NPS CLIMATE CHANGE RESPONSE

Jeff Mow
Superintendent
Glacier National Park
November 13, 2014

NPS CLIMATE CHANGE RESPONSE

"Where Ice and Mountains and Oceans Meet…"

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National Parks of Alaska

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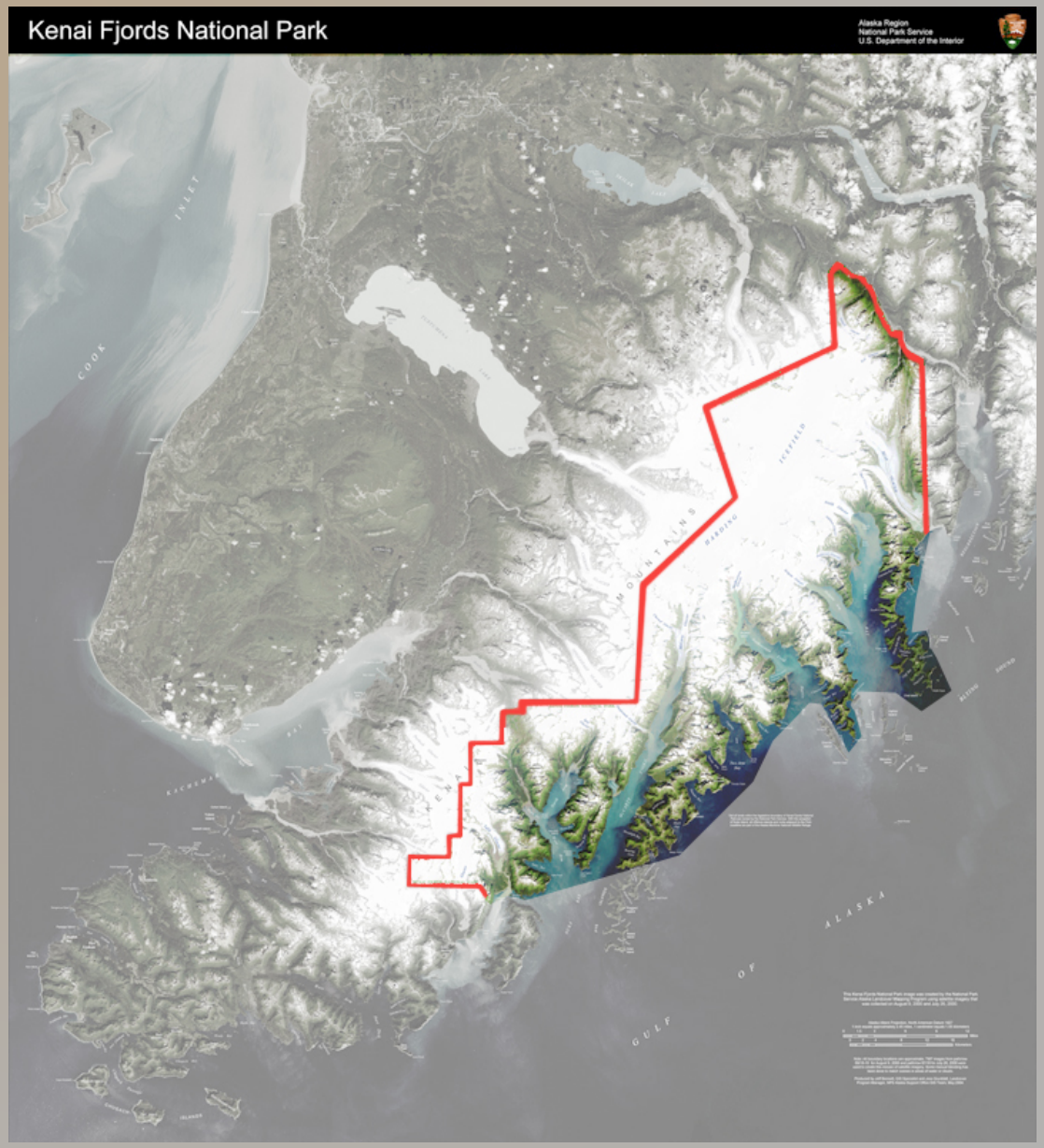

