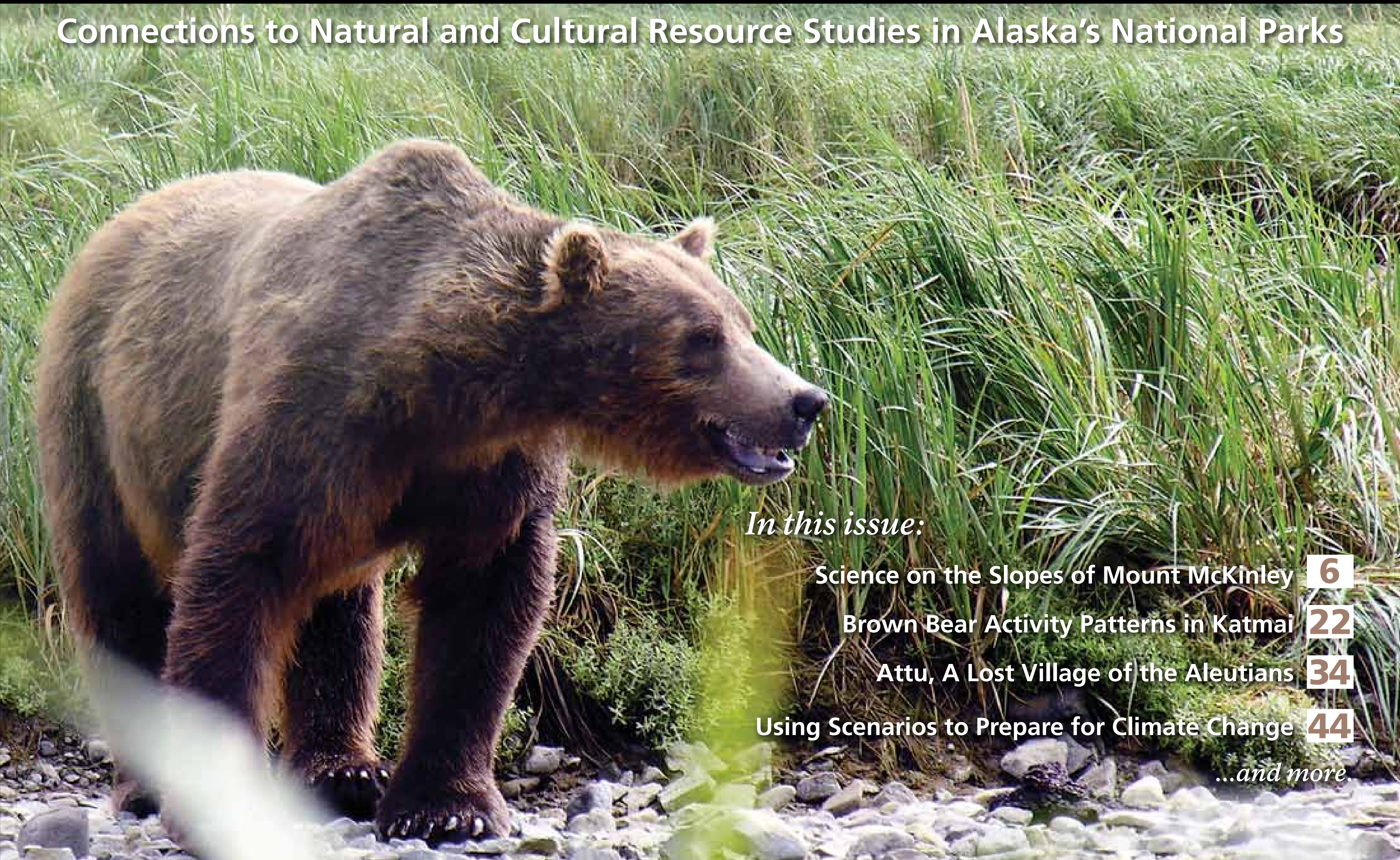
Alaska Park Science

National Park Service
U.S. Department of Interior
Alaska Regional Office
Anchorage, Alaska



Connections to Natural and Cultural Resource Studies in Alaska's National Parks

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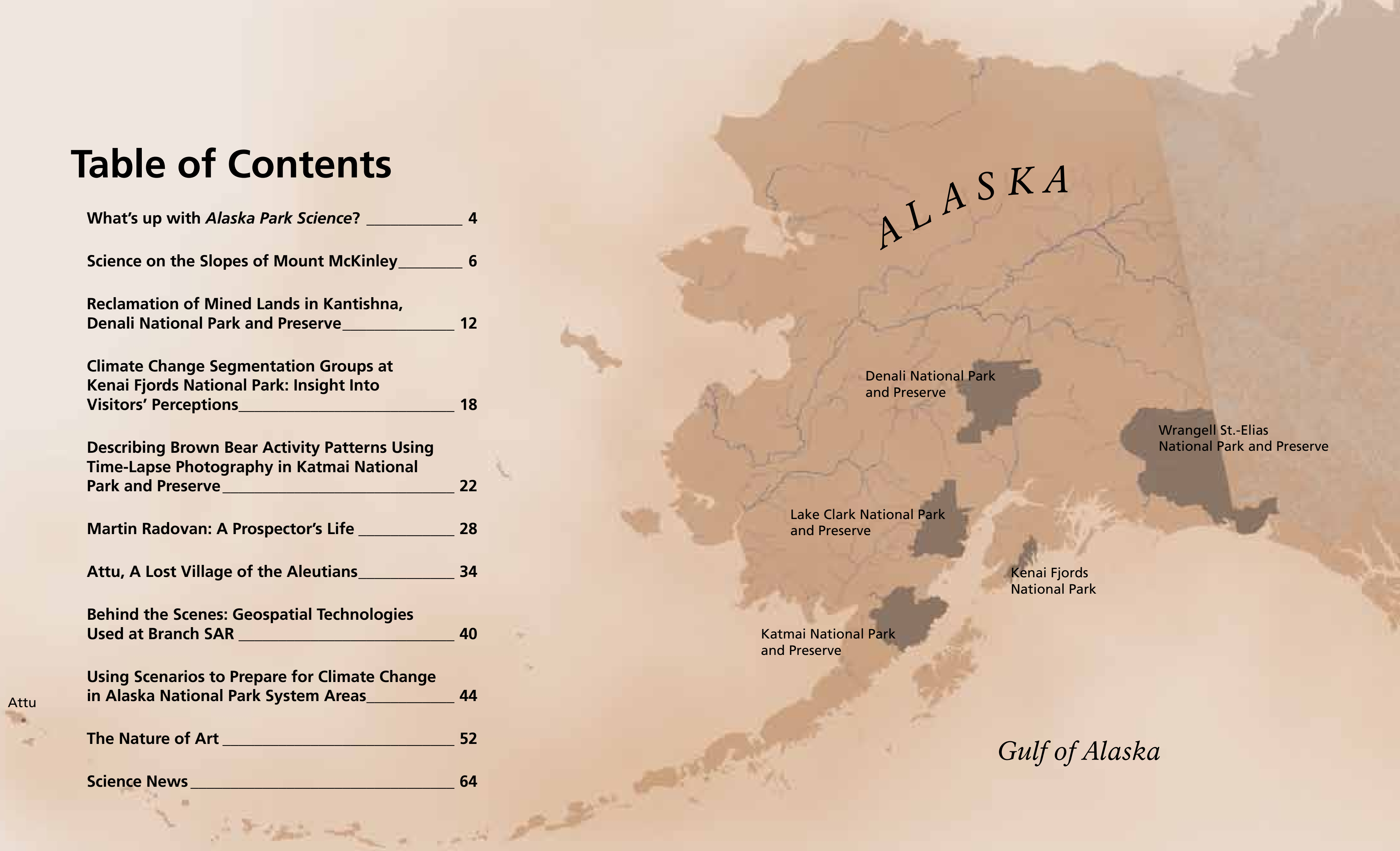

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Attu, A Lost Village of the Aleutians

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This project is made possible through funding from the National Park Foundation. Additional funding is provided by the National Park Service and other contributors.

Alaska Park Science is published twice a year. Recent issues of *Alaska Park Science* are available for sale by Alaska Geographic (www.alaskageographic.org). Charitable donations to help support this journal may be sent to: Alaska Geographic Association, 810 East Ninth Avenue, Anchorage, AK 99501 ATTN: Alaska Park Science.

Alaska Geographic

NATIONAL PARK FOUNDATION

ISSN 1545-4967 December 2011

Alaska Park Science

Project Lead: Robert Winfree, Regional Science Advisor, email: AKR_Alaska_Park_Science@nps.gov

Editor: Monica Shah

Printed on recycled paper with soy based ink

Published twice a year in June and December by Alaska Geographic, a nonprofit partner of the Alaska Region of the National Park Service, supporting educational programs through publishing and operation of visitor center bookstores.

www.nps.gov/akso/AKParkScience/akparkarchives.html


Alaska Park Science
Scientific Studies on Climate Change
Alaska Park Science
Connections to Natural and Cultural Resource Studies in Alaska's National Parks
Alaska Park Science
Park Science in the Arctic
Alaska Park Science
Monitoring the "Vital Signs" of Healthy Park Ecosystems
Scientific Studies in Marine Environments
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Volume 5, Issue 1

What's Up With *Alaska Park Science*?

By Robert Winfree and Kimberly Melendez

Introduction

During the last few years, *Alaska Park Science* has received several awards and praise for content and design, but good peer reviews don't necessarily tell us whether a publication really makes a difference for its readers. So… how effective is *Alaska Park Science* at interpreting scientific and scholarly information for people who can use and benefit from it? The NPS Alaska Regional Office posed that question to a panel of seven professional science educators, journal editors, and members of the NPS Inventory and Monitoring science communicators group in 2010.

The panelists employed a set of qualitative and quantitative measures of effectiveness to get at the answer, including interviews of a cross section of 65 *Alaska Park Science* readers, contributors, sponsors and others. About 80% of the people they talked to were Alaska residents and about two-thirds of them self-identified with the career field of education (including teachers, interpreters, science writers and public information specialists); with the others identifying themselves as researchers, resource managers, or other. Overall, these readers liked the journal's style and format, with 90% or more saying that *Alaska Park Science* was appropriate, useful, effective and important to them and for the National Park Service. About the same number said that *Alaska Park Science* did not duplicate information that they received from other sources, and said that it would be difficult or impossible for them to find this kind of information anywhere else. Most seemed to like the multidisciplinary mix of thematic and general issues, though some indicated clear preferences for particular topics and themes. The vast majority of these readers preferred to receive printed copies of *Alaska Park Science*, although nearly half also wanted access to digital editions, because they used the printed and digital editions in different ways.

Upon completing their review, the panel members discussed their top ten recommendations with NPS managers and with the journal board. The panel's top recommendations were to ensure long-term funding and staffing for the journal, and to continue to produce the journal in both printed and digital editions at least twice a year. Many of their suggestions have already been implemented, such as the revamped web site, use of social media, minor design changes, email subscription options, rotating advisory board positions, and expanded approaches for seeking reader feedback. We're still working on other suggestions, some of which will take time and resources to accomplish. A copy of the panel's full report and recommendations is available at http://1.usa.gov/jIn03T

Following receipt of the panel's report, journal staff received feedback from another group of readers who contacted us to request copies of the journal. This second group of 233 readers identified themselves as researchers (44%), educators (37%), and resource managers (22%); with librarians (10%) and other professions (11%) filling out the group. Several readers aligned with more than one category, so these percentages total more than 100%. Most indicated that APS contained about the right amount of information for them, with only 2% suggesting that there was too much information and one person suggesting "not enough". As with the first group, most of these readers preferred the printed editions, and three-quarters shared their copies with several other readers, for an average of four readers per printed copy. Only 12% indicated that they had used Internet editions of the journal.

Among those who mentioned favorite issues, most readers simply said "All", or listed several issues, usually including the recent *Park Science in the Arctic* symposium proceedings in their list. These readers also suggested topics of particular interest to them. Three-quarters of the suggestions clustered into ten general categories, listed here in approximate order of frequency, with the most frequently mentioned topics listed first:

- Climate Change
- Wildlife
- Geology
- "All topics"
- Oceans and fisheries
- Cultural
- Archaeology
- Alaska history
- Ecology and ecosystems, including fire
- Social Science, including economics and recreation

The journal's advisory board and staff is pleased that the multidisciplinary approach to the physical, biological, cultural, and social sciences, history and related humanities works for our readers. **We plan to use these suggestions to identify new topics for articles and focused issues. We'd like to hear from our other readers, and especially from anyone who has discovered *Alaska Park Science* through Internet searches, social networking, or through citations in other periodicals.** We're interested in what you liked about it and whether you were able to use the information, and of course any suggestions for new articles or other improvements. You can email your comments to: AKR_Alaska_Park_Science@NPS.gov

Figure 1. Previous issue covers of *Alaska Park Science*.
NPS photograph

Science on the Slopes of Mount McKinley

By Frank Norris and Jane Bryant

Explorers and adventurers – with varying degrees of success – have been attempting to climb North America's highest mountain for more than a century. In recent years, the slopes of Mount McKinley have witnessed a small army of invaders each spring as more than a thousand climbers make the valiant attempt to climb the 20,320-foot summit of the mountain's South Peak. During the first 60 years of the mountain's climbing history, by contrast, a climb up the mountain's slopes was a far more singular feat, and through this period numerous climbs sought to showcase Mt. McKinley as a scientific laboratory. Thus scientists, as well as adventurers, made their mark in learning about North America's highest peak and the conditions that prevail there.

During the nineteenth century, the area around Mt. McKinley beckoned to the adventurous, and after 1880, both miners and U.S. Geological Survey expeditions reached ever closer to the mountain massif. In 1903, a group led by Fairbanks Judge James Wickersham made the first summit attempt; they were followed, in short order, by similar parties who aimed for the summit in 1906, 1910, and again in 1912. All failed. Success was finally attained on the afternoon of June 7, 1913, when Harry Karstens, Hudson Stuck, Walter Harper, and Robert Tatum reached the top (*Figure 2*). Upon summiting the peak, Stuck, who combined scientific curiosity with a love of adventure, set up an "instrument tent" and proceeded to take measurements with a thermometer, a mercurial barometer, a boiling-point hypsometer, and a prismatic compass. Indeed, he devoted an entire chapter in his book, *The Ascent of Denali*, to his various attempts to determine the mountain's height (*Stuck 1914*).

Figure 1. Mt. McKinley, North America's highest peak at an elevation of 20,320 feet, has been a climbing mecca for more than a hundred years. Scientific research was a key goal of many early climbs.

DENA Interpretive Collection, #803, Denali National Park and Preserve

No new attempts were made on the mountain for almost 20 years; in part a function of Mt. McKinley's extreme isolation, which made a summit attempt a major logistical challenge even after the completion of the Alaska Railroad in the early 1920s. In the spring of 1932, two expeditions got underway, one of which had science as its primary goal, specifically cosmic ray research. This field of inquiry had been launched in 1911 by Austrian scientist Victor F. Hess. It became widely recognized that various sub-atomic, high-energy particles (Hess' "cosmic radiation") were gamma rays that bombarded the earth from space, and that cosmic ray intensity increased in high latitudes and high elevations. For that reason, the most likely points for measuring cosmic rays were believed to be in Alaska, Hawaii, New Zealand, Australia, Peru and Mexico (*Beiser and Beiser 1962*).

By January 1932, a brilliant electrical engineer from Bell Telephone Laboratories, Allen Carpé, had won a grant to pursue cosmic ray research, and he planned to carry out many of his measurements "at high elevations on Mt. McKinley." Carpé, an accomplished mountaineer, and four other colleagues planned a research camp high on the mountain's slopes. Rangers at Mt. McKinley National Park agreed to support the expedition by hauling 800 pounds of supplies from McKinley Park Station to the research base camp (*Beiser and Beiser 1962, Brown 1991, Pearson 1962*). In late April, bush pilot Joe Crosson made two flights that landed Carpé, colleague Theodore Koven, and additional equipment on the upper slopes of the Muldrow Glacier. By May 3, Carpé and Koven had established a camp at 11,000 feet and began their measurements. Several days later, however, tragedy struck. Carpé fell into a huge crevasse. Koven, who was nearby, was unsuccessful in his attempt to retrieve Carpé. Severely injured, Koven stumbled toward camp but soon collapsed. Both men died and Carpé's body, entombed in the crevasse, was never found (*Figure 3*)(*Pearson 1962, SMR April-May 1932*).

Four years after the Carpé and Koven expedition, a scientific crew from *National Geographic Magazine* took to the air on a two-day photographic reconnaissance of the mountain. Bradford Washburn shot a series of photos in an open-air compartment. The plane's door had been removed, and Washburn sat on an old gas can wearing an oxygen mask, heavy mittens, and a cold-weather flying suit. Washburn was captivated by the experience, and the magazine brought him back in 1937 and 1938 to make additional aerial photos (*Figure 4*).

In 1947 another expedition, of which Bradford Washburn was a key member, had cosmic ray research as a "major scientific goal"(*Sfraga 2004*) (*Figure 5*). The genesis of that expedition, however, was not science but Hollywood; it was a movie project called The White Tower, based on a 1945 adventure novel by James Ramsey Ullman. An RKO Pictures executive, Paul Hollister, called Washburn and pitched the idea of an expedition in order to obtain movie footage. Washburn, who was the head of the New England Museum of Natural History, told Hollister that Mt. McKinley would best suit his needs and that he wanted to include science as part of the filming project (*Sfraga 2004, Ullman 1945*). So the call went to a number of top U.S. scientists "to suggest how many ways [the] expedition might make a real scientific

Hudson Stuck, *The Ascent of Denali* (1914).

Figure 2. The first successful expedition to climb Mt. McKinley in 1913, was led by Archdeacon Hudson Stuck (left) and Harry Karstens.

Grant Pearson Album, DENA 3065, Denali National Park and Preserve Museum Collection

Figure 3. The 1932 "cosmic ray expedition" resulted in the deaths of scientists Allen Carpé and Theodore Koven. Pictured is the party that removed Koven's body from the mountain.

contribution." Before long Dr. Marcel Schein, a University of Chicago physicist specializing in cosmic ray research, stepped forward and expressed an interest in the project (*Sfraga 2004*). Both Washburn and Schein hoped to establish a high-altitude scientific camp, at 18,180-foot Denali Pass (between North Peak and South Peak), where "high altitude survey work and other projects … could be carried out from a reasonably warm and comfortable base." Schein wanted a large research hut that would house a system of 300-pound telescopes, high-voltage batteries, photographic recorders, heaters, and an ionization chamber, all in support of cosmic ray research. The Army Air Force agreed to furnish air support (*Sfraga 2004*).

The expedition, dubbed "Operation White Tower," was organized in Anchorage in mid-March 1947, and the initial base camp (at McGonagall Pass near Muldrow Glacier) was established on March 30 (*Figure 6*). By May 20, Brad Washburn and a climbing colleague had established the beginnings of a new camp at the 16,400-foot level, near Denali Pass. That evening, however, a "wild blizzard" began, and the "Great Storm" that followed howled for nine days and destroyed some of the expedition's most valuable equipment. Washburn and the other expedition members outlasted the storm. The Army Air Force airdropped the research hut and the replacement equipment, and scientist Hugo Victoreen conducted cosmic ray experiments at Denali Pass from June 17 through June 27. The data collected there was judged to be of great research value; such data had previously been "attainable only in short-duration plane flights", and Washburn later wrote a report noting that Denali Pass "appears to be the most practical point for the erection and operation of the highest cosmic ray station on the mountain" (*Drury 1950*).

After this expedition, Washburn continued to work with the U.S. Navy's Chief of Naval Research, Rear Admiral T.A. Solberg, who was also interested in cosmic ray research. In 1949, Washburn announced to the press that Mt. McKinley had "been proposed for the world's highest permanent cosmic ray laboratory" (*SMR August-September 1949, Drury 1950*). Due to protests from conservationists, Washburn was asked to look elsewhere, and by mid-June 1950 he announced that "a location other than Mt. McKinley has been agreed upon" for those purposes (*Tomlinson 1950, Clark 1950, Washburn 1950*).

Despite his earlier setback, Washburn persisted in suggesting Mt. McKinley as a potential development site. In May 1951, Washburn told a University of Alaska audience that Mt. McKinley and other high Alaska peaks were being mapped for use as radar stations, weather observation points and centers of nuclear research. Later that year, he told reporters in Anchorage and Fairbanks that the mountain would be a highly favorable site for "a fixed position radar station" or "a cosmic ray station for the advancement of atomic research." This advocacy continued for years afterward (*NYT 1951,*

Operation White Tower Collection, Denali National Park and Preserve Museum Collection

Figure 4. During the 1947 Operation White Tower Expedition, a ski-equipped plane brought supplies to Muldrow Glacier, near the McGonagall Pass base camp.

DENA 5438, Denali National Park and Preserve Museum Collection

Figure 5. Bradford Washburn took aerial photographs of Mt. McKinley in 1936 through 1938 and again in 1947.

