



Climate Change Scenario Planning Lessons from Alaska

By Robert Winfree, Bud Rice, John Morris, Jeff Mow, Don Callaway, Don Weeks, Nancy Fresco, and Lena Krutikov

Scenario planning is a tool that enables us to test our assumptions about the future. Scenarios are not forecasts or predictions about the future, but are plausible hypotheses of what could happen. Whereas other planning tools are available for situations of fairly high certainty or controllability, scenario planning is ideally suited for assessing situations with critical and uncontrollable uncertainties, which abound in Alaska. In Alaska, scenario planning has recently been applied to questions about marine shipping, climate change, and port site selection, and soon will be applied to resource development on the North Slope. In this article, we will reflect back on the experience of six National Park Service scenario planning workshops that focused on climate change in Alaska.

Approaches to scenario planning can vary, but these five steps are common:

- Framing the issue, purpose, and scope
- Assessing the available information (including driving forces and critical uncertainties)
- Developing and evaluating plausible scenarios (including potential effects and implications)
- Planning and implementing appropriate actions, and
- Monitoring the indicators and consequences of change

Figure 1. Sheet flooding of Exit Glacier Road is a new thaw-related phenomenon for managers at Kenai Fjords National Park.

NPS photo by Jim Pfeifferberger

We were looking at climate change in parks, so we framed the issue with two questions.

- How will climate change impact the landscapes within which the parks are placed over the next 25 to 100 years, and then
- How can managers best preserve the natural and cultural resources and other values within their jurisdiction in the face of climate change?

More than 140 people from 25 agencies, institutions, and communities participated in one or more of the workshops that were jointly organized by NPS and the Scenarios Network for Alaska Planning (SNAP), with funding and technical support by the NPS national Climate Change Response Program. The implications and recommendations that are identified through scenario planning can be influenced by who participates in the process. To promote information sharing and broader perspectives, we deliberately set aside about half of the seats in the workshops for people outside the NPS, including other agencies, park-affiliated communities, businesses, and nongovernment organizations. We didn't pre-select for people who already accepted the evidence for climate change—some didn't, but we provided all workshop participants with background on the subject, through a series of presentations and selected readings. Within NPS, about 80% of the participants worked in five career fields: Natural Resources and Inventory & Monitoring, Interpretation & Education, Management, Planning & Compliance, and Cultural Resources. Other participants came from the fields of Fire, Maintenance, Subsistence, Protection, Wilderness, Social Science, GIS, and Concessions, although

not all fields were represented at every workshop, perhaps reflecting an assumption that climate change is primarily a natural resources and science issue.

Developing the scenarios started with identifying two scenario drivers—factors of high importance and high uncertainty that participants felt could strongly influence future conditions in and around the parks. Table 1 shows the drivers that were ultimately selected by ten groups, each of which developed two scenarios. The selected drivers included temperature and precipitation, storm activity, and for marine scenarios, ocean acidification. Participants discussed potential effects of changing climates, social and institutional responses, creating four plausible, relevant, divergent and challenging scenarios during each 3-day workshop. We chose to focus these scenarios on conditions that could occur 20-30 years from now, far enough to get beyond short-term climatic variations (such as the Pacific Decadal and Arctic Oscillations), but close enough to still be relevant to park staff or to their successors. Although this report will not delve into the methodology or the specific scenarios in detail, that information is contained in other reports and presentations on the project web site: <http://www.nps.gov/akso/nature/climate/scenario.cfm>

We focus here on a summary of more than 750 implications and recommendations that were identified through this process. With 20 widely divergent scenarios, from 10 groups, in 5 workshops, across the state of Alaska, we might expect that the implications and recommended actions would also be highly divergent. There were implications that were specific to particular scenarios, but there was also a lot of similar thinking across a very wide range of scenarios. About a third of the implications focused on general environmental changes. Listed in

declining order by the number of implications identified, these included impacts related to: cultural sites, invasive and pest species, water supplies, fire hazards, biodiversity, permafrost, habitats (see DeGange et al. in this issue), glaciers, ice loss, contaminants, vegetation, and higher or lower relative sea level change – both of which we’re seeing in different parts of Alaska.

