climate change on fundamental resources, including objectives for reducing the carbon footprint.

Chapter 2

CLIMATE CHANGE

Context

Climate change is perhaps the most far-reaching and irreversible threat the National Park System has ever faced (NPCA 2007). Climate change in this context refers to a suite of changes occurring in the earth's atmospheric, hydrologic, and oceanic systems. These changes, including increased global air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level, provide unequivocal evidence that the climate system is warming (IPCC 2007). While the warming trend, commonly referred to as global warming, is discernable over the entire past century and a half, recent decades have exhibited an accelerated warming rate with eleven of the last twelve years ranking among the 12 warmest years on record. Most of the observed temperature increase can be attributed to human activities that contribute heat trapping gases to the atmosphere (IPCC 2007). These "greenhouse gases", particularly carbon dioxide from the burning of fossil fuels, cause Earth's atmosphere to act like a blanket and trap the sun's heat. While the insulating effect (or greenhouse effect) of our atmosphere is important to living systems, the rapid increase in greenhouse gases since the mid 19th century has turned the thermostat up higher than what our systems are adapted to.

While climate change is a global phenomenon, it manifests itself differently in different places. Some areas may get drier, while others may get more frequent and destructive downpours. While most regions will get warmer, others may get cooler. One of the most dramatic effects of global warming is the impact on extreme weather events. A disrupted climate could affect natural resources and cultural resources, and is likely to interfere with public use and enjoyment of the parks. Although many places in the world have already observed and recorded changes that can be attributed to climate change, the impacts to GGNRA have not been specifically determined and the actual implications within the lifespan of this general management plan are unknown. The IPCC affirms that climate change is occurring; however, questions still exist as to the rate and severity of impacts at the park. Climate change is a long-term phenomenon, and the likelihood that significant effects will be seen during the life of this GMP (15-20 years) is unknown; however, acceleration of climate change impacts could have a more immediate effect on park resources and values.

Climate Change Issues and Potential Impacts

Climate change is expected to affect human health; damage infrastructure; alter crop production, animal habitats, and many other features of our natural and managed environments. The GGNRA is one of the top twelve western national parks most at risk from climate disruption (The Rocky Mountain Climate Organization). The loss of beaches and historical and archaeological resources could occur in the park. The following list details the major issues resulting from climate change, and the specific

impacts those issues could have on the GGNRA. The potential issues and impacts to GGNRA due to climate change include the following:

Issue: Sea level rise

During the past century, sea levels along California's coast have risen about seven inches. If carbon emissions continue and temperatures rise, sea level could rise an additional 22-35 inches by the end of the century (California Climate Change Center 2007). According to the US Geological Survey, 50% of the GGNRA coast is classified as having high or very high vulnerability. Rising mean sea levels in combination with increasingly severe winter storms and high tides is expected to cause more frequent and severe flooding, erosion, and damage to coastal systems and structures. This impacts the parks in several ways.

Potential Impacts:

- Beaches could shrink or be lost, affecting both public recreation and enjoyment. A rise of three feet could likely inundate most if not all of the beaches. Heavily visited beaches include Ocean Beach, China Beach, and Baker Beach.
- Rising sea levels could put some cultural resources partially or wholly underwater. Not only could historical and archaeological sites become inaccessible, but they could be at risk of eroding or falling into the ocean. Two examples of vulnerable sites are Fort Cronkhite and Fort Point.
- Rising sea levels could damage or destroy riparian habitats through coastal storm surges and flooding.
- Rising sea levels could infiltrate the fresh water resources, causing natural and economic impacts.

Issue: Temperature increases

Average temperatures in California are expected to rise between 3 and 10.5 degrees Fahrenheit by the end of the century, depending upon the level of emissions; in the next three decades, temperatures are expected to rise between 1 and 2.3 degrees Fahrenheit (California Climate Change Center 2007).

Potential Impacts:

- Subtle changes in temperatures and seasonal variation could change vegetation patterns and influence the integrity of coastal plant communities.
- Ecosystem disruption could occur, including wildlife extinction, invasive animals, range shifts poleward and up in elevation; stresses on wildlife from changes in seasonal timing, increased mortality due to pests and pathogens, and habitat fragmentation.
- Temperature increases, along with precipitation changes could increase the risk of wildfire.

Issue: Weather is less predictable and more extreme

Since 1950, the world wide number of heat waves has increased, flood events have increased, and many areas have experienced longer droughts (IPCC 2007). In a warmer

future climate, extreme weather events are likely increase in frequency and intensity (IPCC 2007).

Potential Impacts:

- Stronger and more frequent El Nino events may promote harmful algal blooms that are toxic to seals, seabirds, and fish, and could poison shellfish. Over the past decade the number and frequency of California sea lions exposed to toxic domoic acid from harmful algae have increased dramatically. (Neubaucher)
- Erosion and sedimentation to GGNRA's 59 miles of coastal systems could occur.
- Increased social pressures on park resources for consumptive uses and as a refuge from urban living could occur if a storm event made those resources scarce within the metropolitan area.
- *What are the impacts to the park if the area gets warmer and wetter? What are the impacts if the area gets warmer and dryer?*

Issue: Hydrologic Changes

Observations show that changes are occurring in the amount, intensity, frequency, and type of precipitation (IPCC 2007). While projections show little change in total annual precipitation in California (California Climate Change Center 2007), even modest changes to precipitation, including changes to the seasonality of rainfall, could cause disruption to ecosystems that are conditioned to historical precipitation levels.