ADT 1951, LAT 1951). Washburn, though unsuccessful in establishing a research station on the mountain, did what he could to encourage cosmic ray research. In 1952, for example, he convinced a Mt. McKinley climber, Army Capt. William Hackett, to conduct scientific research. Hackett agreed to carry "several nuclear plates coated with special emulsions to record the effect of cosmic rays striking the earth." Whether the plates yielded much information, however, is unclear (*Pearson 1962*).

The last known proposal to utilize the upper slopes of Mt. McKinley emerged during the late 1950s. After the Soviet Union launched the Sputnik 1 satellite in October 1957, U.S. authorities became far more aware of their defense vulnerabilities. In a plan to buttress America's sagging defenses, Hughes Aircraft engineer Vernal Tyler proposed the construction of a long, vertical tunnel under Mt. McKinley, the primary purpose of which would be to launch high altitude space missiles. Implementing the plan, however, would require the construction of a 52-mile railroad spur, the construction of an 18-mile horizontal tunnel, and the drilling of two 10,000-foot-long vertical shafts under Mt. McKinley. Tyler, so far as is known, made little or no headway with his scheme, but four years later, two other engineers aired much the same proposal – and had similar results (*ADT 1959, ADT 1964*).

Given the strong emphasis on science in many of the early climbs of Mt. McKinley, it is not surprising that science played a role in shaping climbing policy. Until 1950, all climbing parties had approached the mountain from the north. But in 1951, a scientific expedition broke new ground when pilot Terris Moore dropped off an eight-man party (which included Bradford Washburn) at the 8,500-foot level of Kahiltna Glacier, and all eight summited the mountain from the southwest (*Sfraga 2004, SMR June 1951, Pearson 1962, Washburn and Roberts 1991*).

Several months later, in February 1952, the Harvard Mountaineering Club contacted the park and requested permission to allow supplies to be air-dropped at McGonagall Pass as part of a planned climb of Mt. McKinley later that year (*Maier 1952*). The Harvard party's air-drop request, which was needed "to test new Army equipment" and "to conduct survey operations and geological collecting," stirred the NPS to review its climbing regulations. A month later, Director Conrad Wirth issued a new policy that prohibited airdrops, but supported glacier landings in the park if they were connected to "a scientific party," a policy that was reiterated in slightly revised form in mid-June 1952. This policy, new to Mt. McKinley, was entirely unlike any policies that were in place at Mount Rainier, Grand Teton, or other national park units that attracted mountain climbers (*Pearson 1952, Jackson 1999, Catton 1996*).

Wirth's policy regarding a "scientific" need for glacier landings remained in place for years afterward. In the spring of 1954, for example, Superintendent Grant Pearson noted that a five-man climbing party had asked if it could land supplies on Straightaway Glacier, northwest of Mt. McKinley. Pearson noted that the party "had permission for air support as they are making tests for the Ladd Field Aero Medical Laboratory and the UpJohn [Pharmaceutical] Company." (*Figure 7*) A year later, Pearson justified a climbing request because one member was a U.S. Weather Bureau employee, another was with the Bureau of Land Management, and the two planned to make scientific studies for their respective agencies (*SMR May 1954, May 1955*).

After the 1955 season, however, Superintendent Pearson began to have second thoughts about the park's support for aircraft landings in conjunction with summit climbs. Because NPS regulations allowed non-scientific parties to spend additional time and money on their summit attempts, "mountain climbers [were increasingly] resorting to subterfuge" by "attempting to … assume the position of being a scientific venture" in "an attempt to evade the issues set forth in our regulations." Pearson, trying to respond to those demands, said that "one suggestion [which] may have some merit … would be to allow one air drop of equipment and

Operation White Tower Collection, Denali National Park and Preserve Museum Collection

Figure 6. The base camp for the 1947 Operation White Tower Expedition was located at McGonagall Pass.

DENA 17-23, Denali National Park and Preserve Museum Collection

Figure 7. Talkeetna-based pilot Don Sheldon (second from left) transported hundreds of Mt. McKinley climbers to and from Kahiltna Glacier during the 1950s-1970s.

NPS photo, Roger Robinson Collection

Figure 8. Dr. Peter Hackett (at right) was instrumental in establishing a high-altitude medical research program on Mt. McKinley during the 1980s, and he also provided medical assistance to climbers in distress.

supplies per party at the base of the mountain." This "base" was defined as a "low elevation base camp such as at McGonagall Pass." Pearson's suggestion met with general approval, and on March 19, 1956, Wirth issued an aircraft policy statement that cancelled his earlier (June 1952) statement (*Pearson 1955, Lee 1956, Coates 1962*).

The new rule was widely approved and appeared to have the potential to fundamentally change the way in which climbers organized their expeditions. During the winter of 1956-57, however, a new event made the air-drop rule largely irrelevant. The Muldrow Glacier (according to Grant Pearson) "made a sudden rapid downhill movement" that "was still heaving and shifting" in June 1957. This "galloping glacier" made the Muldrow useless for climbers (*Pearson 1962, SMR May-July 1957*). Beginning in 1958, therefore, the vast majority of Mt. McKinley climbing parties used Kahiltna Glacier as their access point. Because most of these parties did not have scientific permits, Talkeetna pilot Don Sheldon and his associates landed climbers just south of the park boundary (*Greiner 1974, Pearson 1962, SMR 1958-60*). But beginning in 1962 or 1963, Sheldon and other pilots began using the Kahiltna's southeast fork, at or near the 7,000-foot level (and just inside the park boundary), a practice that became the norm in later years (*Various correspondence*).

Throughout this period, the NPS scientific requirements remained in place. As late as May 1960, author James Greiner noted that "All expeditions that are airlifted to points on the mountain within the geographical borders of Mt. McKinley National Park must be conducted under scientific permits issued by park authorities." Greiner also noted that a would-be climber that spring, John Day, had "secured authorization for a 'photographic' expedition, a marginal category only occasionally acknowledged by authorities." (*Greiner 1974*). But given the move to Kahiltna Glacier, and the consequent lack of a need for airdrops, climbers no longer were required to cite scientific pursuits to justify a Mt. McKinley ascent, and before long the clause that provided preferential treatment to scientific expeditions was removed from the park's climbing regulations.

Since the 1960s, Mt. McKinley has continued to attract scientists. Key contributions have been made by members of high-altitude medical research teams, who beginning in 1981 performed the dual role of scientifically measuring the effects of high altitudes (and high latitudes) on climbers' physiological systems, and performing valuable medical assistance to those who have suffered from high-altitude pulmonary edema and related stressors (*Figure 8*). These teams, which are organized through the University of Alaska Anchorage's High Latitude Research Group, established a camp at Mt. McKinley's 14,200-foot level in 1984. Their assistance has been a key element of the park's climbing management program ever since.

This article is based on *Crown Jewel of the North: An Administrative History of Denali National Park and Preserve* by Frank Norris (http://www.nps.gov/dena/historyculture/park-history.htm).

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Reclamation of Mined Lands in Kantishna, Denali National Park and Preserve

By Guy Adema, Tim Brabets, Josh Brekken, Ken Karle, and Bob Ourso

Introduction

The Kantishna district of Denali National Park and Preserve (Denali) has a history of mining dating to an early stampede of fortune seekers (c. 1905). The initial rush subsided quickly, but mining continued there through 1985. Miners sought ore in many different ways, including manual placer mining, excavation of hard rock mines, and use of heavy equipment to scour stream beds. Some miners restored their claims and removed their camps upon completion of mining, while others did not.

At the time, the mining claims in the Kantishna Hills were outside the boundaries of the park. When the park tripled in size in 1980, Kantishna's mining claims became included in Denali, making the claims subject to the Mining in the Parks Act of 1976. Some claims later acquired by the NPS included abandoned hazardous materials, abandoned camp infrastructure and mining equipment, non-functional floodplains, tailing piles, and exposure of streams to heavy metals. Reclamation efforts were necessary to mitigate the impacts of mining on the stream ecosystems in the park. The goal of restoration activities in Kantishna is to restore damaged streams to some semblance of healthy stream function, including improved water quality, riparian habitat (vegetation), and aquatic life.

Figure 1. Rock weirs, coir logs, and a constructed functional floodplain have helped improve water quality on Caribou Creek.

NPS photograph

Reclamation activities in Kantishna began in 1989 and have continued sporadically until 2008, including substantial activities on lower Glen Creek, Red Top Mine, Eureka Creek, and Moose Creek. To address the remaining large-scale restoration need in Kantishna, the park received NPS funds for work in 2008-2010. Primary efforts focused on Glen Creek (2009), Caribou Creek (2010), and Slate Creek (2010). Slate Creek and Caribou Creek were classified as *impaired waterways* under the Clean Water Act at the beginning of this effort based on their high turbidity and compromised water quality.

Restoration activities included removing hazardous materials, contaminated soils, and abandoned equipment; reconstructing floodplain and stream channel structure; stabilizing stream banks from erosion; and revegetating the site. Success is measured through stream channel and floodplain character, water quality, and re-vegetation success.

Design Considerations

The design guidance for these projects was based on a long-term stream restoration and monitoring project, initiated in lower Glen Creek in 1991. The objective of that project was to test channel/floodplain design methods for riparian habitat recovery, and to conduct research and monitoring for future projects in Kantishna. The goal for the original design was to develop a stable channel and floodplain system in coarse alluvium (*Karle and Densmore 1994*).

Design flood flows were estimated from regional multiple-regression techniques, and slope and sinuosity determinations were made by regional comparisons to other Kantishna streams. Shear stress equations were applied to determine both bed and bank stability. Floodplain design was based on a 100-year flood capacity.

Though some of the early techniques continue to be used, lessons learned in the past 20 years have resulted in significant changes. For example, slower-than-expected revegetation rates have altered our approach. On banks and floodplains, vegetation is an essential component of structure and stability. The root system anchors the substrate, and above-ground stems decrease water velocity, catch organic debris, and promote sediment deposition. Revegetation growth was even slower than expected, due to the lack of soil and low nutrient levels in the mine tailings. The new design guidelines place less emphasis on desired channel geometry and greater emphasis on addressing excess sediment supply in the watershed.

The importance of determining all causes for the disequilibrium of an unstable system requires an accurate assessment of the sediment regime for the entire watershed. In many disturbed watersheds, impacts such as road construction and vegetation alteration can lead to accelerated bank erosion and mass wasting, resulting in abnormally high rates of sediment loading, bar deposition, and increased width/depth ratios. In many of the mined Kantishna watersheds, the upstream sediment supplies from tailing piles, incised channel conditions, and denuded floodplains are essentially limitless. Given the slow revegetation rates and the flashy watershed, morphological changes will likely occur for years following channel reconstruction, unless actions are taken to reduce

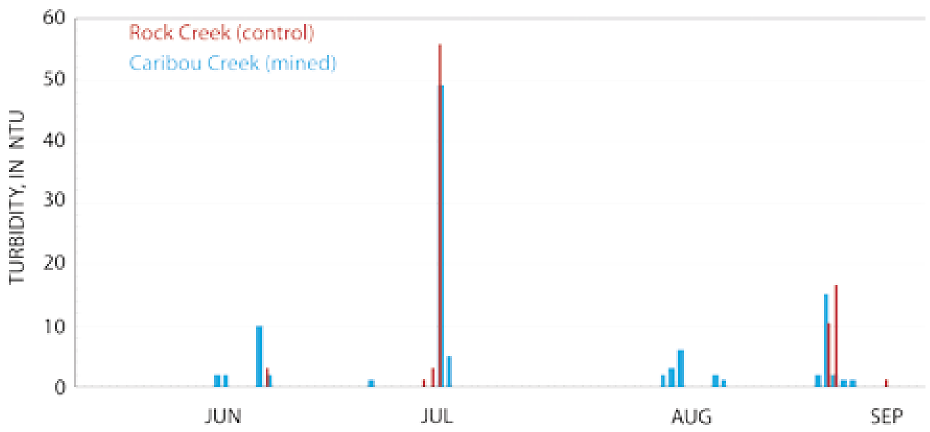

Figure 2. Comparison of average daily turbidity from Rock Creek (reference sites) and Caribou Creek (mined sites).

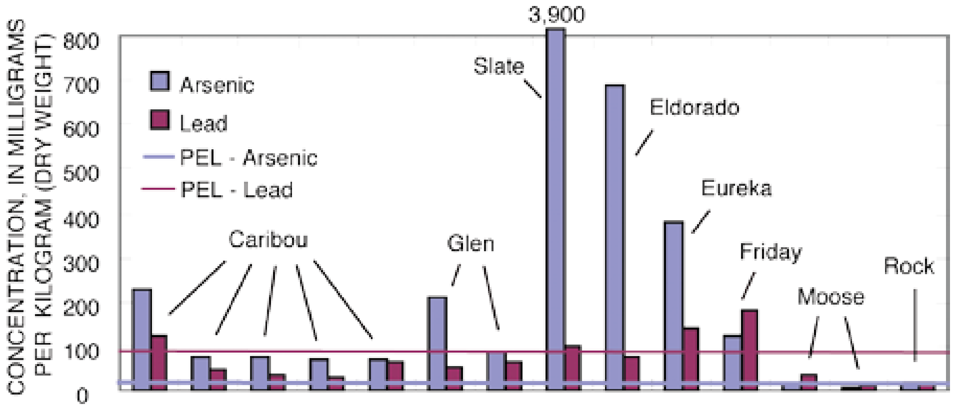

Figure 3. Concentrations of arsenic and lead measured in streambed sediments at 14 sites in the Kantishna Hills.

upstream sediment loading (*Densmore and Karle 2009*).

Another design consideration is related to extent of erosion and deposition occurring in the watershed during years without large floods. We used a 20-year return period for our original design flood; however, channel monitoring showed substantial changes from smaller annual flows. This indicates that the effective discharge (which generally transports the most sediment over time) is significantly smaller in an unbalanced system with excess upstream sediment. These factors now drive the channel and floodplain designs used in Kantishna.

Construction

Access

Remote locations, abandoned and rough roads, stream crossings, NPS regulations, and sensitive environments all contributed to access challenges. Road improvements and maintenance were integral components of the stream restoration. All locations required a Road Travel Permit to drive the 92-mile Park Road to Kantishna, and rough mining trails provided access to the reclamation sites beyond Kantishna.

Earthwork and Removal of Abandoned Equipment

Heavy equipment was used in all phases of the reclamation work, including road preparation, mining debris and equipment removal, floodplain contouring, channel construction, bank treatments, installation of in-stream controls, tailings pile earthwork, and re-vegetation.

Abandoned equipment and mining debris, which ranged from screening plants to school buses, was removed from all sites. The range and volume of debris removed required substantial planning and time, with 100-tons being removed from one site alone (Moose Creek). Items were transferred to Kantishna property owners for reuse (e.g. reusable buildings), recycled (e.g. scrap metal), staged for burning (e.g. wood debris) or landfilled.

In Caribou Creek, to reduce sediment sources during high water events, a 125-foot section of bank (which was the side slope of a remnant tailings pile) was moved away from the stream, widening the floodplain by more than 15 feet. This floodplain bench was established two feet above the adjacent thalweg and provides conveyance for higher flows in a formerly constricted portion of the stream.

Excavation of an extended tailings pile at Slate Creek was one of the significant challenges. The tailings were comprised of fine silt, clay, and gravels and were saturated from hillside seeps and precipitation. Excavation of the fine material, in a saturated condition, resulted in liquefying of the tailing pile at times. Excavating this extended tailings pile removed a substantial volume of loose and unstable substrate from the floodplain that was contributing to accelerated erosion, sedimentation, water turbidity, and water quality degradation to Slate, Eldorado, and to some extent, Moose Creek. The new slope, where excavated material was removed, was constructed to match the existing, natural valley side slopes and was treated with biodegradable erosion blankets.

Channel Construction

A section of Caribou Creek was straightened (radius of curvature was too small), moved to the center of the valley, and shortened by 500 feet. Additionally, four rock weirs were constructed at the upper end of this reroute to direct and control flows into the new channel.

At Slate Creek, a new 400-foot channel was constructed to redirect streamflows around the main pit area of the former mine. Fabric-encapsulated soil lifts (FESLs) were used to construct the new stream banks. Additionally, willow cuttings were planted into the lifts for revegetation and long-term stability. Rock was placed in the channel to provide roughness to the steep channel (7-10% slope).

Streambank Stabilization

At Glen Creek, the size, steepness, and location of a particular tailings pile precluded its removal entirely from the floodplain. Instead, gabion baskets and Reno Mattresses were installed at the toe of the slope to prevent lateral erosion of the creek into the tailings pile. As was common to all sites, existing site conditions had changed in the seasons between design surveys and construction, requiring some modifications by on-site crews.

Coconut fiber coir bio-logs and rock weirs were the primary constructed streambank stabilization on Caribou Creek. Bio-logs were installed in four sections and were a mix of new logs and re-use of logs on site from previous reclamation efforts in 2002. Rock weirs were constructed to direct flows away from unvegetated banks during high flows.

Revegetation

Revegetation consisted of scarifying and grading tailings piles and roadbeds, tracking slopes, transplanting vegetation, installing willow cuttings and/or erosion blankets, seeding with native plants and temporary erosion control ryegrass, hydroseeding, liming, and fertilizing at prescribed rates. Nearly 4,000 willow cuttings were installed at the Slate Creek site alone, although at most sites the number of cuttings numbered in the hundreds. The Denali Revegetation Manual (*Densmore et al. 2000*) was used as a guide for revegetation efforts.

Water Quality

Extensive water quality measurements were made at the conclusion of mining in the 1980s (*Deschu 1985*), but has not been consistently monitored since then. To determine the effects of reclamation on water quality and provide baseline data, water quality monitoring was re-established in 2008. Initially, 15 sites, including sites at Caribou Creek, Glen Creek, and Slate Creek, were selected for water quality monitoring in the Kantishna Hills (*Figure 1*). Most of the monitoring sites are located on streams that have been mined with the exception of Rock Creek, which serves as a reference site. Data being collected include trace elements in streambed sediments; major ions, trace elements, and suspended sediment in water; field parameters (flow, water temperature, pH, specific conductance, dissolved oxygen, and turbidity); macroinvertebrates; and algae. Water temperature, specific conductance, and

Figure 4. Removing debris from Glen Creek

Figure 5. Construction of FES stream banks at Slate Creek.

Figure 6a, 6b. View of extended tailings pile showing pre-construction conditions (left) and post-construction slope treatment and erosion blanket installation.

turbidity are continuously collected at several sites.

Water samples were collected during average flow conditions. Concentrations of suspended sediment and turbidity at all sites were low, generally less than 5 mg/L and 5 NTUs respectively. Data from previous studies in the 1980s indicated high concentrations of suspended sediment and turbidity during mining activities. The low concentrations of these constituents today indicate that the water quality has improved. Turbidity was continuously monitored during the summer at six sites; results from Rock and Caribou Creeks, representing reference and mined sites, show nearly identical patterns (*Figure 2*). Periods of turbidity were due to rainfall resulting in increased streamflow. The similarity in turbidity patterns between these two sites suggests that much of the mined lands in the Caribou Creek watershed have been re-vegetated, reducing the amount of sediment entering the stream.

Streambed sediments were sampled for 34 trace elements at 14 of the sites in 2008. Metals such as arsenic and lead in streambed sediments can be harmful to aquatic life. A guideline known as the probable effect level (PEL) (*MacDonald et al. 2000*) above which adverse effects are expected to occur is used here for comparative purposes. The PELs for arsenic and lead are 17.0 and 91.3 milligrams per kilogram dry weight, respectively. Arsenic concentration for Slate Creek was 3,900 mg per kilogram and all sites with mining exceeded the PEL limit for arsenic (*Figure 3*). The Moose Creek and Rock Creek sites were slightly over the PEL limit. Some of the mined sites also exceeded the PEL for lead.

Benthic macroinvertebrates were sampled at seven sites in 2008 and 2009. The USGS National Invertebrate Community Ranking Index incorporates 11 metrics to rank sites with regard to land use (undeveloped, mining, urban, etc.). Slate Creek and Friday Creek scored lowest on the NICRI, whereas the downstream-most Caribou Creek site and Rock Creek scored highest, suggesting Caribou Creek appears to be recovering from prior mining activity.

Conclusion

Since 1985, when most mining ceased in Kantishna Hills, water quality conditions at most streams have improved. Restoration efforts as well as natural re-vegetation have resulted in decreased suspended sediment and turbidity levels in all streams. Trace element concentrations in streambed sediments from a number of small watersheds indicate that arsenic concentrations could adversely affect aquatic life. A major accomplishment of restoration has been the delisting of Caribou Creek from the Clean Water Act section 303(d) list in 2010. Slate Creek is still a degraded watershed, but new efforts in 2010 to repair previous mining damage by adding structure and complexity to the system offer a promising future for the watershed. Continued water quality monitoring will determine if these efforts have improved water quality.

These reclamation activities, along with numerous other efforts since 1989, have removed thousands of pounds of abandoned equipment from national parklands, improved riparian function and stream dynamics, and have improved aquatic habitat and water quality. The collective effort of the engineers, scientists, field crews and support staff have resulted in a measurable improvement in the condition of natural resources in the Kantishna Hills.