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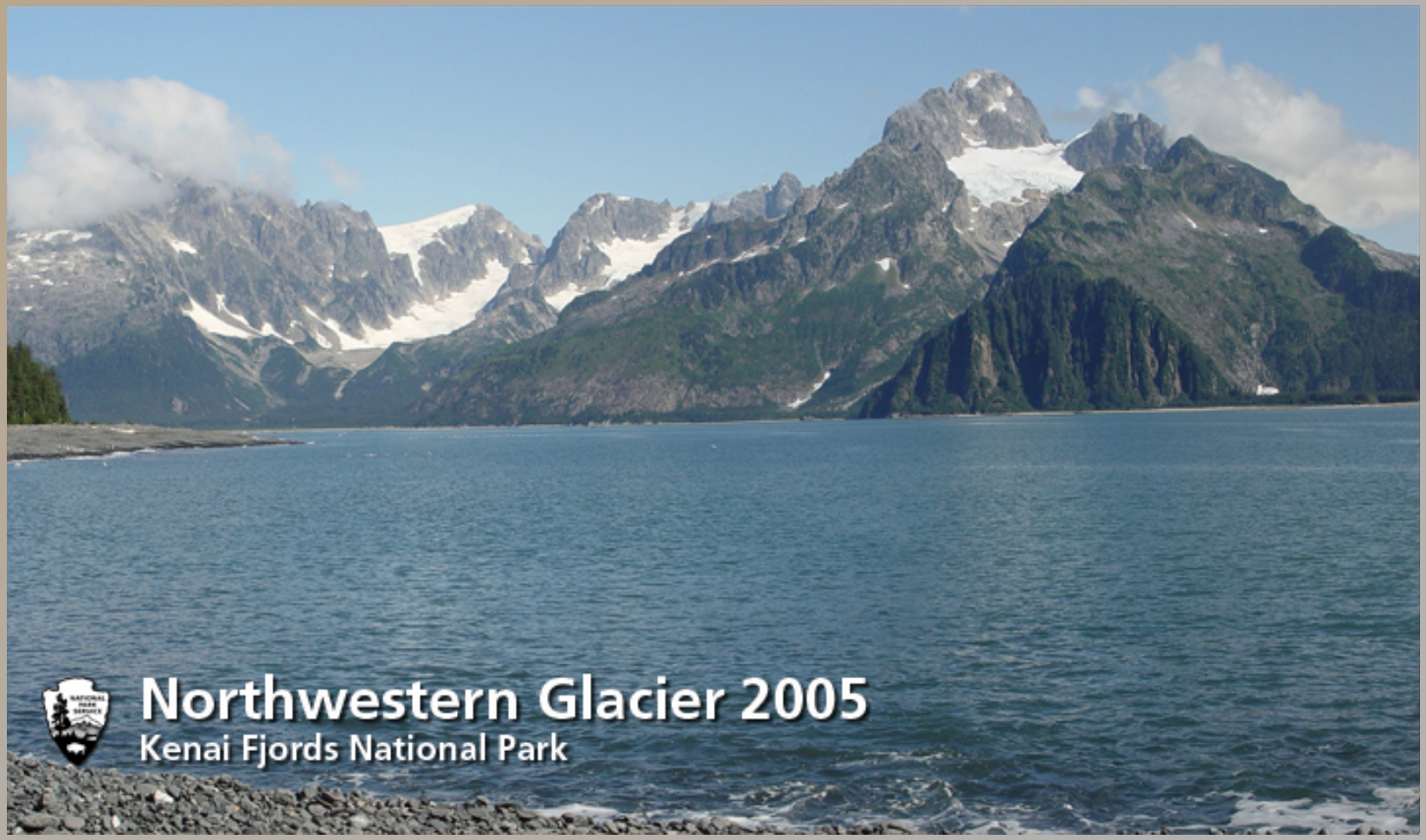

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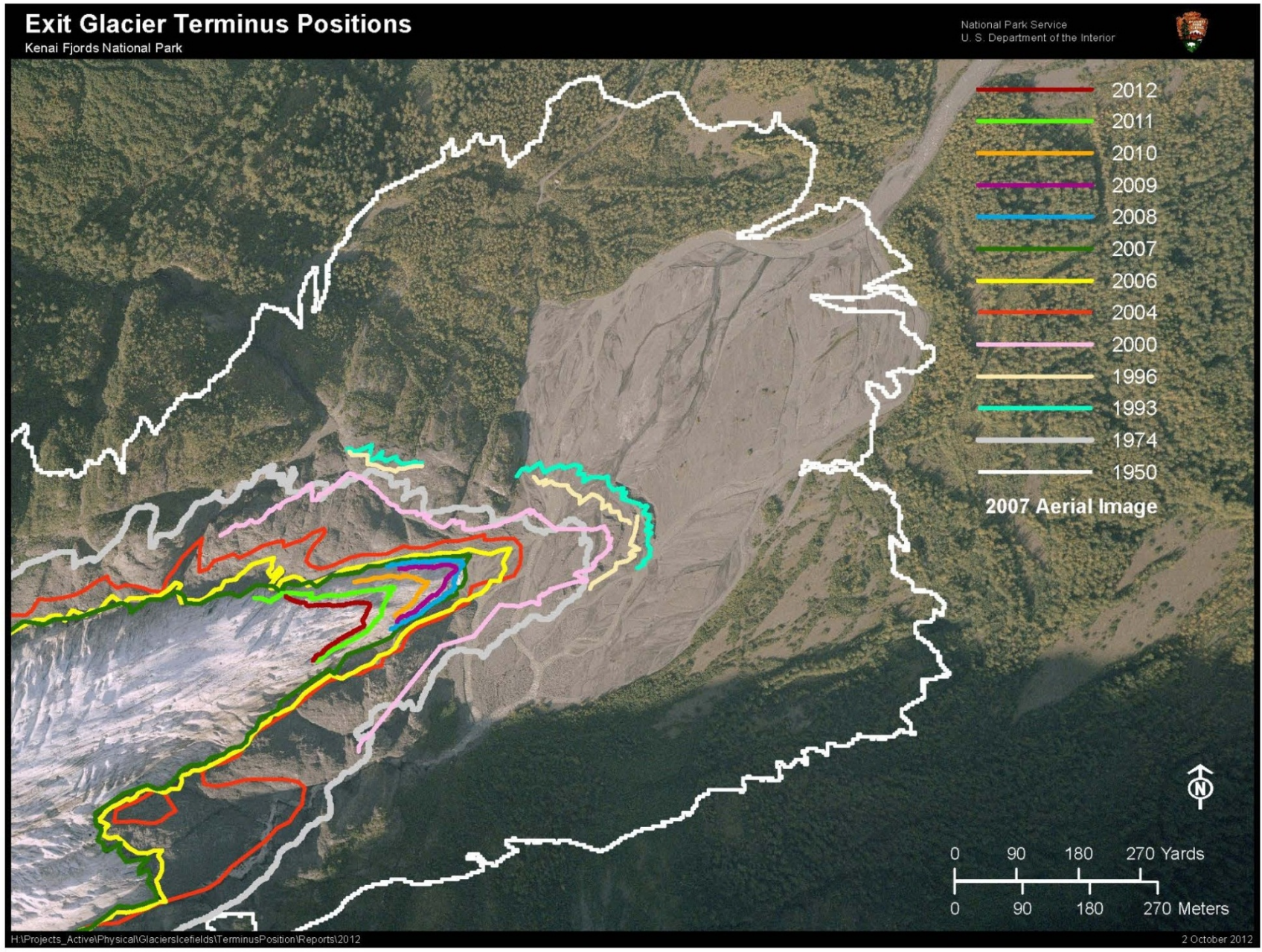