Fundamental environmental changes would also have implications for wildlife and fish, and for subsistence

access, all of which are major food security concerns in Alaska. Facility and infrastructure failures were also identified in many scenarios, such as damaged foundations, roads and utilities (Figure 1) and a growing need for sustainable energy supplies and use (Figure 2). Regional economic development, especially from minerals, energy, and transportation—related activities, were considered likely—with potential benefits and risks.

Nearly a quarter of the implications were related

to current and potential effects on communities: due largely to changes in subsistence foods (also see Moerlin et al. in this issue), facilities and infrastructure (Figure 3) (also see Rice et al. in this issue), and needed services. The tourism industry was under-represented in several workshops, which may account for the relatively few implications related to changes in tourism, or to the agency’s ability to handle those changes. However, there were more questions about the agency’s ability to remain relevant, protecting people and resources in a rapidly changing environment (Figure 4).

Although climate change is expected to have some benefits, only about 5% of the implications were phrased in neutral or favorable terms. Potential benefits from some scenarios and perspectives included more roads, tourism, berries, moose, bears, and beaver—and locally-new wildlife species like deer, elk, cougar and bison (Figure 5). Perhaps the tendency to identify negative implications stems from concern that resources and people that are already well adapted to current conditions may not fare as well if conditions change.

About 3-4% of the implications actually stemmed from actions that people could plausibly take to adapt

Drivers	Atmospheric Carbon Dioxide	Air Temperature	Precipitation	Atmospheric Circulation
Scenario Workgroup				
Northwest AK Bering Land Bridge		Temperature	Extreme Precipitation and Storm Events (includes wave action)	
Northwest AK Cape Krusenstern		Temperature		Extreme Storm Events (includes wave action)
Southwest AK Coastal Group	Ocean Acidification		Storms/Precipitation (includes wave action)	
Southwest AK Riverine Group		Thaw Days	Precipitation	
Southeast AK Marine Group	Ocean Acidification	Stream Flow		
Southeast AK Terrestrial Group		Seasonality of Water Flow	Extreme Events (storms, floods, fires, etc.)	
Central AK Wrangell-St. Elias and Yukon-Charley Rivers		Season Length Above-Freezing	Water Availability	
Central AK Denali		Season Length Above-Freezing	Precipitation	
Interior Arctic AK Group 1		Changes in Seasonal Timing (phenology)	Extreme Events (storms, floods, fires, etc.)	
Interior Arctic AK Group 2		Temperature	Precipitation	
Total	2	9	8	5

Table 1. These climate drivers that were selected by ten workgroups, each of which developed two scenarios. Most groups selected drivers that were related to temperature, precipitation, atmospheric circulation (storms), or ocean acidification.

- More Intensive Wildlife Management**
- More Predator Control**
- Moose “Farming”**
- More Reindeer Herding**
- More Hunting Restrictions**
- More “Proxy” Hunters and Fishers**
- More Fish Hatcheries**
- Co-Management of Resources**
- Innovative Modes of Tourism**

Table 2. Adapting to climate-related changes could also have implications to other resources and values.



NPS photograph by Robert Winfree

Figure 2. Mitigating fossil fuel consumption with an NPS solar power system at Bettles, Alaska.

to other changes. While small in number, some of these implications could be very challenging for Alaskan park managers—and some already are (*Table 2*).

Among recommended management actions (*Figure 6*), building partnerships was mentioned more than anything else—partnerships with local communities, tribes, other agencies, and cross-borders, with Canada and Russia. Using sustainable facilities, energy sources and practices was also very high among the recommenda-

tions, as was improving our capacity for dealing with larger and more frequent emergencies, like fires, flooding, spills, and other disasters (*Figure 7*), and improving our ability to communicate with multiple audiences.