Figure 7. Field crews assemble bank stabilization structures.

Acknowlegements

Reclamation work in Kantishna was funded through the NPS Flexible Base program and water quality work was funded by the NPS-USGS Water Quality Partnership Program. Numerous people played important roles in accomplishing the work, including Phil Brease, Nat Wilson, Larissa Yocum, Chad Hults, Lillian Agel, Nadine Reitman, Brian King, other Denali park staff, and the field crews from Oasis Environmental and Environmental Compliance Consultants, Inc. – particularly Michael Anderson.

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Climate Change Segmentation Groups at Kenai Fjords National Park: Insight Into Visitors' Perceptions

By Matthew T.J. Brownlee and Jeffrey C. Hallo

Introduction

Recently the National Park Service announced initiatives that aim to interpret and communicate global climate change to park visitors (*CCRP 2010*). Interpretative design and delivery, as well as communication initiatives, require a comprehensive understanding of visitors' attitudes, opinions, and values. However, opinions about climate change can be difficult to assess and may vary widely between regions and groups. General U.S. polling data cannot be assumed to be representative of visitors to a specific park or region. An abundance of park research indicates visitors and managers often differ substantially in their opinions about resource conditions and levels of human impacts (*Manning 2011*). As a result, managers may ineffectively distribute resources by inaccurately assuming knowledge of an audience's beliefs and opinions. Park staff engaged in climate change interpretation, communication, or policy decisions may need empirical data to help identify visitors' attitudes towards climate change.

During the summer of 2010, researchers investigated Kenai Fjords National Park (Kenai Fjords) visitors' attitudes about global climate change and climate influenced park resources. The purpose of this project was to gain insight into visitor awareness regarding climate influenced park resources and visitor belief in the occurrence (i.e., if global climate change is happening) and human influence on global climate change (i.e., anthropogenic causation).

Figure 1. Visitors at Exit Glacier, Kenai Fjords National Park.

NPS photograph

Methods

The research occurred in three phases. First, researchers conducted in-depth, one-hour interviews with seven Kenai Fjords interpretative and management staff in June 2010. Based on these interviews, researchers designed a visitor questionnaire. Second, researchers conducted a pilot test, using the draft questionnaire (N = 123) and asked staff to review the questionnaire. During the third phase, researchers administered the revised questionnaire to adult visitors in August 2010. Researchers approached potential respondents at the Exit Glacier Nature Center and the *MV Kenai Star* (a park concessionaire ship that provides marine based tours of Kenai Fjords). Visitors completed the questionnaire prior to their Exit Glacier or boat tour experience.

The questionnaire assessed a wide range of visitor perceptions regarding climate change, park experiences, and resources. Presented here are results that assess visitor beliefs in the occurrence of global climate change and anthropogenic causation. The questionnaire also captured visitors' perceived awareness of four different types of climate related biophysical change at the park: 1) change in the size of glaciers, 2) change in the terminus location of glaciers, 3) increases in vegetation, and 4) decreases in the number of Steller Sea Lions. All responses were measured on a seven-point scale.

After standard data cleaning and ensuring adequate validation of the measurements, researchers calculated descriptive statistics regarding visitor opinions. Researchers then used a statistical procedure to divide visitors based on their beliefs about climate change and their perceived awareness of climate related change at the park.

Results

Researchers approached 411 visitors; 366 visitors completed the questionnaire (89% response rate). This sample is representative of August visitors to Kenai Fjords. A total of 128 visitors were sampled at the Exit Glacier Nature Center, and 238 visitors were sampled at the *MV Kenai Star*. Researchers compared visitor responses and characteristics (e.g., length of stay in the area, past visit history, demographics) from these two samples. The two visitor groups did not differ statistically. Therefore, the results in the remaining sections are aggregated, combining both the Exit Glacier and *MV Kenai Star* samples.

Description of the sample

The sample was evenly split between males (49.8%) and females (50.2%). The majority of visitors are well educated, with approximately 60% possessing at least a four-year college degree. Limited differences of race exist, with white visitors comprising 88.5% of the sample. However, income is more dispersed, with 50% of the visitors reporting more than $75,000 in annual household income. Respondents reside in a variety of U.S. states, with 7% of the sample from Alaska, and approximately 80% of the sample split evenly between U.S. Census Regions.

Visitor opinions about the occurrence and cause of global climate change

Visitors seem to generally believe that global climate change is happening (80% in agreement; *Figure 1*). Approximately 1% of visitors possess an extremely low belief that global climate change is happening. Similar results appear for beliefs in anthropogenic causation, with approximately 32% of visitors indicating an extremely high belief that global climate change is at least partially caused by human actions (*Figure 2*). However, the standard deviation is higher for human influence (*SD* = 1.52), indicating that more disagreement among visitors may exist in this belief.

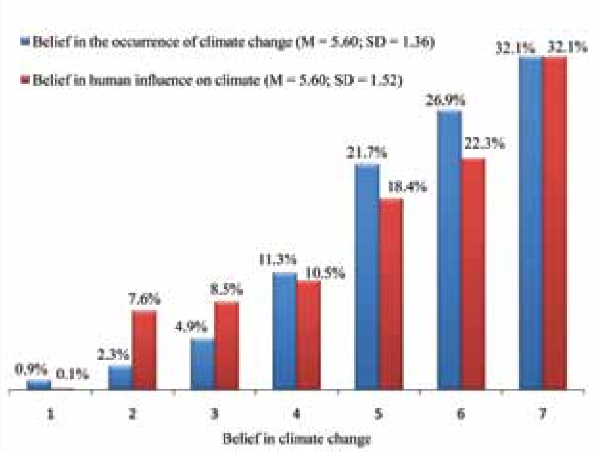

Figure 2. Kenai Fjord visitor beliefs in the occurrence and human influence on global climate change (both measured on seven-point scale using multiple response items). 1 = extremely low belief; 7 = extremely high belief.

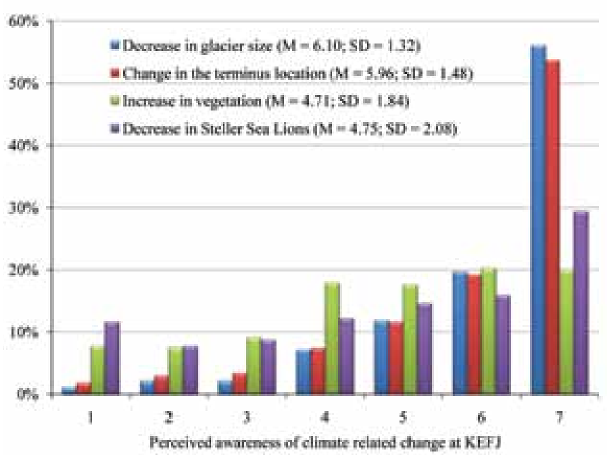

Figure 3. Kenai Fjords visitors' perceived awareness of climate related change at Kenai Fjords (measured on a seven point scale). 1 = not aware at all; 7 = highly aware.

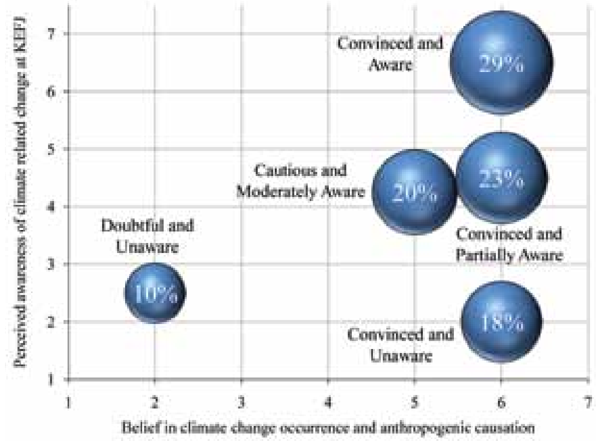

Figure 4. Results of an analysis to segment Kenai Fjords visitors based on their beliefs in global climate change and their perceived awareness of biophysical climate related change at Kenai Fjords (both measured on a seven-point scale using multiple response items). Awareness: 1 = not aware at all; 7 = highly aware. Belief in climate change: 1 = extremely low belief; 7 = extremely high belief.

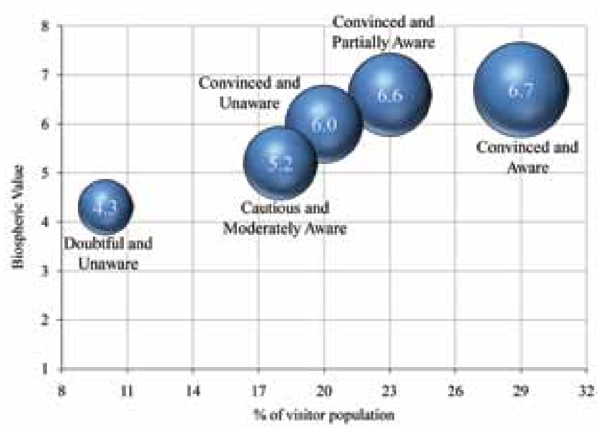

Figure 5. Kenai Fjords climate change segmentation groups' level of biospheric value (measured on a seven-point scale using multiple response items). 1 = low biospheric value; 7 = high biospheric value. The mean value is noted inside of each bubble.

Visitors' perceived awareness of biophysical climate related change at Kenai Fjords

Visitor awareness of climate-related change at Kenai Fjords is generally high, but it does vary based on the park resource being impacted (*Figure 3*). Specifically, most visitors (87.6%) perceive themselves to be aware of the decreased size in many of the park's glaciers and changes in the terminus location of glaciers (84.5%). Conversely, 57.9% of visitors report an awareness of increased vegetation in the park and 59.0% of visitors indicate they are aware of a decrease in the number of Steller Sea Lions.

Kenai Fjords visitor climate change segmentation groups

To identify different groups of visitors with similar beliefs, the researchers combined all the measures for beliefs in global climate change and perceived awareness of climate related change at Kenai Fjords. Results indicate five distinct groups of visitors exist, who differ statistically ($p < 0.001$) and conceptually regarding their 1) belief in the occurrence of global climate change, 2) belief that humans influence or cause global climate change, and 3) perceived awareness of climate-related change at Kenai Fjords (*Figure 4*). The largest group of visitors with similar beliefs (29% of visitors) may be described as "Convinced and Aware". These individuals are characterized by a high belief in both occurrence ($M = 6$) and human influence ($M = 6$) on global climate change and a high perceived awareness of park-specific climate-related change ($M = 6.5$).

The next largest group, which makes up approximately 23% of the visiting population, may be described as "Convinced and Partially Aware". This group has a high belief in both occurrence ($M = 6$) and anthropogenic causation ($M = 6$), and a partial awareness of climate-related change at Kenai Fjords (e.g., $M = 6.5$ for change in glaciers; $M = 2.5$ for increase in vegetation and decrease in Steller Sea Lions). Next, a "Cautious and Moderately Aware" group is characterized by a moderate belief in both occurrence ($M = 5$) and human influence ($M = 4$) on global climate change, and a moderate perceived awareness of park-specific climate-related change ($M = 4$). This group represents approximately 20% of the visiting population.

A "Convinced and Unaware" group comprises 18% of visitors who have a high belief in both occurrence ($M = 6$) and human influence ($M = 6$) on global climate change, and a low perceived awareness of climate-related change at Kenai Fjords ($M = 2$). The smallest climate change visitor group may be described as "Doubtful and Unaware" (10% of visitors). This group is generally characterized by a low belief in both occurrence ($M = 2$) and anthropogenic causation ($M = 2$), and a low perceived awareness of park-specific climate-related change ($M = 2.5$).

Interestingly further analysis reveals these five climate change segmentation groups do not differ statistically in past visit history to the park, age, income, residence location, or education ($p > 0.05$). However, the researchers also measured respondents' values, and these groups differ substantially in how much they value plants, animals, and ecosystems (i.e., biospheric value). Specifically, the "Convinced and Aware" group and the "Convinced and Partially Aware" group report a significantly higher value for plants, animals, and ecosystems than the "Doubtful and Unaware" or the "Convinced and Unaware" group ($p < 0.05$; *Figure 5*). In short, although these groups do not differ by standard demographics, they do differ by their levels of value for the natural world.

These groups of visitors with distinct attitudes towards climate change also maintain another important commonality. The majority of respondents, regardless of their group membership, report that habitat for marine life and glaciers are both extremely important to their visit. This finding indicates one area all respondents have in common even though their beliefs in climate change may differ.

Discussion and Management Implications

The purpose of this study was to gain insight into Kenai Fjords visitor awareness regarding climate influenced park resources and their beliefs in the occurrence and human influence on global climate change. Results indicate that visitors generally have high beliefs in the occurrence and human influence on global climate change, which differs from the general U.S. population (*e.g., Leiserowitz et al. 2010*). Three of the five climate change segmentation groups agree or completely agree that global climate change is happening, and that global climate change is at least partially caused by human actions. In contrast, four of the five groups are partially aware or unaware of climate-related change to natural resources at Kenai Fjords.

Communication and interpretation with visitors should perhaps highlight biophysical change at the park to increase visitor awareness of park-specific climate related change. Furthermore, it may be important for educators and interpreters to help visitors connect their already existing global beliefs with park specific indicators of climate change (e.g., increases in vegetation). Creating this connection between abstract global beliefs and more concrete awareness (e.g., changes in the size of glaciers) may assist audiences in understanding global climate change and its influences at a local level.

Since visitors seem to possess relatively high levels of belief in climate change, Kenai Fjords may be ideally positioned to provide advanced climate change education and interpretation. Furthermore, it seems simply introducing the topic of climate change to visitors may not be engaging for an audience that perceives themselves to be convinced of its occurrence and human causation. Therefore, interpretation should perhaps be designed to advance visitor knowledge of the subject beyond the basics. For example, interpretation could help visitors explore and understand more complex topics relating to Kenai Fjords, such as the role of ocean currents in global heat transfer or why climatic changes are more pronounced in and near the polar regions.

In addition, it would be appropriate to identify and evaluate the most effective methods to educate the 10% of visitors who are "Doubtful and Unaware" of climate change and its impacts. With noticeable impacts to glaciers and other primary park resources, Kenai Fjords provides an unique and potentially impactful stage to reach this group.

The results presented here continue to provide insight for managers into the Kenai Fjords visiting population. As Kenai Fjords and other NPS units strive to interpret and educate about global climate change, studies such as this are becoming increasingly necessary. A strong prerequisite for effective interpretation, communication, and some policy decisions is knowledge of a park's audience. Without a comprehensive understanding of visitors' attitudes and opinions, park resources may be ineffectively allocated, or opportunities for visitor resource stewardship may be lost.

Acknowledgements

The authors would like to thank and acknowledge The Clemson University Institute for Parks and the American Alpine Club for funding this research, and Superintendent Jeff Mow, Dr. Brett Wright, Captain Ron Long, and the staff at Kenai Fjords and Major Marine Tours for their consistent support of the research.

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THE NORTH FACE

Describing Brown Bear Activity Patterns Using Time-Lapse Photography in Katmai National Park and Preserve

By Carissa Turner and Troy Hamon

Introduction

Katmai National Park and Preserve (Katmai), located on the Alaska Peninsula, is home to one of the largest protected populations of brown bears (*Ursus arctos*) in the world (*Sellers et al. 1999*). A recent population survey in 2004 and 2005 estimated 2,183 ± 379 brown bears within the park boundary (*Olson and Putera 2007*). Concentrated food resources along salmon streams and coastal foraging sites result in seasonal aggregations of bears. The spatial and temporal activity of these animals in relation to their habitat has not been well studied, despite extensive general knowledge of these activity patterns in many locations. Documentation of activity patterns is important to park managers: changes to these patterns may reflect changes in food availability or habitat over time, or behavioral responses to development or human activity.

There are several remote backcountry areas in the park that have seasonal aggregations of brown bears. Many of these areas also attract bear viewers and wildlife photographers. Visitation to backcountry bear viewing locations has increased in recent years (*Kim 2008*). Human presence at brown bear foraging areas has the potential to alter bear use (*Olson and Gilbert 1994, Olson et al. 1997, Smith 2002, Smith and Johnson 2004, Nevin and Gilbert 2005*).

In 2004, Katmai initiated a study using time-lapse photography at the lower Brooks River. The purpose of the study was to analyze bear use in and around the river crossing (a floating boardwalk) and evaluate whether or not repositioning the boardwalk may reduce human-bear interactions (*Hamon et al. 2007*). In 2007, the time-lapse study was expanded to the backcountry as a tool to monitor bear use of remote foraging sites.

Geographic Harbor was the first backcountry site where bear use was monitored using time-lapse photography (*Figure 2*). Bears make use of several foraging resources in the narrow bay: clam beds exposed on the intertidal flats at low tide, high protein sedge meadows, and seasonal salmon runs. Visitors are attracted to Geographic Harbor for bear viewing and photography. The combination of bear and human use at this site provides park researchers with an opportunity to document bear and human activity patterns and changes in bear activity in the presence and absence of people.

Figure 1. Bear viewers at Geographic Harbor, Katmai National Park and Preserve.

NPS photograph

Methods

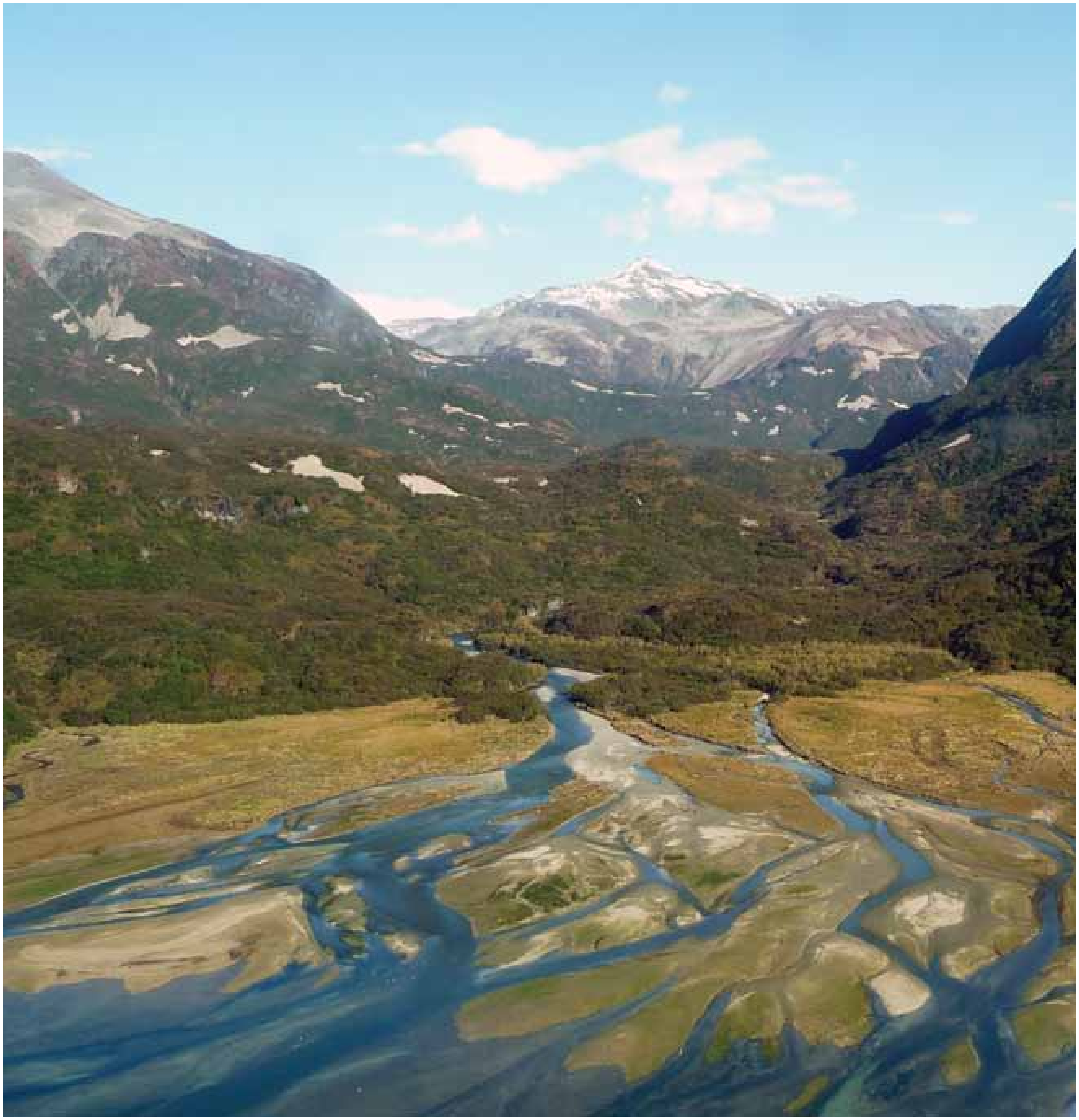
In 2007, 2008 and 2009, cameras with time-lapse controllers were set up on a hillside overlooking Geographic Harbor. The cameras were set to take photos at regular intervals to capture bear activity from June to September. The camera (*Figure 3*) was visited regularly to change memory cards and conduct maintenance as needed.