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"Climate change is fundamentally the greatest threat to the integrity of our national parks that we have ever experienced." **Jon Jarvis**

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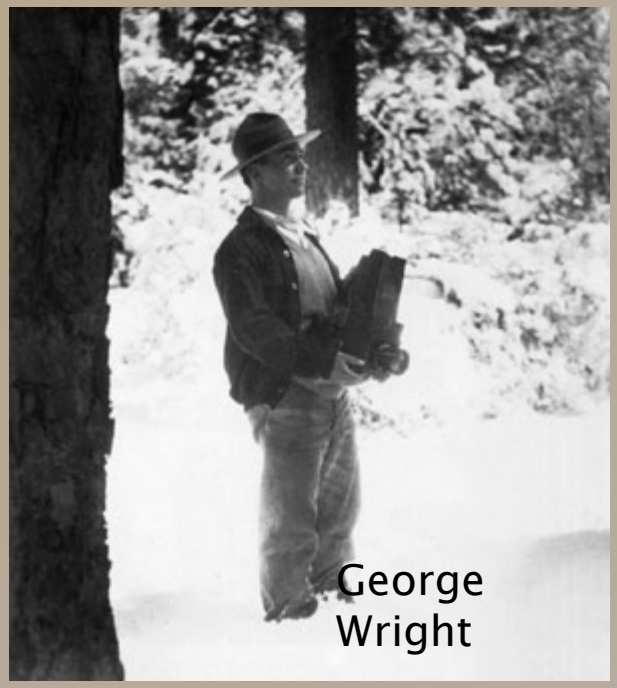
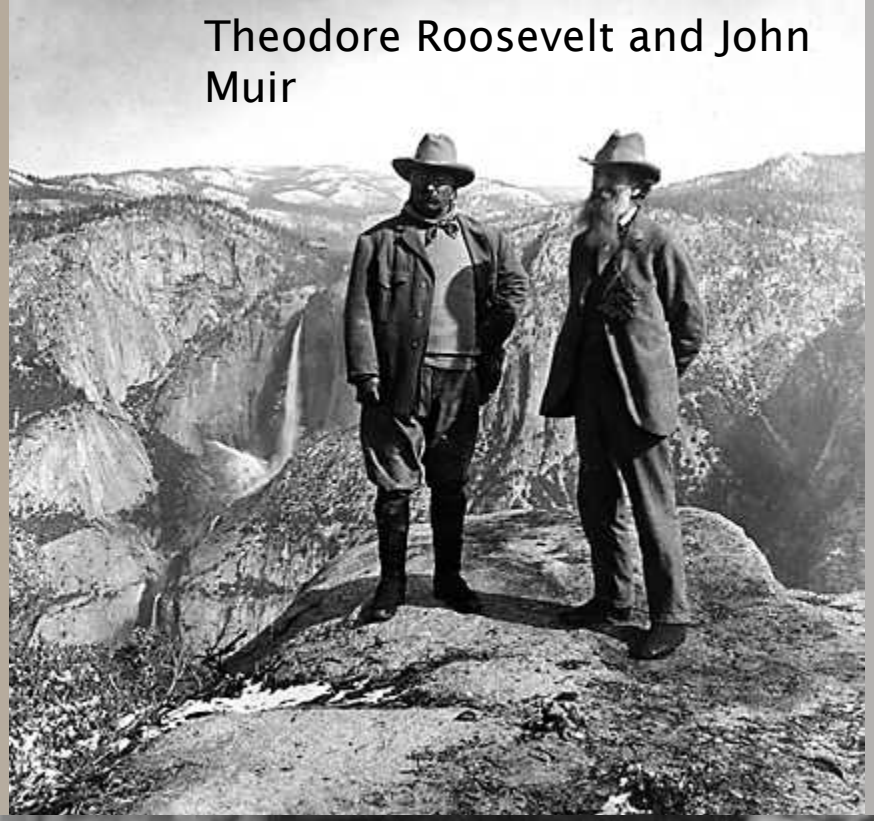