We can also build climate change and scenarios thinking into our planning processes. Scenarios are a “wind tunnel” for testing management strategies, proposed actions, and NEPA planning alternatives against broad range of plausible futures – including those that are

beyond current mindsets. Scenarios enable us to ask the question “Would this approach make sense if conditions are different in the future... and if not, is the investment worth the risk?”

Acquiring needed information and developing the capacity to use it is another kind of “no regrets” action. Two-thirds of the identified information needs related to resource monitoring, reflecting active participation by people concerned about natural,



Figure 3. Increased wave activity and reduced ice cover has caused severe coastal erosion at Bering Land Bridge National Monument and the community of Shishmaref.

cultural, and subsistence resources. More monitoring of wildlife and habitat, and expanded monitoring in general, were mentioned most frequently. Monitoring of water supplies, cultural resources, and traditional knowledge was also mentioned frequently (*Figure 8*).

In Alaska, with our highly dispersed parks and communities, limited transportation and communications alternatives, climate change represents serious challenges for park resources, facilities, operations, and stakeholders. Impacts to rural and park-affiliated communities weighed high among these identified concerns, as did agencies' abilities to protect people and resources in a changing environment. Scenario

planning is not prescriptive. It doesn't set or determine policy. However, it does offer useful information for policymakers, land managers, and stakeholders as they face the task of planning for an uncertain future.

The President of the United States recently identified fostering of partnerships, stakeholder engagement, and research for science-informed decision as key elements of his National Strategy for the Arctic Region (*Obama 2013*). The Interagency Working Group's Report to the President (*IWG 2013*) expanded on these ideas, and identified scenarios as a promising planning approach. This scenario planning process does not end with the workshops, reports and presentations. Rather, these

NPS photo by Bob Winfree



NPS photo by Josh Foreman

Figure 4. Workshop participants expressed concerns about the abilities of agencies to remain relevant in a rapidly changing future.



NPS photo by Robert Whirene

Figure 5. Potential benefits suggested by some scenarios and perspectives, included more roads, tourism, berries, moose, bears, and beaver and locally-new wildlife species such as deer, elk, cougar, and bison (shown here).



Figure 6. Among recommended management actions, building partnerships was mentioned more than anything else – partnerships with local communities, tribes, other agencies, and cross-borders, with Canada and Russia.



NPS photograph

Figure 7. Increasing transportation and changing marine hazards were among the concerns mentioned relative to emergency response capacity. This ship grounded on glacial outwash sediments in Glacier Bay National Park.



Figure 8. Acquiring needed information and developing the capacity to use it is another kind of “no regrets” action. Increased resource monitoring, to better understand changing systems, was recommended in all workshops.

are intended to stimulate creative thinking, to address changing, but still undetermined future conditions.

Long-term monitoring and feedback to the scenarios process are also important. New and unexpected information may warrant revisiting these scenarios or repeating the process later. Good and consistent communications are vital for policymakers, land managers, and stakeholders as they face the task of planning for uncertain and challenging futures. Scenarios thinking can help them prepare, and lessen the element of surprise. Potentially, some of the most useful outcomes from this project will be development of a suite of tools to communicate climate change impacts, choices, and potential outcomes to a wide range of stakeholders. Change is nearly always stressful, because the things we’ve become accustomed to are no longer the same, and we need to adapt to the differences. However, people, organizations, and ecosystems do adapt, and people can choose to make the future different.

REFERENCES

Interagency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska. 2013. *Managing for the future in a rapidly changing Arctic: A report to the President.* <http://www.interior.gov/news/upload/ArcticReport-03April2013PMsm.pdf>

Obama, B. 2013. *National strategy for the Arctic Region.* Washington, DC. http://www.whitehouse.gov/sites/default/files/docs/nat_arctic_strategy.pdf

Final reports, presentations and other information is available for each of the workshops. That information is contained in other reports and presentations on the project web site: <http://www.nps.gov/akso/nature/climate/scenario.cfm>