Data was later collected from each usable photo. Photos were imported into ArcMap® with a standard x/y coordinate reference system. Each bear, person, boat and plane were identified and marked as a point feature (*Figure 4*). A relative tide stage point was also marked. Geodatabases were used to store object identification, spatial (x/y coordinate), and time and date information for each photograph.

Photo object data was analyzed to compare bear numbers in relation to day of year, time of day and tide stage. The number of people in photographs was also compared by day of year and time of day. Primary bear activity and bear viewing time periods were determined through these analyses. In addition, the data was used to compare bear numbers and bear spatial distributions in the presence and absence of people.

Results and Discussion

During the three years of the study, bears were observed in 61% of usable photos and people were observed in 18% of usable photos. Not all photos could be scored due to weather and low light conditions. In some cases, objects in groups (such as close knit visitor groups) were hard to distinguish from each other, so scored data represent minimum estimates when people or bears are clumped.



NPS photograph by Carissa Turner

Figure 2. Geographic Harbor. A view of the outflow of Geographic Creek, sedge meadows and tidal flats at Geographic Harbor.

Bear and Human Activity and Day of Year

Bears were observed as early as June 12 (2008) and as late as October 3 (2009). Over 90% of bear activity occurred between July 23 and September 17, with the peak observed in late August (*Figure 5*). This activity corresponds with Geographic Creek's seasonal salmon runs.

Visitors were observed as early as June 24 (2008) and as late as September 15 (2009) in Geographic Harbor. During the three year study, human activity peaked between August 18 and August 25 (*Figure 6*). Approximately 95% of human activity occurred between August 4 and September 12. Bear viewing accounts for 93% of visitor activity at Geographic Harbor and the Amalik Bay area, according to Katmai's commercial use data. This explains the observed concentrated visitor use during peak bear activity.

Bear and Human Activity and Time of Day

Bears were observed at all times of the day; however, two prominent peaks in bear activity were observed during daylight hours (*Figure 7*). The first peak occurred in the morning (approximately 6:00am to 12:00pm) and the second occurred in the evening (approximately 6:00pm to 10:00pm). In all three years, a decrease in bear activity was observed between these two peak periods.

Visitors were observed as early as 8:50am (August 13, 2009) and as late as 9:51pm (August 22, 2009). There was one peak in visitation during the day, which occurred from 10:00am to 4:00pm (*Figure 8*). Almost 80% of visitation occurred during this timeframe.

Bear use in the presence and absence of visitors

The highest number of bears counted in a photograph was 19, recorded on August 30, 2007 at 7:11am. Similarly high numbers of bears were recorded in 2007 (18), however significantly fewer bears were recorded in 2008. The maximum number of bears in the 2008 photographs was 10 (August 13). Overall, the average number of bears recorded was four in both 2007 and 2009, and two in 2008. The cause for lower bear numbers in 2008 is un-

Figure 3. Camera installation at Katmai Bay. As in Geographic Harbor, two cameras with time-lapse controllers were set up in weather proof housings. The installation was surrounded by an electric fence to prevent damage from wildlife and camouflaged so as not detract from the visitor experience.

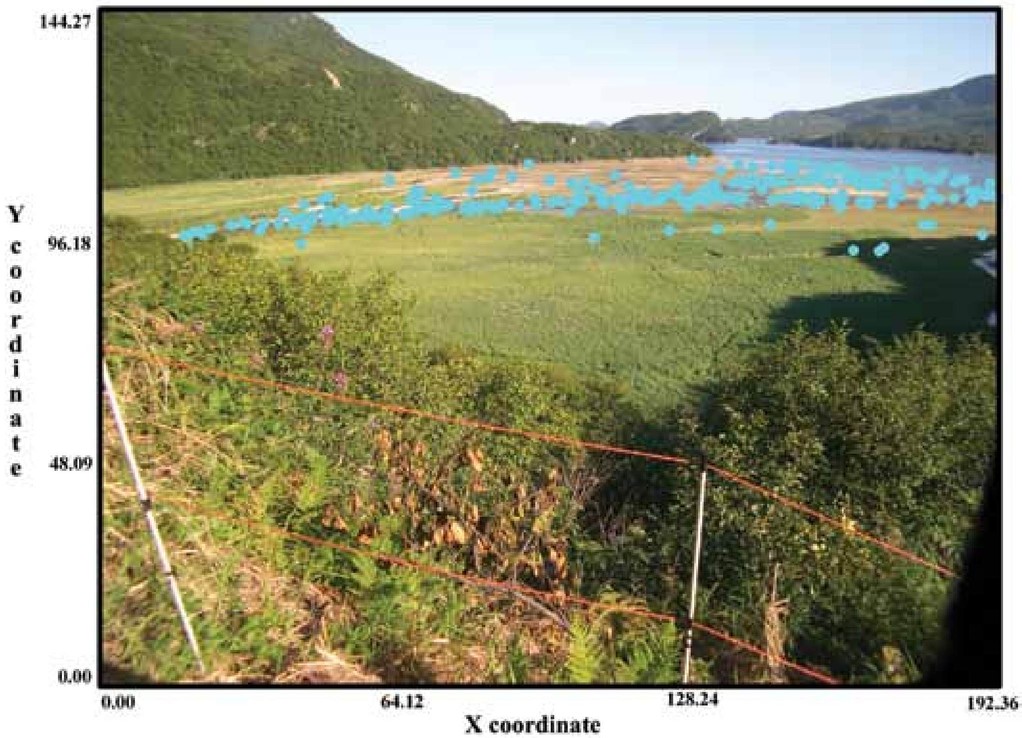


Figure 4. Data collection from photos. Photos were imported into ArcMap® and standardized. The points represent bear activity on August 12, 2007.

known, but may indicate lower food availability at the site.

Visitor numbers ranged from one to 29, with the highest count occurring on August 12, 2009, at 3:50 pm. The number of people in the photographs was similar in all three years. During times of visitation, the average number of people was seven, and the most common number of people counted was six. Average numbers of visitors did not change significantly over the three years, even though bear activity was lower in 2008.

To determine whether or not bear activity changes with human presence, the number of bears can be compared to the number of people in photographs. Figure 9 illustrates this comparison; a general decrease in maximum bear numbers is observed as human numbers increase. Bears are not seen in numbers greater than 8 when there are more than 16 visitors present.

Spatial data was also used to evaluate bear use. X/Y coordinates collected from photographs allow for comparison of bear distribution during time of visitation and times without visitors present. During primary bear use (late July through mid-September), bear activity is focused in Geographic Creek and the river corridor.

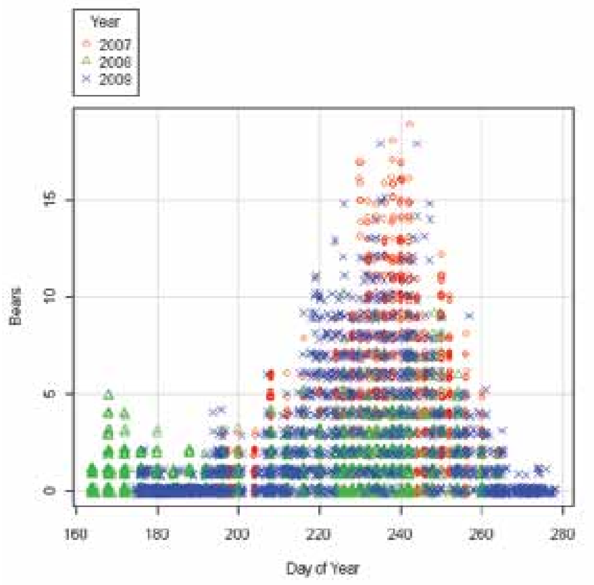
For ideal bear viewing, visitor groups distribute themselves along the banks of Geographic Creek. This has the potential to displace foraging bears, or alter their feeding patterns and locations (*Olson and Gilbert 1994, Olson et al. 1997, Smith 2002, Smith and Johnson 2004, Nevin and Gilbert 2005*).

Management Implications

Time-lapse photography is a relatively cost-effective method for monitoring bear activity at remote foraging sites, and allows for data collection in the absence of people. Katmai is expanding this project to other areas within the park and is currently setting up seasonal cameras at another foraging site that does not attract visitors. This research control site will provide baseline bear activity data for comparison with Geographic Harbor and other sites where visitation is common.

Evidence of changing bear presence and habitat use with changing visitor use levels warrants additional monitoring and research. Long-term data collection and analysis of bear use at remote foraging sites will

Figure 5. Bear use throughout the seasons. This graph compares the number of bears in a photograph in relation to the day of the year. Days are numbered based on the 365/366 day calendar. For example: 220 is August 8 in 2007 and 2009 and August 7 in 2008; 260 is September 17 in 2007 and 2008, but is September 16 during the 2008 leap year.



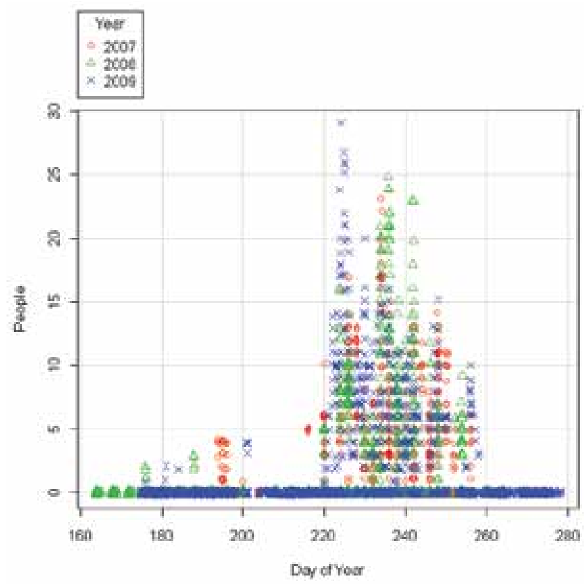


Figure 6. Human use throughout the seasons. This graph compares the number of people within a photo in relation to the day of the year. Days are numbered according to the 365/366 calendar days.

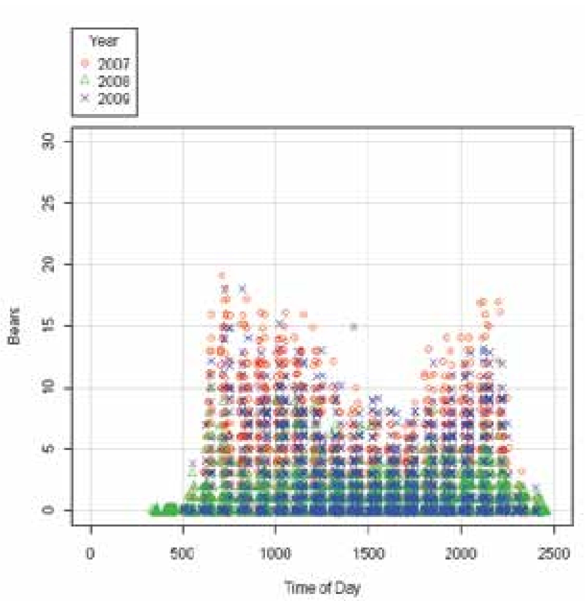


Figure 7. Bear use throughout the day. Two peaks in bear activity occur in the observable 24-hour period.

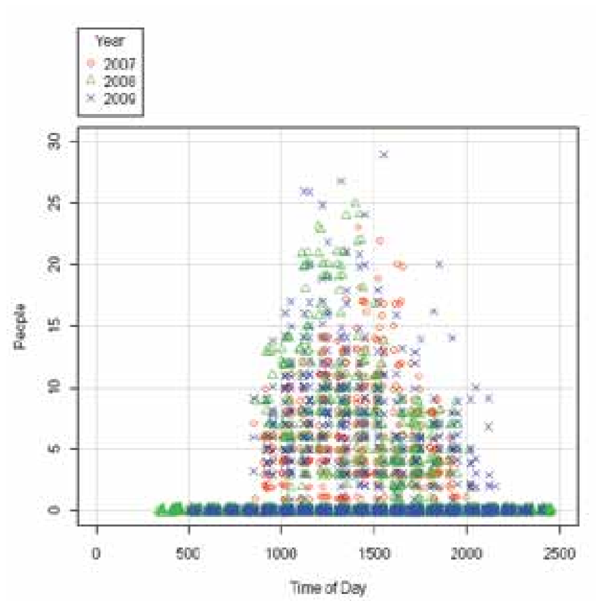


Figure 8. Human use throughout the day. One peak in human activity can be observed over the observable 24-hour period. Due to camping restrictions and remoteness of the site, Geographic Harbor is predominantly a day use area.

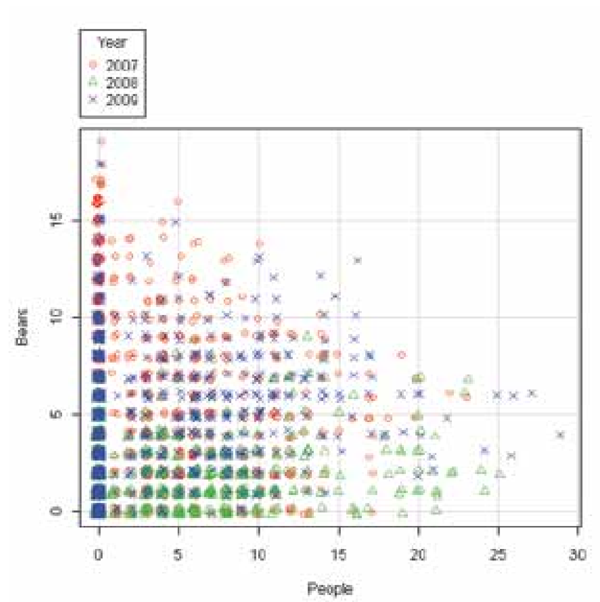


Figure 9. Bear numbers as they relate to human numbers. The number of bears observed within photographs decreases with high visitor numbers.

help Katmai staff to identify natural and human-caused changes in bear activity, and resource management options for mitigating negative impacts to brown bears. By understanding bear use activity patterns at foraging sites and changes in bear numbers and spatial distributions with visitation, park managers and guides will be better able to adapt tourism and management activities to protect natural bear population dynamics and maintain high quality wildlife viewing experiences for the public.

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Martin Radovan: A Prospector's Life

By Katherine Ringsmuth, Daniel Trepal, and Logan Hovis

In summer 2010, the Alaska Region of the National Park Service, through its Abandoned Mine Lands program with funding from the American Recovery and Reinvestment Act, initiated the process of physically closing dangerous mines at Radovan Gulch, located in Wrangell-St. Elias National Park and Preserve. Before NPS personnel could begin sealing adits, the agency had to comply with the National Historic Preservation Act and determine if the properties were eligible for listing in the National Register of Historic Places. After fieldwork and archival research, an interdisciplinary team determined that the camps, prospects, artifacts, roads and trails at Radovan Gulch maintained historical integrity and were historically significant on a local level. But the story went far beyond compliance; the examination of the site revealed a remarkable time capsule, preserving the life and work of the enduring copper prospector, Martin Radovan.

A 19-year-old Martin Radovan departed Croatia for the United States in 1900. He arrived at Ellis Island where his surname, 'Radovanovich' was transliterated to 'Radovan.' He gained railroad experience in New Jersey and in California, but after the 1906 San Francisco earthquake, Martin moved to Seattle. While there, Martin learned of a railway being constructed into the Interior of Alaska by two giants of American business: J.P. Morgan and the Guggenheims (*Radovan 1974*).

Martin arrived at Cordova in 1908 and found work building the Copper River & Northwestern Railway. After completion of the railway in 1911, Martin stayed in Alaska. He worked as a machinist for Kennecott Copper Corporation, and eventually, took a job with a hydraulic mining company at Dan Creek, south of present day McCarthy in the Nizina mining district, and began prospecting nearby creeks and benches for gold. In the 1920s, Martin began searching for copper in an ice-filled cirque on Glacier Creek, a tributary of the Chitistone River, later named Radovan Gulch in his honor.

Figure 1. The limestone cliffs above Radovan Gulch in Wrangell-St. Elias National Park and Preserve came to dominate Martin Radovan's life as they dominate the landscape.

NPS photograph

By the late 1890s, copper was a coveted metal made increasingly valuable by America's desire for electric power. In 1900, Kennecott's world-famous Bonanza copper deposit was discovered in the Chitistone Limestone above the Nikolai Greenstone, a formation that dominates much of the visual landscape on the south side of the Wrangell Mountains (*Winkler et al. 2000*). Federal geologists and successful prospectors encouraged others to look for copper where the distinctly colored deposits meet (*Moffit and Capps 1911*). Martin Radovan, like nearly all the copper prospectors working the Nizina district for years before him, began to scrutinize every accessible linear foot of the contact zone.

Martin gained notoriety as a prospector when he laid claim to the Binocular Prospect, a copper outcrop above the greenstone-limestone contact high on the face of a cliff overlooking a glacial cirque. The U.S. Geological Survey had known about the outcrop, and had studied it - through binoculars - since the turn of the century. The vertical face of the cirque wall, and the location of the outcrop over 3,000 feet up, had prevented geologists from inspecting and sampling it. In 1929, the Kennecott Copper Corporation, always looking for more ore in the Nizina district, sent European mountain climbers to try to reach the Binocular Prospect. After a summer of attempts, the climbers failed to reach the contact (*Casley 1972*).

Martin managed to do what Kennecott could not. He reached the Binocular Prospect by following a precipitous route along the cliff wall toward the target. Martin was supported in his endeavor by his wife, Augusta Louise Iverson, a person of great significance in Martin's life. Somehow Martin, a brown-eyed, black-haired Croatian, who spent more time in a tunnel than in town, caught the attention of an attractive Norwegian bookkeeper who worked at the Kennecott Milltown. Martin and Augusta were married in McCarthy in 1914. Moving seasonally between the cabin at Dan Creek and the camp at Glacier Creek, she made a life with him in the Nizina country.

Augusta not only helped Martin build the steep trail to the Binocular Prospect, but it was her professional skills and steady income that allowed Martin to spend his time prospecting at Dan and Glacier Creeks. While Martin remained steadfast in working his surrounding claims, Augusta interacted with the larger community of miners and their wives. Augusta fished, baked bread, sluiced for gold, cut wood, called on neighbors and friends, traveled to town, usually on foot, scheduled daily life around the mail, and had a naturalist's eye for wildlife. Besides working at Kennecott from time to time, she supplemented their earnings by running the Blackburn roadhouse with Martin during the Chisana gold rush, washing miners' laundry, and assisting as the local postmistress and notary. While making a small income, she still managed to send money to her mother in Seattle. Martin also took part-time jobs when money ran short. Although their daily routine was gender-specific, Martin and Augusta shared a common vision. She not only made his dream possible, she believed in it, too (*Radovan 1930*).

Augusta died unexpectedly in 1944, but Martin continued his search for copper for the next three decades. Besides the Binocular Prospect, he discovered and staked other claim groups: the Low-Contact, the Greenstone, and the Triassic. He built a substantial camp

Photograph courtesy of the family of Martin Radovan

Figure 2. Later in life Radovan described how he discovered the Binocular Prospect: "Before I knew I was asleep, a vision came to me clear as a blueprint…I saw a great bed of ore in that mountain a thousand feet in—true solid rock—on both sides of the canyon….This is the vision of my dreams".

Geneva-Pacific Corporation photograph

Figure 3. After 1974, others could work at the precarious Binocular Prospect besides Martin.

on the banks of Glacier Creek near the mouth of Radovan Gulch. Alone and unaided, he hauled 400 feet of 3/4 inch steel cable six miles upriver on a hand sled and then succeeded in stretching it 325 feet across Glacier Creek for a tram he built to pull himself across to his creek-side camp (*Edwards 1965, Sykes 1980, Green 1994, Smith 2006*).

By a twist of fate, Martin was reunited with his long-lost brother Jack Radovich of Delano, California in 1951 (*Anchorage Daily Times 1951*). Jack, a wealthy vineyard owner, flew to Glacier Creek in hopes of reuniting with his brother Martin, whom he had not seen in fifty years. Jack wanted his Sourdough brother to return with him to Delano, but the family reunion did not deter Martin from his mining aspirations. After a string of disappointing leases and business arrangements between the 1950s and the late 1960s, the Geneva-Pacific Corporation purchased Martin's prospects in the early 1970s, giving Martin hope that the Binocular Prospect would finally be mined and his life work validated. In 1974, at age 91, Martin left Alaska to spend time with his family. The following spring Geneva-Pacific reached the Binocular Prospect using a helicopter. Before the company's findings were reported, Martin died. In their report, the sampling team reported that they were "stunned" to have discovered tools used in 1929 by Martin Radovan at 7,000 feet (*Geneva-Pacific 1979*).