George Wright



Theodore Roosevelt and John Muir

Stephen Mather and Horace Albright

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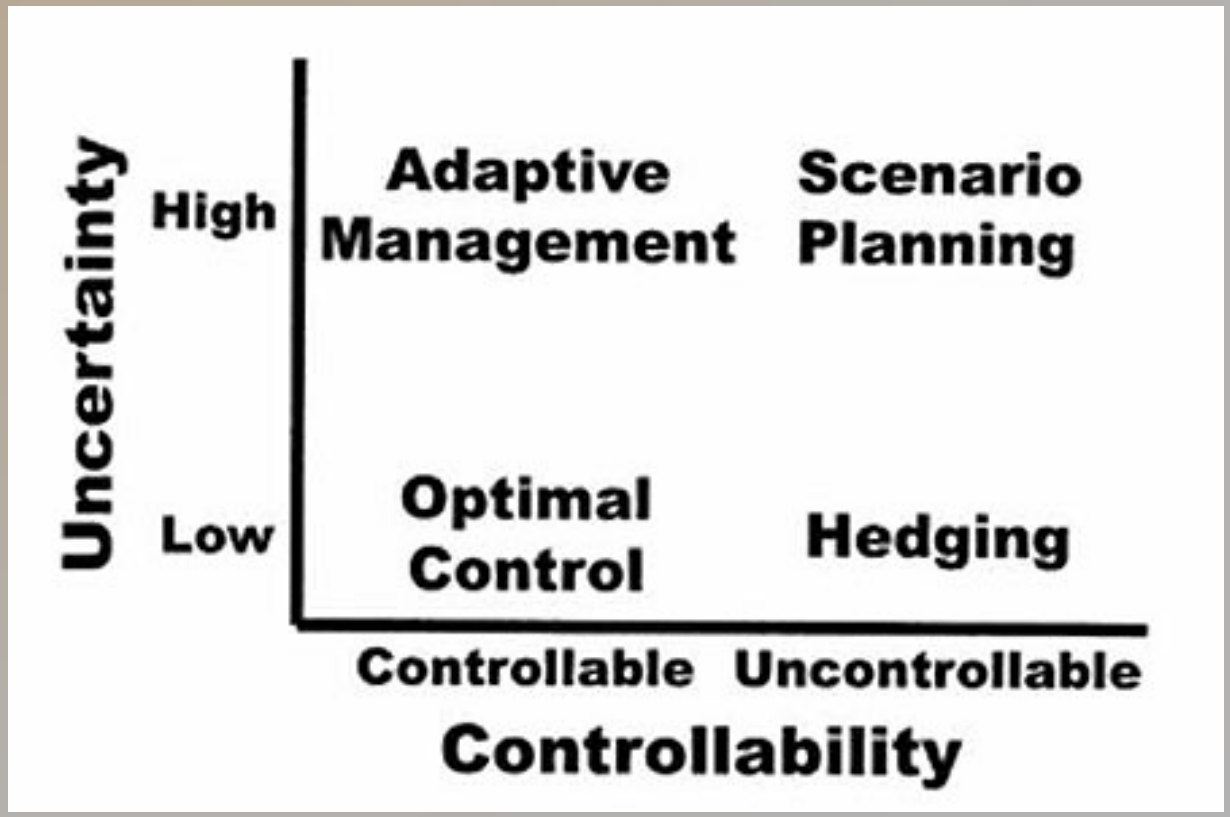
Alaska Leadership Council

Uncertainty

- Climate
- Management Actions
- Response of Ecosystems



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Scenario Planning

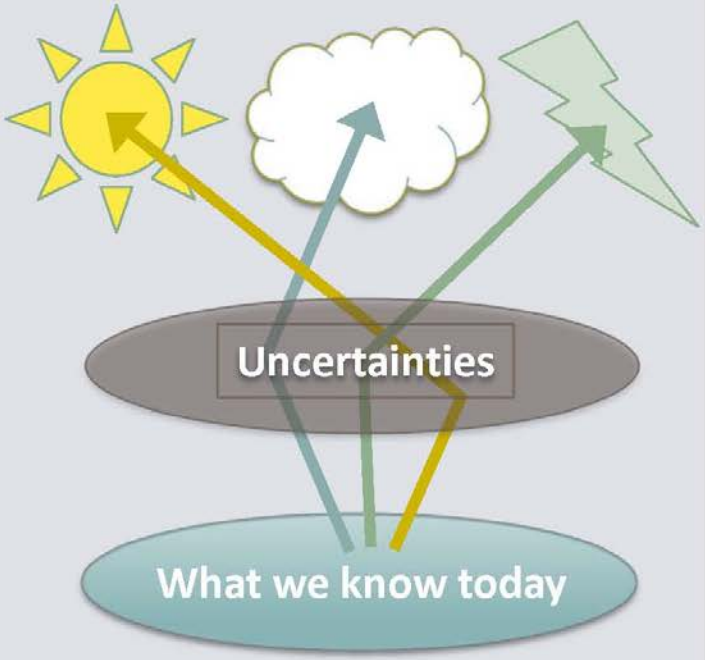
"We use scenario planning to rehearse the future to avoid the management surprises"