Potential Impacts:

- Earlier stream flow and higher stream temperatures could impact the stream ecology.
- Impacts to fog? (Point Reyes is considered one of the foggiest places in the world, but in 2004 and 2005, the amount and timing of summer fogs were reduced because nearshore waters were warm. The fog patterns changed due to increased nearshore sea surface temperatures. Many forest and scrub species derive are dependent on moisture from fog drip. (Neubacher Statement to Congress).

Issue: Air quality worsens

Air quality is reduced due to increases in ground level ozone and airborne particulate matter, which stem from increased emissions and temperature increases.

Potential Impacts:

- Deterioration of scenic views and the quality of the night sky could occur.

Issue: Ocean currents shift and the ocean becomes more acidic (NPCA 2007).

The marine area surrounding the GGNRA is a highly productive fishery. The fishery could be threatened by climate change.

Potential Impacts:

- The ocean temperature could increase and become more acidic, causing species to relocate. In 2005 and 2006, Point Reyes researchers documented very low krill populations off Point Reyes and Golden Gate National Recreation Area, resulting in complete breeding failure for the seabird, Cassin's Auklets. These are the first

breeding failures recorded for this species in 30 years. (Neubacher Statement to Congress).

- Changes in the timing of upwelling bring nutrients and food to salmon that feed at sea too late. Global climate change may undermine extensive restoration efforts by NPS to improve stream habitat for salmon while the salmon starve at sea. The salmon go out to sea in mid-April to mid-May, but in 2005 they found nothing to eat at sea and by the time upwelling started, they were dead from starvation. (Neubaucher)

Protecting the park with respect to Climate Change

Sustaining and restoring healthy parks will require the NPS to address many challenges—fiscal, ecological, and threats to the integrity of cultural and natural resources. The GMP describes the policy position that the parks will take to reduce its contribution to climate change, educate visitors on the topic, and adapt to climate change over the next 20 years. This information is common to all of the alternatives and is considered park-wide guidance. While the parks are already undertaking projects that address climate change, such as reducing carbon emissions, there is more to be done. GGNRA aims to exceed legal requirements and acknowledge that they are not enough. In order for the GGNRA to respond to the above issues and impacts, the park has developed high level responses and actions. The park has three primary policy goals and related objectives in regards to climate change. These are:

1. Reduce - Reduce CO2 emissions

Goal: Reduce CO2 emissions and increase use of renewable energy to the point of becoming a carbon neutral park for NPS and Partner operations.

Rationale: National parks can demonstrate how to minimize our contribution to climate change through practices such as energy efficiency and use of renewable energy. The park will work with partners to promote sustainable operations and reduce partners' emissions.

Goal: Reduce visitor greenhouse gas emissions from personal vehicles by reducing dependency on personal vehicles.

Rationale: Since visitor emissions from driving contribute over 90% of the park's emissions at the time of this writing, the park will assist in the reduction of visitor greenhouse gases by providing opportunities for alternative transportation options.

2. Educate - Education and interpretation

Goal: Help park visitors understand climate change and how they can respond. Inspire visitors to action through leadership and education.

Rationale: Through the efforts of employees, partners, and displays the park can engage visitors on the topic of climate change, relate what response is being taken at the park, and inspire visitors to aid in that response.

3. Adapt - Assessing the impacts and responding to the effects

Goal: Proactively monitor, plan, and adapt to the effects of climate change

Rationale: Climate change is a global phenomenon, outside the control of the park. Therefore, the park will not have the ability to control impacts of climate change on the park through its own emissions reductions and education practices.

The park will utilize and promote innovation, best practices, and partnerships to respond to the challenges of climate change and their effects on park resources. By using and developing tools and monitoring methods, including seeking outside assistance, the park can better respond to climate change. The park will interpret climate change science and develop management strategies, which may include predicting and projecting expected changes more than it did in the past.

Temperature and precipitation changes may require that the park no longer simply manage for natural communities; therefore, the goal transitions towards managing for native biodiversity and ecosystem function. GGNRA may chose to use adaptive management to allow natural processes to continue unimpeded except when public health and safety and the park's fundamental resources and values are at risk. GGNRA will also work with other local, regional, and national agencies to collaborate in the effort to assess and adapt to climate change.

Goal: Use the best information on climate change as it becomes available.

Rationale: The National Park Service is actively developing tools and strategies to help parks identify and manage climate change impacts. By adopting the best information on climate change as it becomes available, GGNRA will be positioned to respond quickly and appropriately to the local effects of climate change.

World Heritage Committee recommendations for protecting significant natural and cultural sites

In July 2006, the world heritage committee, a United Nations body, adopted resolutions outlining a framework of action for protecting the world's most significant natural and

cultural sites from the effects of climate change. The recommendations could apply to GGNRA. The WHC identified options for planning and managing protected areas faced with climate change:

- Creating new protected areas
- Enlarging existing protected areas
- Creating replicates of existing protected areas
- Designating “stepping-stone” or corridor protected areas
- Creating buffer zones of natural habitat around protected areas.
- Increasing habitat heterogeneity within protected areas (e.g. Altitudinal, latitudinal, and topographic)
- Restoring, regulating or maintaining disturbance regimes
- Removing or reducing invasive alien species
- Reducing other environmental stresses
- Restoration or rehabilitation of natural habitat
- Translocation, reintroduction or introduction of species.

Chapter 3 - AFFECTED ENVIRONMENT

Chapter 4 – ENVIRONMENTAL CONSEQUENCES

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