Today, Martin Radovan's life continues to intrigue students of frontier Alaska. The Binocular story has inspired popular articles, chronicling Martin's life at Glacier Creek. He has left his name on the map, and geology reports tell and retell the story of the Binocular Prospect, perpetuating Martin's feat in the collective imagination. Still, since Martin Radovan's death in 1975, Radovan Gulch has been abandoned. Over the past 35 years, natural weathering has damaged the structures, many beyond repair. During a routine site assessment in 2010, NPS researchers observed many deteriorated buildings. Unless the remaining structures are stabilized, they will collapse in the near future. Significantly, the site has not been disturbed by vandals, and Martin's possessions at the camp and adits remain much as he left them. These artifacts connect the place to the person and his lifestyle, and even the ruins present clear evidence of the prospector's presence. Thus, the seemingly valueless things Martin left behind provide us fresh insight into the park's mining past.

In many ways, Martin's life at Radovan Gulch fits a frontier image of a 'rugged individual,' but Martin never lived independently of the outside world. Though Martin lived seemingly isolated in his wilderness home, he consumed canned foods purchased through an industrial network that connected Radovan Gulch to distant markets. He used Gillette shaving cream, wallpapered his cabin, and seasoned his food with spices from around the world (*Spude et al. 1984*). He remained a creature of an industrialized economy, taking trains or planes to towns like Cordova, Chitina, Kennecott, and McCarthy, towns that replicated the material, institutional, and ideological culture of rural America. Rather than evading civilization, Martin fully participated in an industrial process that transported twentieth century American life into the heart of Interior Alaska.

Still, unlike many who left Alaska with dashed dreams, Martin stayed. Even after Kennecott abandoned its mines and railway in 1938, after McCarthy deteriorated into a ghost town, and after Augusta's untimely death in 1944, Martin remained at Glacier Creek. Immersed in a perilous landscape day after day, Martin picked through tons of rock and, over time, came to know in profound ways the natural environment between his creek-side camp and his tunnels dug deep in the mountainside. By employing rudimentary tools and near-obsolete technology, Martin perfected climbing, construction and prospecting skills at Radovan Gulch that inspired awe and respect from people who knew him.

The Binocular Prospect, although it never produced ore, reflects Martin's courage, his ingenuity, and his position as the "little guy," pitted against one of the most financially successful operators in Alaska history. Likewise, the Low Contact property, exposed in a slide path, reflects Martin's famed persistence and tenacity, and how he embedded himself in a dangerous and perilous natural landscape. Finally, the Greenstone prospect and camp reflect how larger, better-capitalized corporations, such as the Alaska Copper Company and the Geneva-Pacific Corporation, pigeonholed Martin's prospecting knowhow in his twilight years.

Indeed, the rationalization and scientific professionalization of mining after World War II rendered prospectors with his "practical" knowledge outdated. While the modern industry was still happy to examine the old-timers' claims and prospects, it increasingly applied the expertise of university-trained engineers and geologists to determine where and how to build mines in order to efficiently and profitably extract copper. For most of his prospecting life, Martin was completely dependent upon scientists to validate his claims, technocrats to mine them, and ultimately, absentee investors for the capital and ties to international markets to develop and sell the ore.

We can learn much from Martin Radovan. His

Geneva-Pacific Corporation photograph

Figure 4. Augusta Louise Iverson Radovan, on the right, snowshoeing with an unknown woman at Dan Creek, circa 1929.

Photograph courtesy of James Edwards

Figure 6. Radovan's Camp, circa 1961.

Photograph courtesy of James Edwards

Figure 7. Martin at work at the dangerous Low Contact Prospect, circa 1962. Simply getting to and from the prospect located in a slide path was a task.

Photograph courtesy of the family of Martin Radovan

Photograph courtesy of the family of Martin Radovan

Figures 8 and 9. *BootsBoy* and *KiKi Birds*. After Gussie died, Martin filed twelve new claims in 1948. Several were named for the things he cherished most: his pet fox 'Boots,' the grey jays he called 'Ki-Ki' birds, a bear he called 'Pongo Boy,' and his wife and partner of thirty years, "Augusta."

Photograph courtesy of James Edwards

Figure 10. Martin Radovan (center) at work with James Edwards (left) and an unknown miner, circa 1961.

NPS photograph

Figure 11. (Right) Archeologist Dan Trepal takes measurements at the Greenstone Prospect in July 2010.

Saturday, November 4, 1972 Anchorage Daily Times—3A

Sourdough Tells Of Early Days In Territory

(Continued from Page 2)

ping business that handled grapes and wine, and made himself a millionaire, not knowing that his brother was alive in the wilds of Alaska.

Meanwhile both Radovan's sisters died and it was until 1966 that the brothers found each other.

In Cordova in 1965, Radovan met a fisherman that spent his winters in Delano. He happened to mention that he had a brother in Delano, and the fisherman recognized the name.

The fisherman returned to Delano and related the news to his brother Radovich.

In the late fall of 1966 Radovich flew to Cordova to find his brother. He chartered a plane and it took two days for him to find Radovan, who was in the middle of moving from his summer prospecting to his winter cabin.

"Radovich talked to me a while, not letting me know who he was," said Radovan. "He asked me some questions, and then asked me if I had a brother. I told him I did, and that my brother's name was Jack. He put his hands on his hips and said, 'I'm Jack'."

Radovich wanted his Sourdough brother to go to Delano immediately with him, but Radovan had some good claims and he was preparing for the winter.

"I can't go, I have to lay in my winter supplies and lay out feed for the birds," Radovan told him.

"To hell with that," said Radovich.

"To hell with you," said Radovan.

NOV 4 1972

THERE WERE NO TV DINNERS IN 1915

Radovans wife, Augusta, not only had to cook dinner on early camping trips, she had to catch it. This picture was taken on a camping trip a few years after they were married, probably on an expedition to fill the meat larder.

Radovan finally agreed to go after his supplies were taken care of and he had spent time in Delano meeting his brother's family.

Radovan returned to Alaska and his claims turned out to be quite valuable. Radovan says that the U.S. Bureau of Mines sent geologists to his property and that in its Virginia offices the bureau has it recorded that his claim has 4.5 million tons of the richest copper bearing ore in the United States. It's some of the same ore that made the Kennicott strike big.

In 1968, Radovan says he sold exploratory rights to the claims to a friend who had the finances to back the exploration. Radovan received a $20,000 check, and was to receive installments on the rest of the payment every year until the rights expired, on June 1, 1974.

However, the rights were soon sold to a Mr. Thomas of Tampa, Fla., who hoped to back the development of the claim. In 1969 Thomas in turn sold the rights to the Geneva-Pacific Corporation of Illinois.

In 1969, Radovan spent the winter in Cordova, the first time he had left the claim for any length of time. When he returned the next spring he found all of his firewood had been burned, his cookshack was pushed off into a creek, and the company had set up its own camp.

"Since those guys set up camp all the animals have left the gulch," said Radovan. "There are shotgun shells all over the creek. My birds were tame, they went to them like they came to me, and last year they were killed."

"We only killed what we needed to eat here, or like the bear, where it was the only cure," said Radovan. "Now some people can get up there in a car and they kill everything they see."

"Copper is scarce and my strike is rich, but I don't have the money to stop them," he said.

Radovan plans to let the lease run out, and then try to have the government mine the copper.

Meanwhile, Radovan is leaving Alaska to go to Delano where the rest of his family is.

"They're so convincing down there for me to stay," said Radovan. "I don't have to do anything there, and I travel all over with my brother."

"I stopped in Anchorage to have my will made up, so I can leave my money to the poor," said Radovan.

Asked if he would ever return to Cordova, Radovan smiled and said, "Oh, maybe, I don't know. I like to help the kids there."

"All the kids like me in Cordova," he smiled.

"Radovich talked to me for a while, not letting me know who he was. He asked me some questions, and then he asked me if I had a brother. I told him I did."

Anchorage Daily Times (November 7, 1972), p. 3A

Figure 12. The Binocular story has inspired numerous popular articles, chronicling Martin's life at Glacier Creek.

story reflects broader episodes and themes that shaped Alaska's past, such as the contributions made by early twentieth century immigrants; the role of big business and the Americanization of Alaska; the dependency of the so-called "rugged-individual" on science, industry, and corporatism; and, through his hard-working wife, Augusta, the role of women at mining camps. But in the end, Martin came to Radovan Gulch because of a dream—a dream, which in 74 years, he never achieved.

Perhaps the most compelling question, then, is why did Martin stay? One clue comes from Gary Green, a McCarthy resident who befriended Martin during his last years at Glacier Creek. "Martin was a prospector," recalls Green, "and a prospector always has to believe there is something to find" (*personal communication, July 2010*). Martin's longtime friend Jim Edwards agrees, "He was a prospector; he had a prospector's head…he never gave up" (*personal communication, July 2010*). Indeed, Martin was an ordinary man who accomplished extraordinary feats. Although he never found his "copper mountain," the real value of Martin's uniquely preserved properties is the history they can convey to visitors about a way of life in the Wrangell Mountains. To residents who knew Martin, or simply knew of him, Martin's value is his unwavering faith in his way of life, a way of life that local residents – ordinary individuals themselves – continue to seek in pursuit of their own extraordinary dreams.

Photograph courtesy of the family of Martin Radovan

Figure 13. Martin's triumphs never produced great wealth; however, for his Binocular feat Martin gained lasting fame, for his endurance and ingenuity he obtained local respect, and through his personal relationships – whether it was with his family, friends, wife or wildlife – Martin attained constant companionship. Martin shown in the twilight of his years at Glacier Creek.

Photograph courtesy of the family of Martin Radovan

Figure 14. A sampling team for Geneva-Pacific reported in 1975 that they were "stunned" to discover, at 7,000 feet, a rock hammer and pick-ax used in 1929 by Martin Radovan to sample the Binocular Prospect.

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Attu, A Lost Village of the Aleutians

By Rachel Mason

Four tiny, remote Aleutian villages were left behind forever during World War II: Makushin, Kashega, Biorka, and Attu. After the Japanese bombed Dutch Harbor, the U.S. government evacuated the Unangan (Aleut) residents of the Aleutian Islands and brought them to camps in Southeast Alaska, ostensibly for their own protection. At the end of the war the residents of the smallest villages, their numbers further diminished by death and hospitalization, returned to the Aleutians but were not permitted to return to their homes. Instead, they were settled in other Unangan communities.

The residents of Attu, the most remote Aleutian village, had a different and especially tragic wartime experience. They were taken by the Japanese in 1942 and held prisoner in Otaru, on Hokkaido, for the duration of the war. Almost half of them died, many from malnutrition and starvation. When the survivors returned from Japan, they were not allowed to go back to Attu, but were taken to the village of Atka (*Figure 2*).

Lost Villages of the Aleutians, a project of the Aleutian-World War II National Historical Area, began as a small-scale history of the former villages, documented through oral history interviews and secondary sources. It became more participatory and collaborative when it grew to include boat trips to revisit each village with elderly former residents and their descendants. In 2009 and 2010 the project chartered the US Fish & Wildlife Service research vessel *Tiglax̂* to bring elders and their descendants to the sites of Makushin, Kashega, and Biorka. The journeys gave participants a chance to see the places they remembered or had heard about, and to honor the memories of those who once lived there. The project's final boat trip will be to Attu, tentatively planned for the summer of 2012. The NPS is also helping former Attu resident Nick Golodoff, who was six years old when he and his family were taken to Japan, compile and edit his memoir, *Attu Boy*.

The Attuans'wartime displacement took them not to U.S. soil but to Hokkaido Island in Japan. Attu is one of the "Near" Islands, meaning that it is closest to Russia and Asia; however, at the time of World War II it was the furthest human settlement from the Alaska mainland. Because it was so remote, it was visited only once or twice a year by priests, traders, or Coast Guard revenue cutters bringing mail and medical providers.

There is still a mystique to Attu. There is more interest in revisiting Attu than any of the other lost villages, except among the few remaining people who once lived there (*Figure 3*). Since the war, most of the surviving residents have been reluctant to talk about or reflect upon their painful experience. Of the three Attuans left, siblings Nick Golodoff, Greg Golodoff, and Elizabeth Kudrin, only Nick has been interested in publicly telling his story. Nick, the oldest, is the only one with clear memories of those years.

For years Nick Golodoff has been writing a book about his experiences in Japan, *Attu Boy*, with the help of his granddaughter Brenda Maly. The resulting book weaves Nick's memories with other first-person accounts by Nick's mother Olean Prokopieff, his uncle Innokenty Golodoff, and fellow Attuans Mike Lukanin and Alex Prossoff. All are now deceased.

In addition to these personal narratives, several other sources provide information about the Attuans' World War II experiences. Japanese author Masami Sugiyama, inspired by the pictures a military photographer took in Attu in 1942, interviewed surviving Attuans as well as Japanese who had known them in Otaru (*Sugiyama 1984*). Henry Stewart, an American anthropologist living in Japan, wrote a report and an article based mainly on the diaries and records of Japanese soldiers, guards, and medical personnel (*Stewart 1978, 2008*). Mary Breu's 2009 book about her great-aunt Etta Jones offers another perspective. Etta was the school teacher on Attu, and her husband Foster Jones was killed during the Japanese invasion. Like the Unangan residents, Etta Jones was taken to Japan, but she was interned in a different part of the country. From these and the other accounts available, we can piece together Attu's World War II story (*Figures 4-5*).

In the early morning of June 7, 1942, radio operator Foster Jones sent his usual weather report from Attu. A group of Japanese soldiers came into the village on foot later in the morning. The attack surprised the Attuans as they left church (*Carter 1994*). The Japanese were yelling and shooting, and one woman was wounded in the leg by rifle fire. Six men ran away to the hills and hid there all day (*Golodoff 1966*). Later the Japanese sent other Attu men to bring them back. Nick Golodoff, a little boy of six, remembered hiding in a barabara, a traditional sod house.

The soldiers gathered the Unangan residents in the schoolhouse. They killed Foster Jones, and one of the Attu men was ordered to bury him. The Japanese announced that the Unangan were liberated from the American oppressors. After the soldiers ransacked the houses, looking for guns, the Attuans were allowed to return to their homes.

The next morning, the villagers were assembled at the flagpole, and the Japanese raised their flag. Later some

Figure 1. Digging the hole for the cross. Left to right: Carlene Arnold, Brian Rankin, Billy Pepper, Fred Lekanoff, Eva Kudrin, Alexandra Gutierrez, and Irene McGlashin (behind the house where the alter in the church once was).

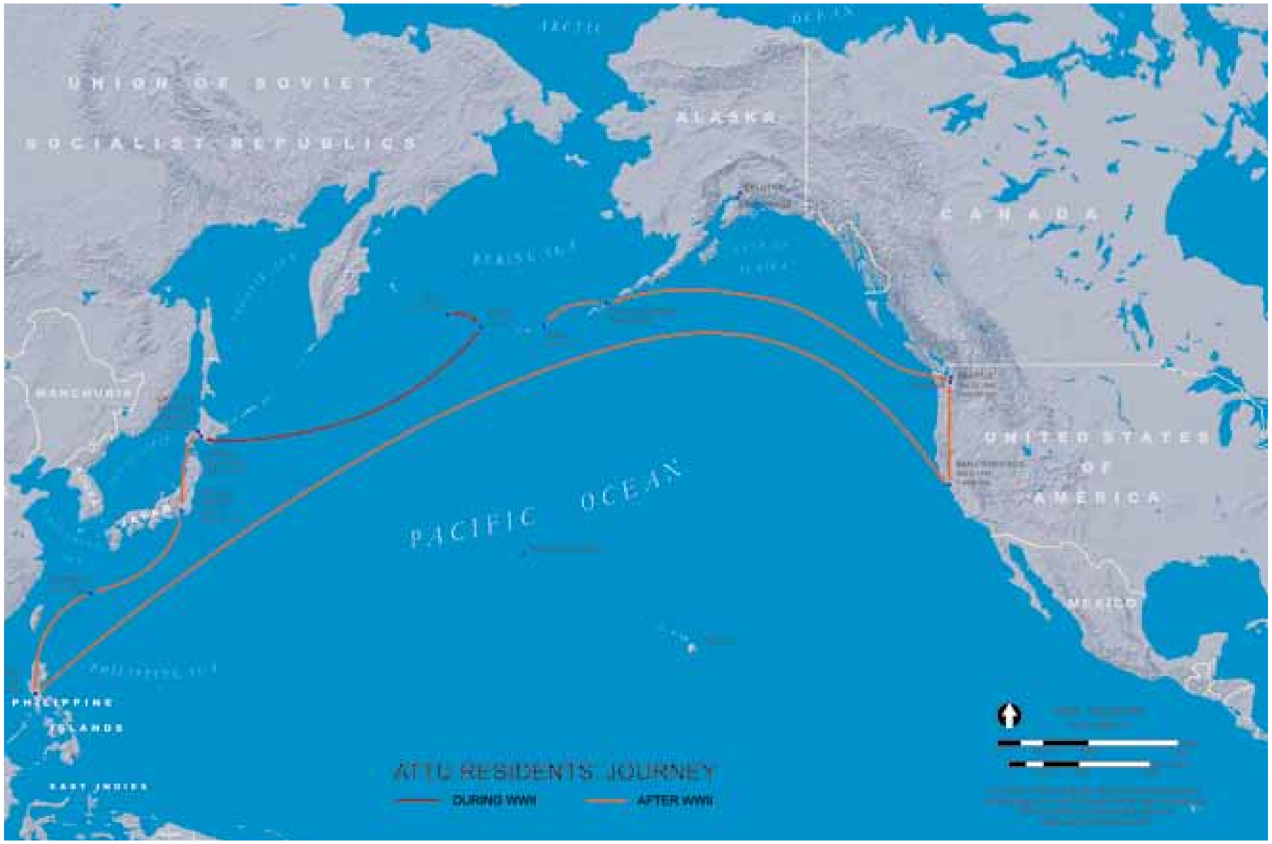

Figure 2. Attuans' journeys during and after WWII.

Nick Golodoff, age 9 in 1945:

"As the end of the war approached, we were still in Japan. The policeman told us the war was over and we painted POW on the outside of our building so the American planes would know where we were. The planes flew over and looked around and saw it, and then the next day they came back with drums filled with food, all kinds of food, and they dropped the drums from the plane with a parachute. Their aim was not very good. Some drums filled with food fell into one of the Japanese houses and the policeman had to go and collect them... [W]e ate well that day. Everything tasted good to me. I really liked the canned peaches."

of the Attuans covertly mocked it, calling it the "Japanese meatball." One of them stole the American flag back and hid it from the Japanese. The Japanese roped off the houses of the village, more to discourage the Japanese soldiers from bothering or stealing from the Attuans than to keep the Attuans inside (*Carter 1994*).

The soldiers guarded the villagers for three months on Attu before they took them to Japan. During that time the elderly John Artumonoff died. The Attuans found it difficult to fish, hunt, or collect firewood, because they had to get permission from the Japanese every time they went out in a boat. If they caught any fish, the Japanese confiscated most of them.

One of the Japanese officers wrote in his diary that the chief's son "Little Mike" accompanied them on mountain hikes and boat rides, and often played the guitar and accordion for them (*Stewart 1978*). Other children, including Nick Golodoff, also befriended the Japanese during these weeks in the summer of 1942 (*Figures 6-7*).

The villagers boarded a ship on September 14, 1942. The soldiers told them to bring food, blankets, and even furniture, perhaps with the idea that their move to Japan might be permanent. The trip to Japan took about two weeks. Anecia Prokopioff, an older woman, died on board ship, and she was buried at sea. At Kiska, the Attuans were transferred to another ship, where their quarters were in a cargo hold that had been used to carry coal (*Kohlhoff 1995*). When they finally arrived at the city of Otaru, on Hokkaido Island, the passengers were very dirty from coal dust (*Carter 1994*).

The Attuans' first house in Otaru was a vacant railroad employee dormitory. They lived on the second floor, storing their furniture and belongings at the rear of the building (*Stewart 2008*). In addition to the hardship of internment, it must have been a big culture shock to live in a city. Otaru's population in 1942 was around 120,000. Once part of Ainu territory, Otaru is now a Japanese and Russian tourist destination (*Irish 2009*).

At first the Attuans were able to supplement their rations with food they had brought. Innokenty Golodoff remembered that at first the food was slightly meager, and included rice, bread, radishes, and a little fish. For about a year, he had a Japanese girlfriend who was a nurse and brought him extra food. When their own food was gone, the Attuans began to starve and suffer from malnutrition. They rarely got any fruits or vegetables. They could see that their Japanese guards were hungry too (*Golodoff 1966*).

In addition to the lack of food, many of the Attuans already had tuberculosis before they arrived in Japan. Their health deteriorated in Otaru. Several died from beriberi, a disease of malnutrition, perhaps caused by a diet almost entirely made up of white rice. Chief Mike Hodikoff and his son George both died of food poisoning in 1945 from eating rotten garbage (*Kohlhoff 1995*).

The Attu residents worked digging clay from a pit mine in Otaru. Although they were supposed to be paid 1-1/2 yen per day, they were not paid at the time. Upon their release, the Attuans were given about $700 in yen to take back to the United States. Unfortunately, this money was appropriated by U.S. officials and American money never given to the workers (*Stewart 2008*).