Scenario Planning vs. Forecasting

- *Scenarios overcome the tendency to predict, allowing us to see multiple possibilities for the future*

- Forecast Planning
- One Future

- Scenario Planning
- Multiple Futures



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Explaining Scenarios: Description

- Scenarios are stories about tomorrow that can help you make better decisions today

- They offer a range of possibilities for the future—not predictions
- Narratives that stretch thinking but are always plausible and logical
- Scenarios provide a framework for recognizing and adapting to change over time—ahead of time

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Selected Drivers (Coastal)

Climate Drivers (or, "Scenario Drivers based on Climate")	Uncertain	High certainty	Important
Temperature	X		X
Precipitation	X		X
Freeze-up		X	
Length of growing season		X	
Sea Level	X		
Water availability	X		
Relative Humidity	X		
Wind Speed (separate from Aleutian Low)	X (duration)	X (increase)	
PDO	X		
Extreme Events (temperature)		X	
Extreme Events (precipitation)	X	X	
Extreme Events (storms)		X	X

Additional drivers introduced by the group:

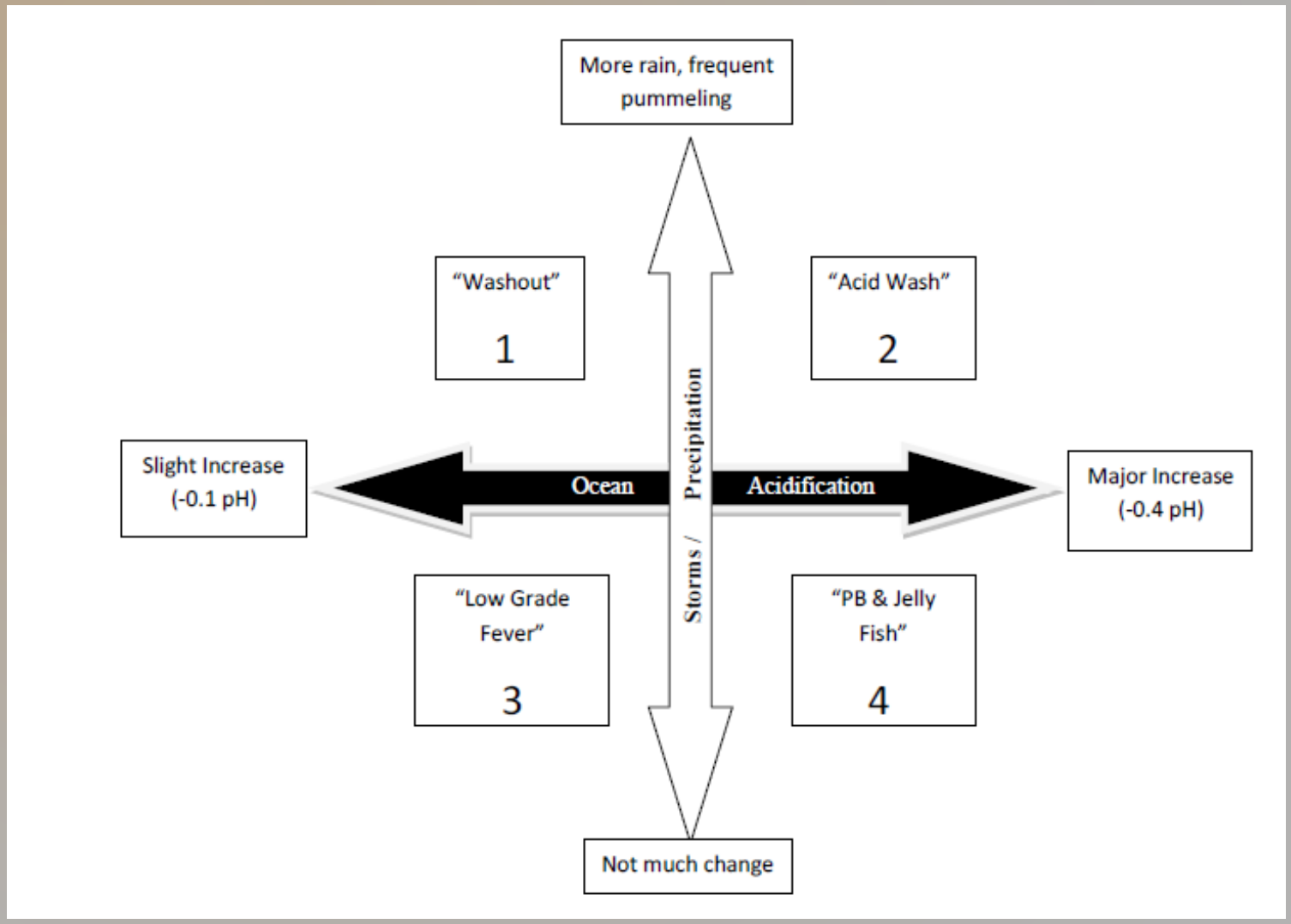
- Ocean Acidification
- Salinity (onshore/near shore)
- Aleutian Low
- Extreme Event (wind)
- AK Coastal Current