In 1944 the 29 Attuans still living were moved from the dormitory to a larger house, which had once been the quarters for Shinto priests (*Stewart 2008*). Their new home was far from the clay pits, and they didn't work after that. Their declining health may have also prevented them from working.

The Attuans communicated with the Japanese in English, and spoke Unangam Tunuu among themselves. Nick Golodoff remembered that the Japanese often wrote notes in English to convey orders or questions. Attuans who spoke English served as interpreters (*Jolis 1994*). A Japanese linguist, Ken Hattori, visited them in 1943 and recorded their language.

The Unangan internees remembered mistreatment by some of the guards. One woman went for three days without food and water, and had to shovel snow in her bare feet, as punishment for shouting at one of the officers after her daughter died (*Lukanin 1988, Prossoff 1988*). Japanese sources, too, acknowledge that the Attuans sometimes suffered at the hands of their guards (*Stewart 2008*).

At least one of their captors became their friend: Mr. Shikanai, the policeman who lived with them in both of their houses in Otaru. On Christmas Eve in 1944, Shikanai obtained goat meat and turkey for a party, and the Unangan played the accordion and danced into the night (*Kohlhoff 1995*). After the war was over, while waiting for an American Army plane to take the Attuans back to the U.S., they had a sake drinking party with Shikanai (*Golodoff 1966*).

Nick Golodoff remembers the day Mr. Shikanai told the Attuans the war was over. The Attuans painted the letters "POW" on the roof of their building so the American planes would know where they were. Planes flew over, dropping drums filled with delicious food. Nick particularly remembered the canned peaches they dropped, and said that he still loves canned peaches.

Some Japanese guards recalled that the Attuans shared some of the food and cigarettes with them, in defiance of American orders. Two weeks later they started the journey back to America. Police officer Shikanai accompanied the Attuans as far as an air base outside of Tokyo (*Stewart 1978*).

Photograph courtesy of Nick Golodoff

Figure 3. While the Japanese occupied Attu, a military photographer took this picture of six-year-old Nick Golodoff on a soldier's back. In 1992 Nick visited Japan and was able to meet that soldier again. He was photographed carrying the soldier, Mr. Kanami.

Photograph courtesy UAA archives

Figure 4. Fred Schroeder, a storekeeper and trader, lived in Attu for part of each year, where he would buy fox furs from villagers. He helped the Attuans pay for construction of their new church by advancing lumber against their season's trapping. Schroeder's wife never visited the island, but every year she sent a dress to each woman , along with toys for the children (*May 1936*).

Photograph courtesy Aleutian-Pribilof Island Association

Figure 5. The Coast Guard was devoting special attention to Attu because Japanese fishing vessels were suspected in the area. In May 1942, the seaplane tender *Casco* asked Attu chief Mike Hodikoff to show the officers good landing spots near Attu.

List of Attuans who died during internment in Japan compiled from Murray 2005. Forty people came to Otaru, but only 24 left. Twenty-one people died, including four of the five babies born while they were in Japan. The main hardship of internment in Japan was the lack of healthful food.

Artumonoff, John – b. 1882, d. 1942 on Attu

Artumonoff, Mavra – b. 1924, d. 1944

Artumonoff, Peter – b. 1920, d. 1944

Borenin, Annie Golodoff – b. 1919, d. 1943

Golodoff, Artelion "Arty"
(Angelina's baby) b. and d. 1943

Golodoff, Harman (Garman) – b. 1888, d. 1945

Golodoff, Helen – b. 1929, d. 1944

Golodoff, Lavrenti – b. 1900, d. 1945

Golodoff, Leonti – b. 1931, d. 1943

Golodoff, Mary – b. 1895, d. 1943

Golodoff, Michael (Julia's baby) b. and d. 1943

Golodoff, Valvigian (Valirjian) – b. 1939 , d. 1943

Hodikoff, Anecia (Mike H.'s baby) b. and d. 1943

Hodikoff, Fred (Fedosay) – b. 1901, d. 1945

Hodikoff, George – b. 1929, d. 1945

Hodikoff, Michael Gorga "Mike"
(Chief) – b. 1893, d. 1945

Lokanin, Gabriel (Mike L.'s baby) b. and d. 1944

Lokanin, Tatiana – b. 1941, d. 1944

Prokopioff, Anecia Kriukov (Golodoff) – b. 1886, d. 1942 enroute to Japan

Prokopioff, Mary – b. 1929, d. 1943

Prossoff, Bladimir – b. 1932, d. 1943

Prossoff, Martha Hodikoff – b. 1903, d. 1943

Figure 8.

The Attuans were given the cremated remains of those who had died in Japan, and they put all the boxes of bones of those who had died together in a big box (*Lokanin 1988*). Unfortunately, the bones were left in Okinawa on the way back to the United States (*Prossoff 1988*). The box of remains was eventually recovered and buried in Atka.

The Attuans flew on their first plane when leaving Japan. From Manila, they boarded a ship and set out for San Francisco. It took 10 or 11 days, Nick Golodoff remembers, but it seemed forever until they went under the Golden Gate Bridge. Red Cross workers met the boat and took the Attuans to a hotel, giving them money for lodging and clothing. They walked around and explored San Francisco for over a week.

They took a train to Seattle; some were left at the tuberculosis hospital in Tacoma (*Prossoff 1988*). They attended services at a Russian Orthodox church. Nick Golodoff remembers learning to ride a bicycle and picking up golf balls for money at a golf course—things he would never have done at Attu or Atka.

The remaining Attuans finally boarded a military barge to return to the Aleutians and arrived in Atka on December 21, 1945 (*Lokanin 1988*). They had hoped to return to Attu, but were told they had to go to Atka instead because there were not enough people to resettle Attu. Sixteen survivors were dropped off in Atka.

The Atkans had not yet recovered from their own wartime displacement. They were in the process of rebuilding their village, which the U.S. Army had burned after the residents were evacuated to Southeast Alaska in 1942. The Attuans had to stay with Atka families until the military could build houses for them. Fortunately, Nick Golodoff's mother was from Atka, so she and her children were able to stay with their relatives. Later his mother married an Atka man. Other Attu survivors married Atka residents and began raising new families.

The resettlement in Atka did not go entirely smoothly. The Attuans were unhappy that they could not return to their village, and did not always feel welcome in Atka. One consequence of the move to Atka was the increased rivalry in basketry between the villages. The Attuans and Atkans had different basket-weaving styles and kept them secret from each other. The Attuan women no longer had access to their own favorite kind of grass, nor did they know the Atka women's secret gathering locations (*Shapsnikoff and Hudson 1974*). The Attuan style, previously known as the finest Unangan basketry, died out with the Attuan women.

The Attuans' first-person accounts of internment in Japan differ in details, as would be expected in remembering traumatic events decades earlier. Japanese and American accounts are filtered through the wartime climate of loyalty to one side or another. Nick Golodoff's child's-eye version of events omits any wartime feeling of Americans versus Japanese, whereas Unangan adults included more patriotic statements. Similarly, Nick Golodoff does not recall hostility between Attuans and Atkans after his family was resettled there. He is a loyal Atka resident and almost always wears a hat that says "Atka" on it.

The Unangan accounts often include the phrase "We were told…" Whether by the U.S. government, traders, or Japanese soldiers; the Attuans were accustomed to being told what to do. The omissions in adults' memories, and reluctance to talk about the years of interment, appear to be a defense mechanism against reliving the painful events. Some former residents were willing to tell about life in Attu before the war, but refused to talk about their traumatic experiences in Japan. Nick Golodoff (*Figure 8*) has a unique perspective, and his forthcoming memoir, Attu Boy, will be the fullest account yet published of the Attuans' experience in Japan.


Photograph courtesy Aleutian-Pribilof Island Association

Figure 6. Japanese soldier with one of the children on Attu, 1942.


Photograph courtesy Aleutian-Pribilof Island Association

Figure 7. Alex and Elizabeth Prossoff, wearing the numbers issued by the Japanese military. During the Japanese invasion of Attu, Nick Golodoff hid with this couple in a barabara (sod house).


Photograph courtesy Brenda Maly

Figure 8. Nick in Atka.

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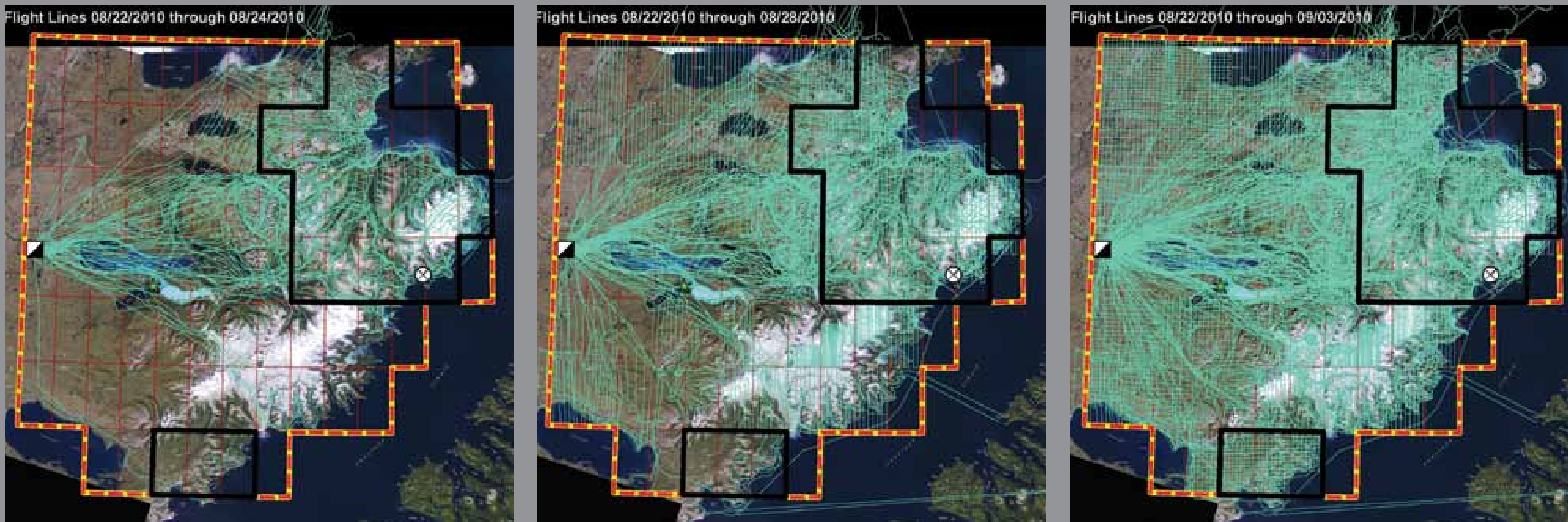

Figure 1.

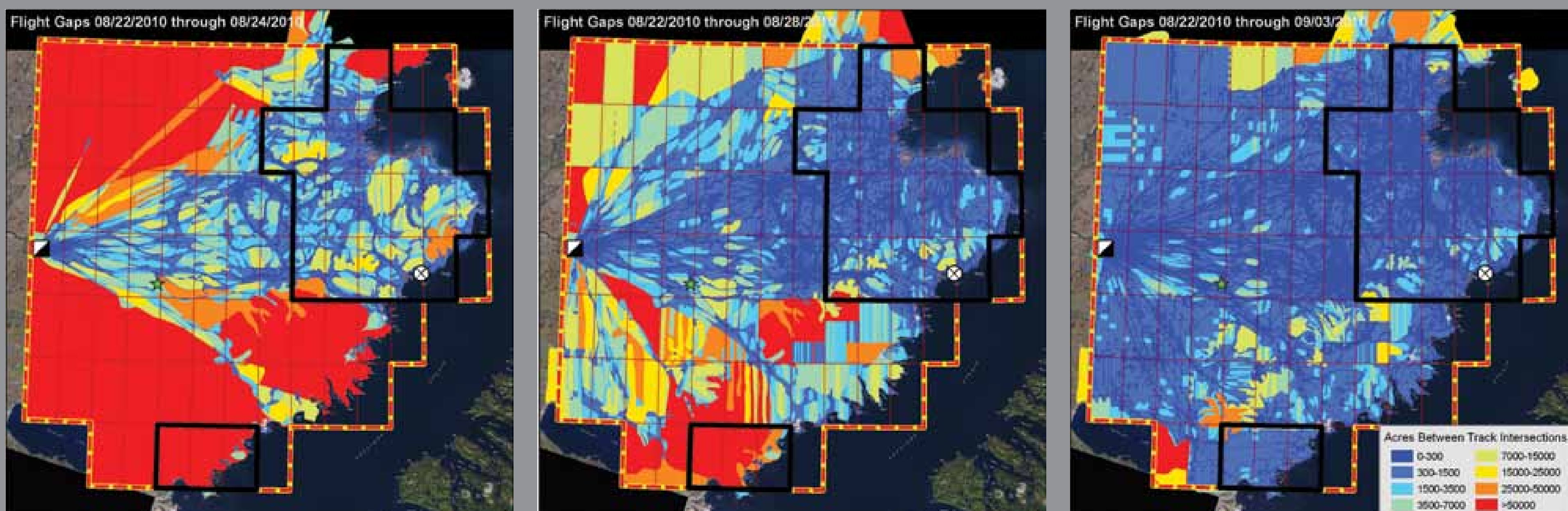

Figure 2.

Behind the Scenes: Geospatial Technologies Used at Branch SAR

By Angie Southwould, Joshua Scott, and Whitney Rapp

The objective of any search and rescue (SAR) mission is to locate and provide aid to persons who are missing and feared to be in distress. A priority during this type of operation is to minimize loss of life, injury, and property loss or damage of the missing subject as well as mitigate similar risks to rescue personnel. A SAR incident management team can employ geographic information systems (GIS) to evaluate the current situation and manage the search operation. Maps provide a visual reference that otherwise might be difficult to describe. And by reviewing and analyzing geospatial data, including real-time data collected during the mission, the management team can make better informed decisions when planning search strategies and scheduling resources. Ultimately, the use of GIS during a SAR mission may reduce operational costs and response times by allowing for a systematic approach to searching an area of interest (*US Coast Guard 2009*).

Figure 1. The accumulation of mission reporting data downloaded daily from search aircraft GPS receivers.

Figure 2. Gap analysis showing progressive coverage of the search by calculating the acreages between search flight paths.

The NPS Alaska GIS community provided valuable support during the Branch SAR effort in Katmai National Park and Preserve, after a single engine floatplane carrying three NPS employees and a pilot went missing on August 21, 2010, near Swikshak Bay (*Figure 3*). Geospatial technologies were integrated into the daily operations as new search data were collected, analyses were performed, and updated maps were generated. The SAR GIS team processed a daily workflow and worked with the Incident Commander and Planning and Operations sections to develop re-usable tools for use during and beyond this single incident. The Branch SAR GIS was kept current with the most recent data at all times and was utilized in the daily planning process to provide situational awareness and safely maximize resources.

During a SAR mission, visualizations are frequently requested. To create timely and effective maps, a SAR GIS team must have access to accurate and relevant base data, as well as mission data that has been captured on handheld Global Positioning System (GPS) units. Since a SAR operation is time critical and the data being collected is always changing, a structured geospatial workflow and file structure must be established early in the operation; it should include the retrieval and integration of newly collected data also.

During the Branch SAR effort, the SAR GIS team and Alaska Region GIS team worked together to assemble the most current and useful base data to underlie the mission data. By integrating existing imagery and other data already in the NPS Alaska GIS data stack with newly received data from GeoEye, FAA, and military sources, the SAR GIS team was able to establish "best available" base layers on which to build maps and perform analyses.

With base layers established and mission reporting data constantly updated, GIS was used to plan air operations: search missions did not overlap, and the search area had comprehensive coverage. During pilot briefings each morning, pilots received custom quadrant maps of their individual search areas for the day. The SAR GIS team developed a script to automatically create these 84 customized maps so that the map series could be easily regenerated with different base layers and features, to emphasize specific topographical elements and search focuses.

Each search aircraft also carried a GPS unit specifically for tracking the day's flight path. After the data was downloaded from the units each night, it was combined with aircraft tracks from that day and all previous days to produce a cumulative dataset (*Figure 1*). In addition to the information generated by the GPS units, the SAR GIS team populated valuable attribute information such as pilot name, aircraft tail number, and conditions that were encountered during the flight. Information on the probability of detection in the areas covered were recorded on pilot debrief forms and entered into the geospatial database. This was then related back to the flight lines and search areas. The maps that were most useful to the SAR Incident Management Team integrated this data with elevation data and annotated satellite imagery to provide an accurate depiction of the search progress along the area's landforms, vegetation, and other resources.

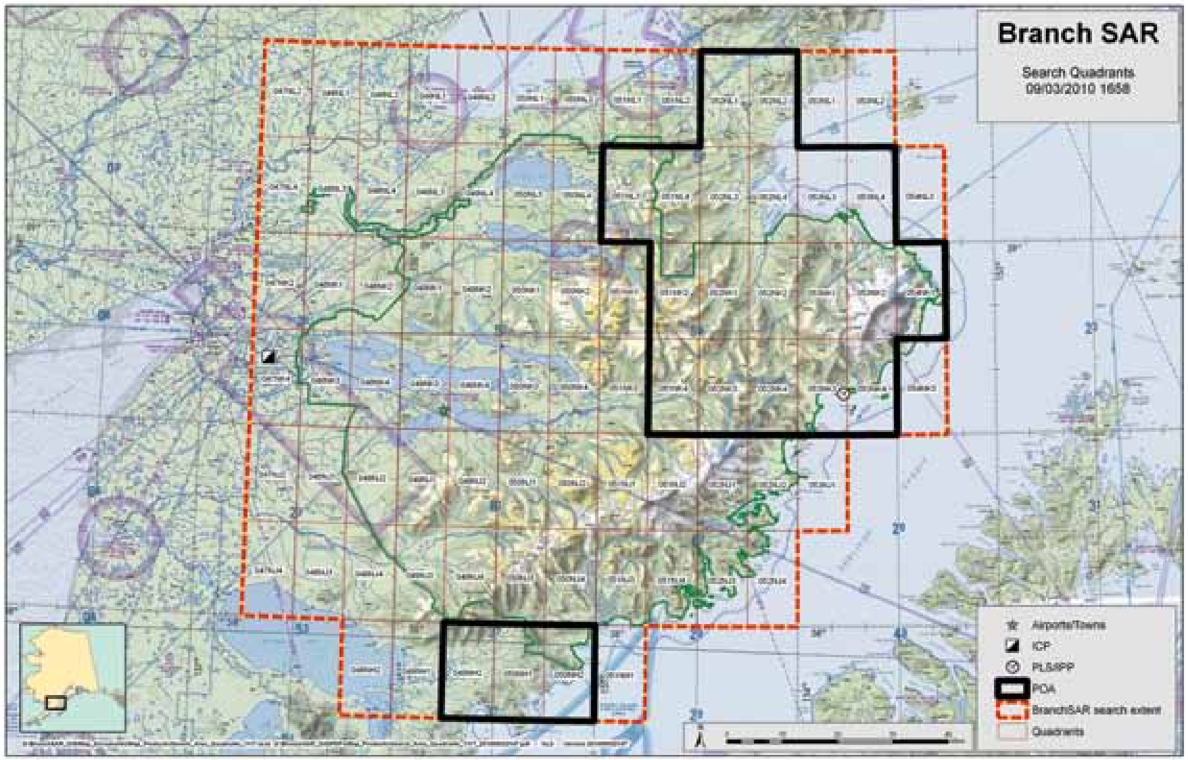

Figure 3. Map of the search area and 15-minute search quadrants generated for Branch SAR.

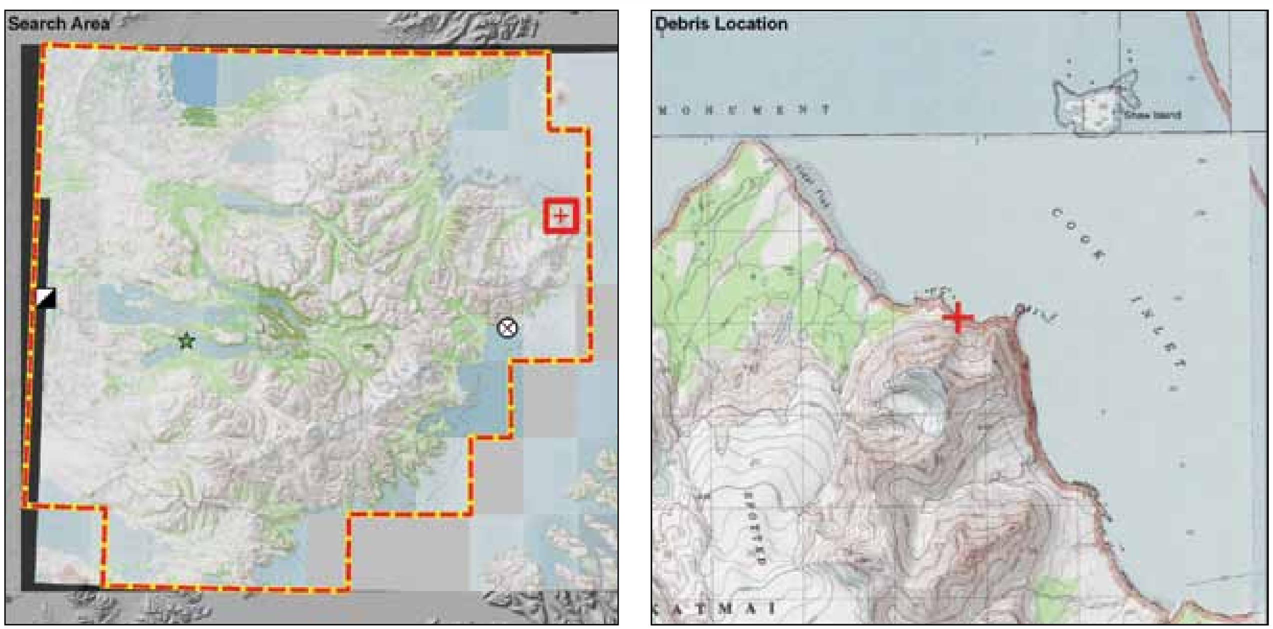

Figure 4. Location of debris from missing aircraft that was found on September 29, 2010.

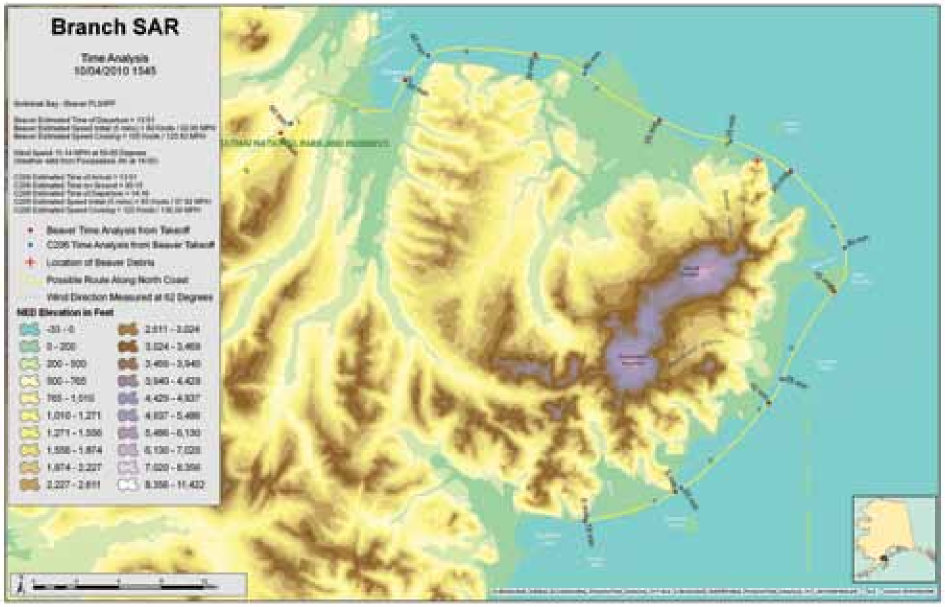

Figure 5. Time-distance analysis map generated for Branch SAR showing possible time lapse between aircraft.

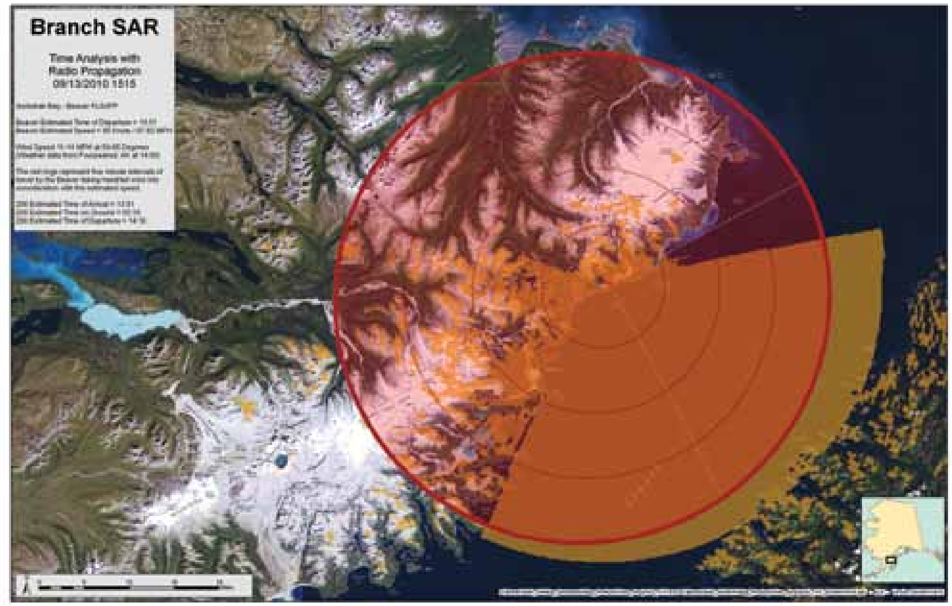

Figure 6. Time-distance analysis map generated for Branch SAR showing possible travel distances in five-minute intervals.

Not only were daily maps generated to produce current visualizations of the search progress, but the underlying data was used to help spatially analyze the search area coverage. Initially, pilots searched areas based on terrain and the most likely routes the missing aircraft may have taken. As more resources became available, a more methodical approach was taken, where pilots flew one mile intervals across 15 minute (9 x 17 mile) quadrants in both the north-south and east-west directions forming a grid-like pattern of flight tracks. By examining all these flight paths and determining the areas between intersecting tracks of the searching aircraft, the SAR GIS team developed custom analysis to show the overall search density (*Figure 2*). This information was updated and visualized on daily maps and used alongside maps displaying the current probability of detection to help the planning and operations sections determine where to send resources for additional searching.

Additional distance and directional analyses were completed in the area immediately surrounding the last known location of the missing aircraft. Variables including the estimated time of departure, aircraft cruising speed, and wind speed and direction at that time were used to map possible routes the aircraft may have flown. These calculated routes were overlaid with maps of radio propagation and compared against another aircraft in the vicinity of the disappearance for possible points of overlap in radio communication.

Geospatial software, hardware, and data are likely the best technology available at this time to accurately process and efficiently manage the voluminous amount of data associated with an air search of this magnitude. During the Branch SAR effort, there were up to a dozen small aircraft, three civilian helicopters, Coast Guard C-130 and Jayhawk, and National Guard C-130 and Blackhawks in the air and collecting data on any given day. These aircraft covered the rugged terrain of an area exceeding four million acres and in two weeks accumulated more than 60,000 miles of search flights. Without the geospatial tools to visualize and analyze this information, the SAR Incident Management Team could not have operated as systematically and effectively as they did. GIS was used throughout the duration of this search mission and the SAR GIS team worked diligently to support this effort by providing the planning and operations sections with up-to-date maps and analysis results so they could make the best informed decisions possible. The workflow used by the SAR GIS team, including the procedures developed to make the most out of the incoming data, were documented and developed in such a way that they can be reused or expanded upon should another emergency situation arise in the future.

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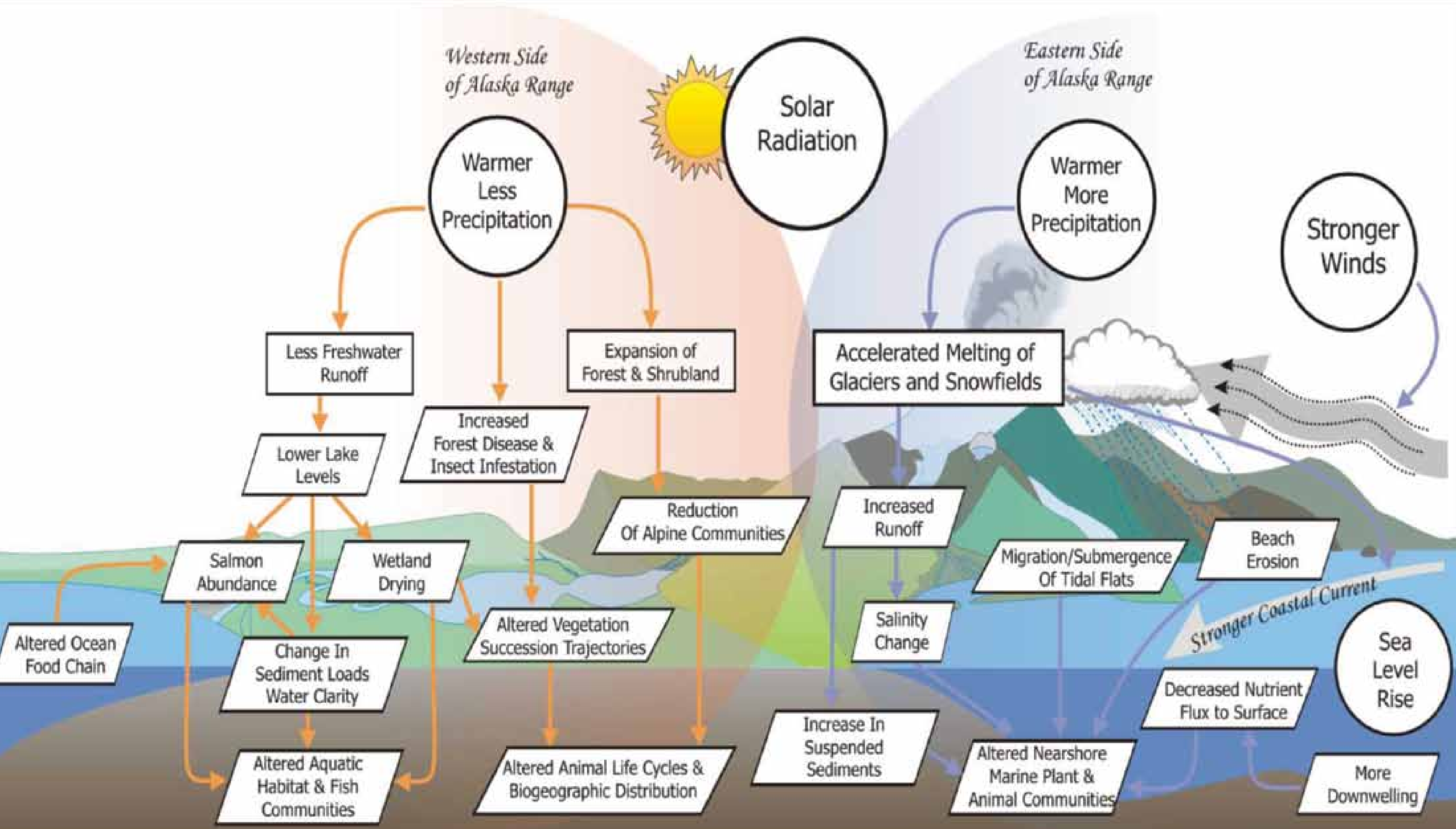


Western Side of Alaska Range
Solar Radiation
Eastern Side of Alaska Range
Warmer Less Precipitation
Warmer More Precipitation
Stronger Winds
Less Freshwater Runoff
Expansion of Forest & Shrubland
Accelerated Melting of Glaciers and Snowfields
Increased Forest Disease & Insect Infestation
Lower Lake Levels
Reduction Of Alpine Communities
Increased Runoff
Beach Erosion
Migration/Submergence Of Tidal Flats
Salmon Abundance
Wetland Drying
Stronger Coastal Current
Altered Ocean Food Chain
Altered Vegetation Succession Trajectories
Salinity Change
Sea Level Rise
Change In Sediment Loads Water Clarity
Decreased Nutrient Flux to Surface
Increase In Suspended Sediments
Altered Aquatic Habitat & Fish Communities
Altered Animal Life Cycles & Biogeographic Distribution
Altered Nearshore Marine Plant & Animal Communities
More Downwelling

Using Scenarios to Prepare for Climate Change in Alaska National Park System Areas

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

Introduction

Changing climatic conditions are rapidly impacting environmental, social, and economic conditions in and around National Park System areas in Alaska (*Figure 2*) With over 50 million acres of parklands to administer, Alaska park managers need to better understand possible climate change trends to better manage arctic, subarctic, and coastal ecosystems and human uses of these areas. National Park Service (NPS) managers have been exploring scenario planning as an alternative approach for science-based decision-making in the face of an uncertain future. With the magnitude and effects of climate change uncertain across various parts of Alaska, scenario planning allows us to develop and test decisions under a variety of plausible climate futures that are grounded in the most current science. Scenarios are not forecasts, but offer a range of possibilities for the future, providing a framework for recognizing and adapting to change over time (*Figure 3*). Climate change scenarios will help prepare Alaska park managers for looming changes, to make informed decisions with the least regrets for future outcomes.

Figure 1. SWAN Climate Warming Model. Manifestations of a warming climate on Southwest Alaska Network ecosystems, habitats, plants, and animals. The changes associated with climate warming include sea-level rise, greater storm intensity and frequency, altered patterns of seasonal runoff, rapid glacial retreat, and shorter duration of lake ice cover.

NPS and the University of Alaska Fairbanks Scenarios Network for Alaska Planning (SNAP) are collaborating on a three-year project to help Alaska NPS managers, adjacent landowners, and key stakeholders to develop plausible climate change scenarios for all NPS areas in Alaska. Final products will include climate change scenario planning exercises and reports for all the NPS units in Alaska, with efforts organized around each of the four NPS Inventory and Monitoring (I&M) networks.

Scenario planning is a well tested tool with business and government applications for a number of important questions, including the implications of climate change (*Schwartz and Randall 2003*). The NPS has worked with the Global Business Network (GBN), an international leader in scenario planning, and other partners to tailor the scenario planning process for climate change in and around parks. While the basic scenario planning process remains similar to each other, the results are as unique as the areas on which they are focused. This article summarizes the process using examples from a workshop focused on southwestern Alaska.

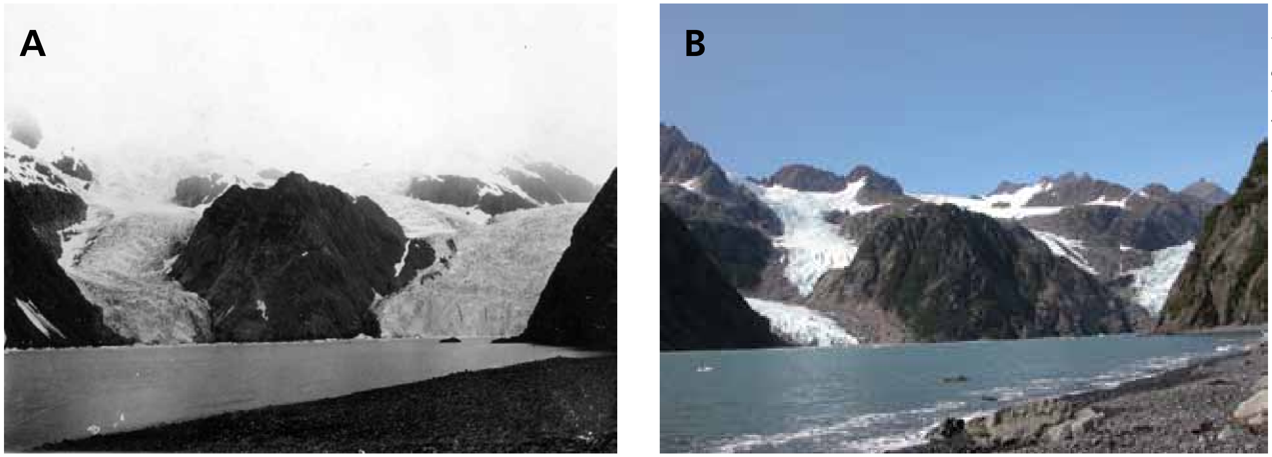
Stage one in this project was a training workshop on climate change scenario planning in August 2010, facilitated by GBN. Participants learned how to develop scenarios based on frameworks of critical uncertainties, and then fleshed out the beginnings of scenarios for two pilot parks, Kenai Fjords National Park and Bering Land Bridge National Preserve. Webinars were held weekly before the workshop to orient trainees to the scenario-building process, climate projections, and associated climate effects. The training workshop included key personnel with NPS parks and I&M networks in Alaska, NPS Climate Change Response Program staff, major adjacent area land managers, SNAP and climate change scientists.

Two climate change scenario planning workshops were recently completed in Anchorage, Alaska. The first one occurred in February 2011 and addressed park areas in the Southwest Alaska Network (SWAN), which includes Kenai Fjords, Katmai, Lake Clark, Aniakchak, and Alagnak. Draft summary results of this workshop are provided in this article. The second workshop addressed two parks along the northwestern coast of Alaska, Bering Land Bridge and Cape Krusenstern, and was completed in April 2011. Participants included representatives from the parks in question, NPS staff from the Anchorage office, UAF-SNAP personnel, and key individuals from other agencies, businesses, and community stakeholders in the region. Thirty-four individuals contributed a wide range of perspectives and expertise to the inputs and outcomes of the SWAN workshop, and 26 individuals participated in the second workshop.

Summary of the SWAN Workshop Process and Results

Preparations

A reading list provided to participants suggested advance reading of two books and a paper: "Beyond Naturalness" (*Cole and Yung 2010*); "The Art of the Long View" (*Schwartz 1996*), and "Understanding the Science of Climate Change – Talking Points Impacts to Alaska Maritime and Transitional Zones" (*Jezierski et al. 2010*). Before the workshops in Anchorage, participants took part in three



USGS photographs by Bruce F. Molnia

Figure 2. A pair of northwest-looking photographs taken from near the head of Holgate Arm, Aialik Bay, Kenai Fjords National Park. The pair documents significant changes to glacier ice thickness and extent that have occurred during the 95 years between July 24, 1909 (A) and August 13, 2004 (B).

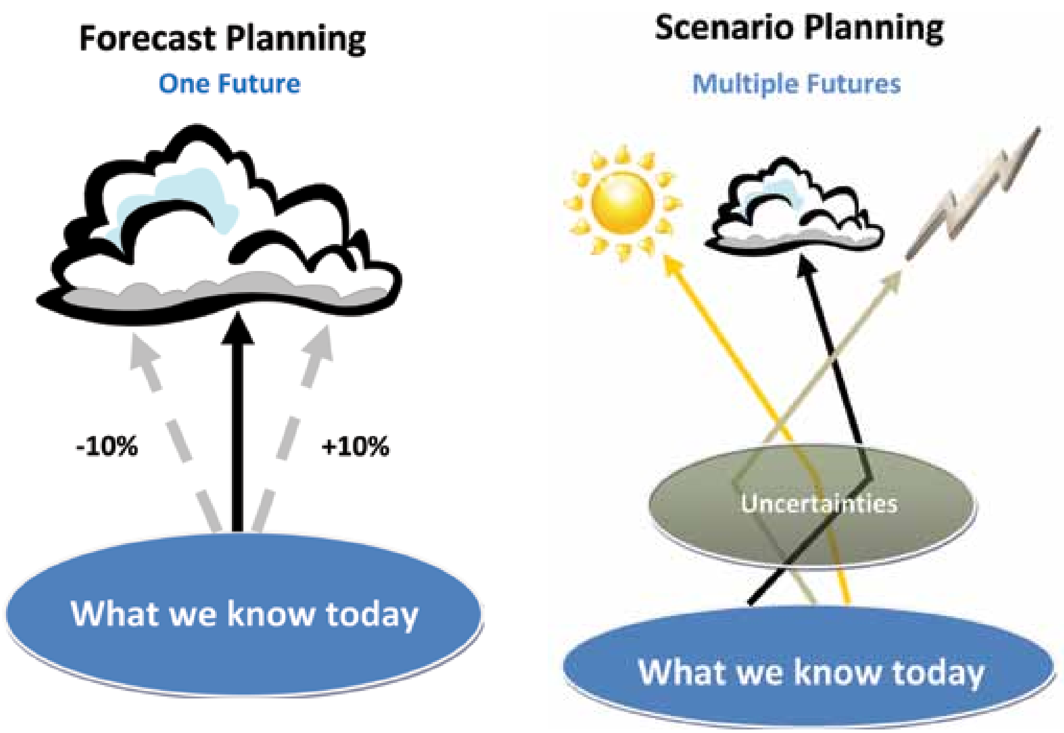


Figure 3. Scenario Planning (B) compared to Forecasting (A). Scenarios recognize the inherent unpredictability of complex systems, and consider a range of possible futures. Scenarios ask the question "What if?", and consequently they provide a richer background for decision making.

pre-workshop webinars. These webinars covered: an introduction to scenarios planning; overview of Alaska climate change scenario drivers appropriate for the SWAN network area; and potential climate change effects, based primarily on reviews of published literature. The webinar presentations that are available on a webpage (*Fresco 2011*) include: SNAP projections for temperature, precipitation, thaw date, freeze date, and season lengths in the affected areas at various times into the future; climate change driver tables; and effects tables.