Selected drivers to explore:

Acidification:
Temperature:
Storms

Precip

Scenario Planning at KEFJ



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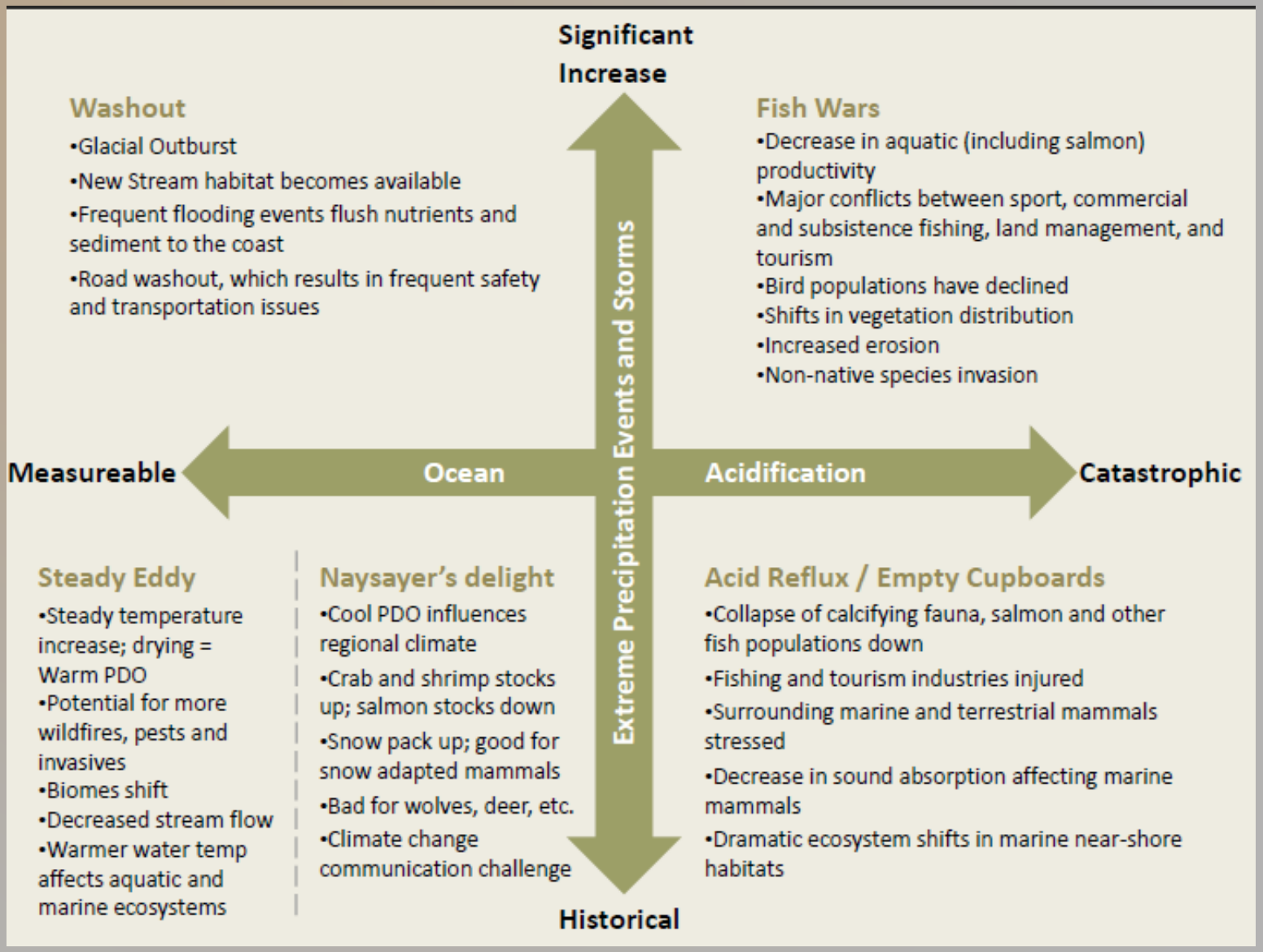
Scenario Planning at KEFJ



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Climate Change Response Program
Scenario Planning Case Study

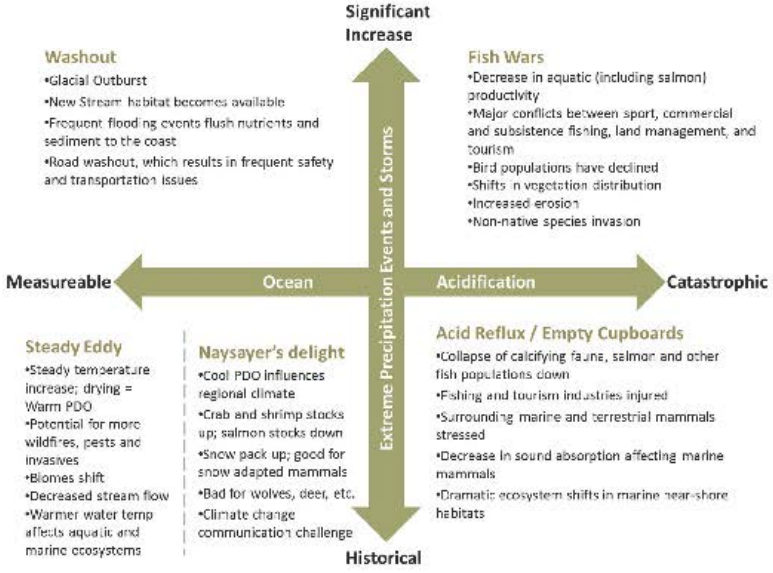
National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science
Climate Change Response Program

Southwest Alaska Network

Background

Since 2006 the National Park Service (NPS) has been using scenario planning, a collaborative and strategic science-based decision support tool, to explore future impacts of global climate change, management policies and societal attitudes on national parks. The NPS has engaged several leaders in the field of scenario planning in this effort, most notably the Global Business Network, the University of Alaska's Scenarios Network for Alaska Planning, the University of Arizona's Office of Arid Lands Studies, the University of Montana National Center for Landscape Fire Analysis and the USGS Northern Prairie Wildlife Research Center. With the aid of these partners, the NPS has developed a unique approach to scenario planning, which employs quantitative as well as qualitative models of change to envision a variety of future social, political and environmental outcomes. By applying the process of scenario planning, NPS managers are able to evaluate the uncertainty and variability surrounding future environmental and sociopolitical conditions, and develop resource management strategies that will be effective across a wide range of potential outcomes.



Southwest Alaska Network Local Climate Drivers

The Southwest Alaska Network scenario workshop participants identified extreme precipitation events and storms and ocean acidification as the most critical and uncertain climate drivers that will affect conditions in the network over the next 50 to 100 years. These drivers were used to create a local climate change drivers matrix where impacts to park resources and infrastructure could be identified and elevated for additional consideration. Based on the local climate drivers matrix, four narrative scenarios were developed, which incorporate the potential impacts of climate change to park resources set in the context of varying future social and political situations.

Scenario #1 – *NPS 911*

NPS 911 is a scenario where southwest Alaska is experiencing an increase in extreme storm and precipitation events. These events cause frequent flooding that flushes nutrients and sediment to the coast, increases erosion and encourages vegetation succession on land - which has allowed for invasive species encroachment in terrestrial ecosystems. Roads are prone to washout, resulting in safety and transportation issues. Increased water temperatures in lakes and streams stress salmon populations. This scenario offers a lack of senior commitment and governments are unable to articulate a coherent set of policies and approaches to climate change, resulting in growing public unease, and unstable systems and structures. Impacts and Implications of this scenario may include cultural resources at risk of flooding and damage and emergency documentation of archeological sites would be necessary. This scenario would be characterized by an increase in the need of community support and assistance from the NPS. Facilities and infrastructure would likely suffer damage, and there would likely be an increase in travel risks and incidents. This scenario would present a challenge for interpretation and education in the form of reduced visitor satisfaction and heightened expectations of climate change response from the NPS.

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Scenario #2 – *Jellyfish Delight*

Jellyfish Delight is a scenario where catastrophic increases in ocean acidification, coupled with extreme storm and precipitation events, have resulted in a decrease in aquatic (example: salmon) productivity. Major conflicts between sport, commercial, and subsistence fishing, land management, and tourism are common. Bird populations have declined due to decreased food availability and the loss of breeding habitat from flooding. However, broad societal understanding of climate change spurs coordinated action leading political leaders to initiate bold policies to mitigate the worst impacts of climate change, and adapt to the inevitabilities of climate change effects. Impacts and implication of this scenario would likely be characterized by severe stress to wildlife, especially aquatic wildlife. Coastal fish population could approach collapse, resulting in severe economic impacts and produce heated conflicts. Cultural resources, historic buildings, archaeological sites, facilities and roads could suffer flooding and erosion. It is likely that visitation would decline as a result of the reductions in charismatic species.

Scenario #3 – *Baked Alaska*

Baked Alaska is a scenario of relatively slow increase in ocean acidification, coupled with a historical trend of extreme storm and precipitation events. This scenario is characterized by strong commitment from leadership and the international community regarding climate change action. However, there are other concerns competing with climate change, and society remains largely indifferent to action.

There are few major changes in species composition and productivity along the coasts, although steady temperature increases have altered the terrestrial environment, causing increases in wildfires and pests, such as beetle kill, which continue to affect the landscape. Vegetation biomes have shifted, creating opportunities for the encroachment of invasive species. Stream volumes are decreasing, drying up many wetland and riparian areas, while rising water temperatures affect fish reproduction, and in turn, marine and terrestrial mammal populations.

Impacts and implications: there would likely be an increase in fires, pests and stress to vegetation. Due to increases in temperature, there would likely be a small window of time to preserve snow bed archaeology relative to other scenarios. Summer tourism would likely increase with the longer visitation season and winter travel would be reduced with more open water.

Scenario #4 - *What Climate Change*

What Climate Change is a wild card scenario where winter temperatures are lower during a negative phase of the Pacific Decadal Oscillation, combined with a measurable level of ocean acidification. Impacts and Implications of this scenario would include climate change becoming a topic of little political or societal concern, as competing concerns and interests dominate public discourse. Southwest Alaska experiences a large marine shift as a result of the changes. Crab and shrimp stocks have increased, while salmon stocks have declined. This effect has caused brown bear declines. Snow pack may increase, resulting in ideal conditions for skiers, moose, and other mammals adapted to large snow cover. Wolves and their prey do not do as well in the deep snow. Potential for changes to the terrestrial ecosystems arise. Subsistence and commercial fishing is affected as more people compete for fewer fish. Interpretation and education would face significant challenges in communicating the implications of climate change to the public when climatic changes are not apparent, due to wetter, cooler weather.

More Information

Leigh Welling, Ph.D.
Climate Change Response Chief

ph: (970) 225-3513
email: Leigh_Welling@nps.gov

http://www.nps.gov/climatechange

Best Practices

The following strategies, actions, and areas for further study were common to all four Southwest Alaska Network scenarios, and represent "best practices", as they will enable managers to better approach resource management regardless of how the future may unfold. Moreover, the indicators to monitor areas for further research represent milestones that could signal whether the future is evolving towards or away from one or more scenarios, allowing managers to adjust strategies and actions accordingly.

Management Actions Common and Applicable to All Scenarios

Resiliency

- Make Climate Change an organizing principle for park priorities.
- Reduce stressors: control invasives, restore disturbed areas.
- Coordinate emphasis on inventory and monitoring of both social and natural systems.

Research and Study

- Safety and access changes.
- Role of natural variability.
- Park relevance with public and visitors under changing conditions.
- Consider park mandates and enabling legislation under changing conditions.

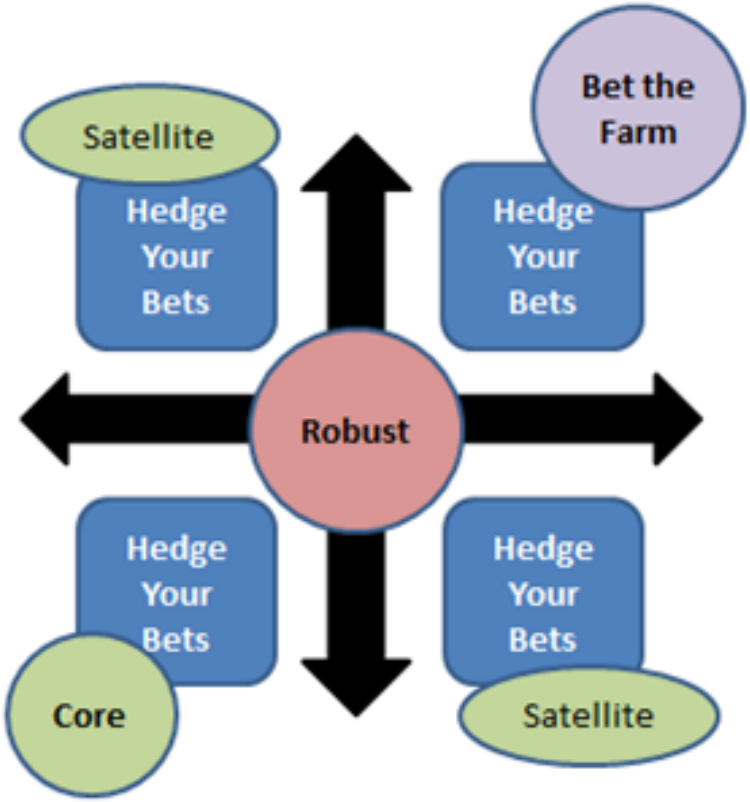
Capacity Building

- Enhanced communication technology.
- Promoting climate change literacy: global vs. local impacts and implications.
- Build true interagency cooperation and collaboration with stakeholders. Consider structuring a coordinating entity to deal with the impacts of climate change (include agency, state, tribal, NGO's).

Indicators to Monitor

- Relative sea level rise
- Geomorphology
- Species changes
- Groundwater
- Landscape level changes
- Migration phenology

Categorizing Options to Help Set Strategy



Robust: Pursue only those options that would work out well (or at least not hurt you too much) in any of the four scenarios

OR

Bet the Farm / Shaping: Make one clear bet that a certain future will happen — and then do everything you can to help make that scenario a reality

OR

Hedge Your Bets / Wait and See: Make several distinct bets of relatively equal size

OR

Core / Satellite: Place one major bet, with one or more small bets as a hedge against uncertainty, experiments, and real options

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National Park Service

National Park Service
U.S. Department of the Interior

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"Rehearsing the Future" - Scenario Planning in Alaska

Changing climatic conditions are rapidly impacting environmental, social, and economic conditions in and around National Park System units in Alaska. With over 50 million acres of parklands to administer, Alaska park managers need to better understand possible climate change trends in order to better manage arctic, subarctic, and coastal ecosystems and human uses of these areas.

This three-year project will help Alaska managers and communities develop a range of plausible climate change scenarios for parks and adjacent areas throughout Alaska. NPS personnel, together with their stakeholders, will complete climate change scenario planning exercises and reports for the all NPS units in the Region, organized around each of the four Inventory & Monitoring networks in Alaska.

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Questions?