Summary

The workshop began with a plenary session on the fundamentals of scenario planning. Scenarios are intended to be stories of divergent yet plausible, relevant, and challenging futures that stretch thinking and provide a tool to navigate change. Scenario development involves five steps: **orient**, **explore**, **synthesize**, **act**, and **monitor** (*Figure 4*).

Orient

In step one, participants considered strategic issues that were framed in focal questions: "How can NPS managers best preserve the natural and cultural resources and values in their jurisdiction in the face of climate change?" and, "How will climate change effects impact the landscapes in which management units are placed over the next 50 to 100 years?" For the second focal question, participants considered the SNAP climate projections for temperature, precipitation, and freeze dates or unfrozen seasons (*see Figure 5 for an example of model output*). These model outputs were generated based on the average of five global circulation models used by the Intergovernmental Panel on Climate Change (IPCC). SNAP selected the best-performing climate models for Alaska. For more information about SNAP methods, see www.snap.uaf.edu.

Explore

In step two, participants discussed critical forces of climate change that could affect parks (*Figure 1*). Critical forces, in this case, projected climate variables, were prioritized based on having high impact and uncertainty. Participants then divided into two groups, to explore and select two critical climate variables to frame into a scenario matrix, producing four futures (*Figure 6*). In the next stage of the workshop, each group nested the four climate futures in a matrix representing varying degrees of public concern and of institutional involvement with climate change, producing 16 futures (*Figure 7*).

Synthesize

In step three, participants selected three to four scenarios from the 16 futures to turn into descriptive narratives. Scenarios were selected based on the criteria of being: Plausible, Relevant, Divergent, and Challenging. From each scenario, participants identified a set of implications or "effects," which were drawn both from the effects tables discussed during the webinars and the participants' professional and personal experiences. Following this the implications and potential consequences were folded into a narrative.

Act

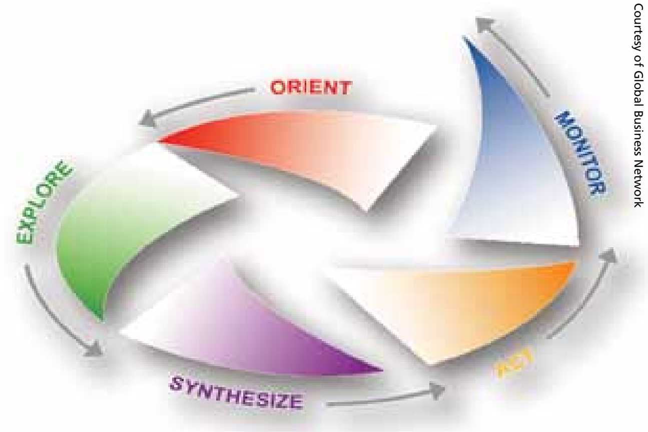
Groups then outlined future actions appropriate to each selected scenario. These potential actions formed the initial part of step four. The next part of step four was to identify "no regrets" actions; that is, actions that could provide substantial mitigation or adaptations to all potential futures. The final step in the process will be to monitor effects of actions over time and continue to validate the scenarios, adjusting action strategies, as needed.

This process is summarized for the SWAN riverine group. The group explored "climate drivers" for the bioregion (*Figure 8*) and also considered other critical drivers such as: volcanic eruptions (local acidification); major climatic cycles – Pacific Decadal Oscillation (PDO), Arctic Oscillation (AO), and Jet Stream changes; and variable stream flows. They ultimately selected two from the following short list of climate drivers: precipitation (variability), temperature (variability), thaw days (more or fewer), and PDO (warm/cold phase shifts). They refined their list to just thaw days (more or fewer days above freezing) and precipitation (low/high variation). PDO effects (multi-year cycles of warming and cooling) were combined with thaw days, creating a cool phase PDO with fewer thaw days and a warm phase PDO with more thaw days to push extreme possibilities.

The group then described the conditions that would likely result from each of the four combinations of thaw days and precipitation (*Figure 6*), and assigned a descriptive name to each scenario.

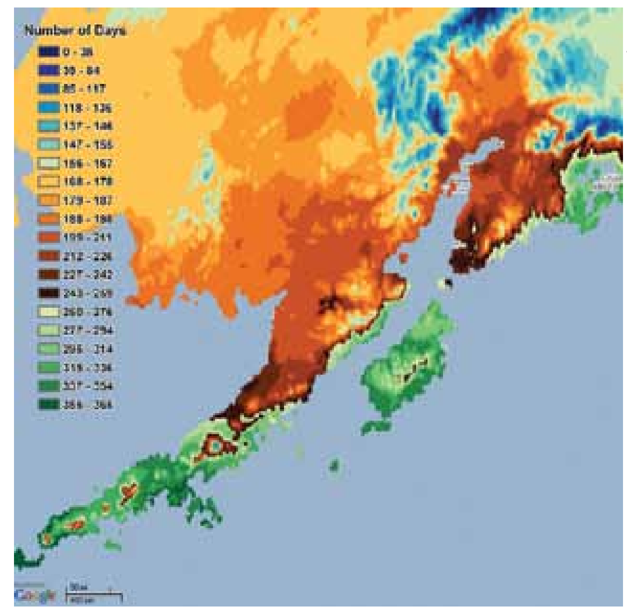
1. The climate scenario from the upper left quadrant of Figure 6, named "Smokey", would be expected to result in the following environmental conditions: drought stressed vegetation; increased incidences of disease and pests; longer growing season; maximum shrub expansion (with less overland access); long-term reduction in stream flows; initially higher stream flows from seasonal glacial melt; reduction and eventual loss of glaciers; long-term reduction in stream flows; increased fire on the landscape; fewer salmon fry surviving due to their smaller size; more difficult access by waterless water with warmer and drier conditions, and less precipitation so barge transports on Naknek Lake and Lake Clark are reduced; fewer biting insects; decreased waterfowl; exposure of cultural resources; lowering of groundwater tables; more fugitive dust from mining should a Pebble Mine be developed; increased competition for water; use; and decreased subsistence travel over water and snow (*Figure 9*).

2. "Juneau /Helly Hansen" is the climate scenario from the upper right quadrant of Figure 6 and would be expected to result in the following environmental conditions: increased rain on snow events (increased flooding); thicker vegetation; increased erosion; increased lightning; increased evaporation (soil drying); more berries (good habitat for bear, moose, caribou); decreased area of alpine tundra; arrival of black bear;



Courtesy of Global Business Network

Figure 4. Stages in the scenarios building process. The Scenario Planning cycle mirrors familiar elements of Adaptive Management and Structured Decision Making.



Courtesy of UAF-SNAP

Figure 5. Example of UAF-SNAP climate projections for unfrozen season length in the 2090s.

increases in waterfowl; increased impacts to park infrastructure; decreased backcountry use (due to rain and reduced flying days); increased hurricanes; decreased salmon production due to flooding; increased contamination due to runoff events; increased avalanches (*Figures 11-12*).

3. "Freeze-Dried" is the climate scenario from the lower left quadrant of Figure 6 and would be expected to result in the following environmental changes: persistent permafrost; decreased productivity of plants and berries, with associated wildlife impacts; continuing overland access; intensified competition for water resources between communities and mining; stable facilities and infrastructure; slow retreat of tundra ponds; extension of the range of Dall sheep; stable lichen ranges support caribou; high wind potential develops; and brown bear populations decrease (*Figure 13*).

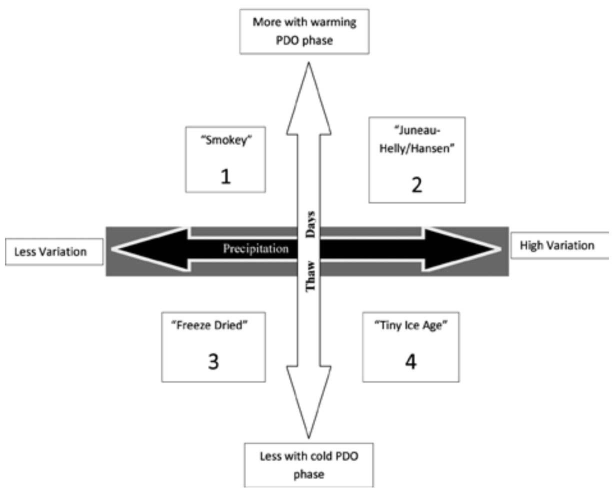


Figure 6. An example climate driver matrix produced by the SWAN riverine scenarios planning group.

4. "Tiny Ice Age" is the climate scenario from the lower right quadrant of Figure 6 and would be expected to result in the following environmental conditions: stable to larger glaciers; viable winter travel access; moderate pests and diseases and extreme weather events that may impact salmon (*Figure 14*).

Nested Scenarios

Each of the four climate scenarios described above were nested within a larger social/institutional framework (*Figure 7*). This framework explored how each story might play out in a world with greater or lesser degrees of societal concern and institutional commitment. We altered the GBM framework slightly, redefining the horizontal axis as "institutional" rather than "governmental", and at national, state, and local scales rather than at national and international scales. Because 16 scenarios present far too many possible futures for anyone to fully consider, the riverine group selected the three scenarios highlighted in red. One of those is described below as an example.

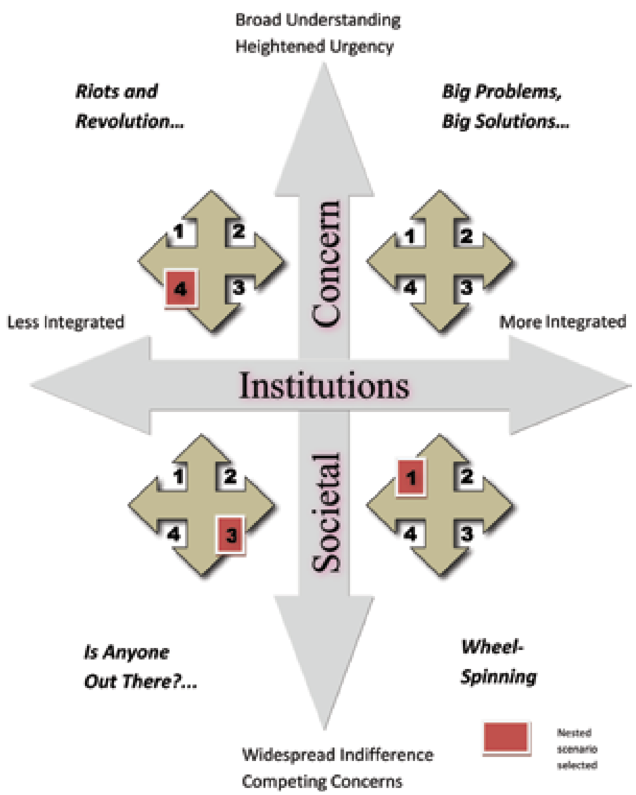


Figure 7. Matrix showing riverine climate scenarios nested in a social/institutional framework. Each quadrant yields four linked scenarios; three are selected in red. The details of these three are described in the text.

The following is one example scenario that includes future implications, important management actions, research and information needs. A descriptive narrative was also developed to illustrate how the scenario could affect people and managers. It is important to reiterate that a scenario is not a prediction, but rather an assessment of what could result if the conditions defined by the scenarios matrix were to occur.

Nested Scenario 3 "Freeze-Dried" is framed in a social context referred to as "of riots and revolution." The potential future implications under the conditions described for this scenario included numerous changes to natural, cultural, and subsistence resources, socioeconomics, and facilities. This scenario differed from the others in that salmon resources could be severely decreased, plant vegetative growth would be limited, and significant economic and cost of living issues would occur.

This scenario would result in cool and dry conditions with less water, yielding poor conditions for salmon reproduction, less snow, and large shifts in wildlife distributions and populations. Historical and archeological resources would not be seriously affected, but conflicts could increase between subsistence, sport, and commercial user groups regarding access, seasons, and allocations for increasingly limited resources. Access over snow and river would be reduced, making access for local area residents limited and difficult. Fewer locals would retain their commercial fishing permits, with rising cost of living, and increased fuel costs. High governmental deficits, inflation, and less funding for land management would further impact rural communities. Coupled with an increased cost of living would be a reduction in fish and wildlife resources for subsistence, resulting in more rural residents moving to urban and regional population hubs. Local communities would suffer a loss of traditional values and behaviors including diminished sharing and the use of Traditional Ecological Knowledge. The dry conditions would increase the risk and occurrence of wildland fires, but most facilities would not be severely damaged.

Important management actions would include intensive management of fish and wildlife resources. Federal harvest preference for local rural residents would be triggered. Current and future critical habitats for fish and wildlife would be protected, including migration routes, breeding grounds, and ecosystem services. A more flexible process for adjusting harvest of resources to reflect rapidly changing conditions would be devised. Federal local hire authority would be greatly enhanced. Long-term funding for managing invasive species would be secured. Future climate change scenario workshops would need to make a greater effort to include important stakeholders.

Research and information needs would include an intensified science outreach and education effort to multiple audiences. A higher understanding of Alaska's protected areas in the global context would be presented. Funding for interdisciplinary studies would be acquired, and social scientists for the Landscape Conservation Cooperatives and Climate Science Center in Alaska would be hired to balance the biologists. An ethnography and oral history program would be initiated to document important cultural information. Communications between the Alaska Landscape Conservation Cooperatives (LCC) would be enhanced, and the Bristol Bay area and its fisheries would be addressed under one LCC. Climate change models would be validated with inventory and monitoring data going forward in time.

Narratives

Climate change scenarios can be used to create multiple outreach tools to assist land managers and to educate the public. One such product is a set of imaginative narratives or stories that help to visualize and synthesize a range of plausible yet divergent futures. As an example, the following narrative was created to synthesize this climate change scenario. This narrative envisions an open letter to Senator Will Goforth, from the Alaska Peninsula Mayors Council, hypothetically published by the Alaska Daily News in July, 2030 (*Figure 10*).

The process should be refreshed periodically as important new information becomes available. Park managers, park neighbors, and stakeholders can prepare for uncertain future conditions by using the best available scientific information and climate projections to create plausible, divergent, relevant, and challenging future climate change scenarios. Working through scenarios, and considering their implications to Alaska's national parks and surrounding areas can help us all better prepare for uncertain future conditions in face of climate change.

	Uncertain	High Certainty	Important
Temperature		X	X
Precipitation	X		X
Freeze-up date		X	
Length of ice free season		X	
River/stream temperatures		X	
Length of growing season		X	
Water availability (stream flow)		X	
Relative humidity	X		
Wind speed		X	
PDO	X		
Extreme events (temperature)		X	
Extreme events (precipitation)	X		
Extreme events (storms)	X		
Soil moisture			

Figure 8. Climate Drivers rated for certainty and importance by the riverine group. HC = highly certain and UC = uncertain.

NPS photograph by Page Spencer

Figure 9. Beetle-killed forest above Tuxedni Bay in Lake Clark. Warmer air temperatures have already increased the severity of insect pest outbreaks in Alaska, including spruce bark beetles, with devastating ecological and economic effects.

Dear Senator Goforth,

We the undersigned appreciate your many years of wise public service and support for Alaska's coastal communities. We are writing today to ask your help again in dealing with a crisis for which government agencies seem unable or unwilling to help our communities. You are well aware of the importance of community, place, and subsistence to rural Alaskans.

While most people in our communities still live a subsistence lifestyle, it has become harder to subsist, and harder to maintain a viable community. After more than a decade of diminishing stream flows and sharply declining salmon returns, many local fishermen have been forced to sell their salmon permits, their livelihood, and their family legacy to out-of-state businesses. After our fish processing plant closed, more people left to seek wage work elsewhere. We were devastated when school enrollments dropped below the minimums. Because schools have closed, there will soon be few younger people and families left in the community. With the prohibitively higher costs of fuel and electricity, we are thankful that some residents still have good paying jobs in government and community services. But the number of such positions has also declined with falling tax revenues. A few residents found jobs with new construction, wind farms, and mining operations on nearby state and corporation lands, but most good jobs seem to be filled by Outsiders.

Federal and state agencies have compounded the challenges faced by our communities. For example, with the loss of salmon, we have increasingly looked to hunters to provide for our aging residents. The decades-long drought, coupled with a history of water resources mismanagement, deforestation by wildland fires and mining impacts, and steadily increasing federal predator protection, has made it increasingly necessary for hunters to travel long distances to find harvestable wildlife. Agency regulators don't appreciate that the changed landscape and unrealistic hunting seasons make access by boat, foot, and snow machine unreliable. Now, those same agencies are working against our hunters, by denying use of ORVs for access to game on government lands. Senator, we need the agencies to work with our public, not against us, and we desperately need more good jobs in our rural communities before our young families all move away to hub communities and urban areas.

Today, we ask for your sponsorship of the "Salmon for our Children" bill, a program to fund construction and operation of an expanded network of government-funded community salmon hatcheries. We also ask for your support of a local-hire mandate, provisions for securing any necessary water rights from adjacent federal lands, and reasonable community access to federal lands by ORV in this bill.

Respectfully,
The Members of the Peninsula Mayors Council

Figure 10. Scenario narratives are stories that help participants to visualize a range of divergent, yet plausible, relevant and challenging futures. This example is a hypothetical letter from future constituents to their senator, describing the issues they could be dealing with about 20 years from now and asking the senator for help.

Photograph by Stephen R. Capps

NPS photograph by M. Torre Jorgenson

Figure 11. Tree and shrub expansion near Two Lakes, Lake Clark National Park and Preserve, is illustrated by paired photographs taken in 1928 (A) and 2004 (B). Rising treelines, taller and thicker vegetation would be expected if warmer and wetter conditions prevail.

The climate change scenario planning process does not end with the workshops, reports, and presentations. Rather, they are intended to stimulate creative thinking to address changing but still undetermined future environmental and socio-political future conditions.

NPS photograph by Jim Pfeiffenberger

Figure 12. Flooding of the Exit Glacier Road in Kenai Fjords, in August 2010. A scenario that includes more precipitation as rain, melting glaciers, and drainage from glacial lakes would increase downstream flood hazards.

NPS photograph by Robert Winfree

Figure 13. Healthy fisheries and wildlife depend on healthy terrestrial, aquatic and marine habitats.

Photograph courtesy of Karen Evanoff, Janis Chambers, Gladys Evanoff and Yuzshen Evanoff

Figure 14. Processing salmon at a subsistence fishcamp by Nondalton Village. Subsistence users could experience severe changes to quantity and location of resources as climate and habitat change.

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The Nature of Art
Communicating Park Science, Nature and Culture through Art

By Robert A. Winfree

Art has entwined nature, culture, and science for centuries. Alaska's artistic heritage is part of a long and important tradition for understanding, sharing, and preserving parks and related protected areas (i.e., preserves, monuments, and refuges, hereafter referred to as "parks"). Long before the concept of the parks was framed, artists and their art works were already inspiring support for exploration, and sometimes for protection of the special places they knew.

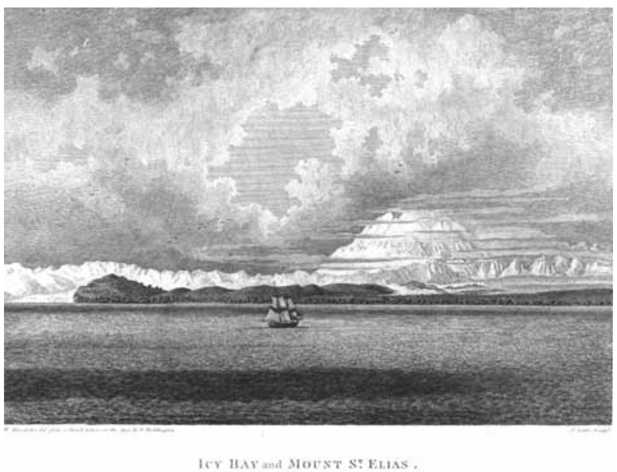


Figure 1. (Left) *Grand Canyon of the Yellowstone*, oil painting on canvas by Thomas Moran,1872.

Smithsonian American Art Museum. Lent by the U.S. Department of the Interior Museum.

Figure 2. (Top) The *Discovery* offshore in Icy Bay with Mount St. Elias in the background, 1794. An engraving from *A Voyage of Discovery to the North Pacific Ocean and Round the World* by Captain George Vancouver.

www.photolib.noaa.gov/bigs/libr0126.jpg

Artists as Interpreters and Advocates for Protected Areas

Artists have accompanied explorers on many expeditions, from which they brought back images of grand vistas, strange and beautiful life forms, diverse cultures, unspoiled skies, waters and landscapes, and some of the earliest visual records of places that would later be set aside as parks (*Figure 2*). Artist George Catlin is credited with having first coined the idea, in 1832, for establishing "a nation's park, containing man and beast, in all the wild and freshness of their nature's beauty" (*Mackintosh 1999*).

When explorers and travelers landed in Alaska, they encountered well-developed indigenous art traditions, which had been refined through thousands of years' experience with wood, ivory, minerals and other natural materials (*Figure 3*). Collectors acquired art for patrons and museums, and artists depicted local arts in their own sketches, paintings and photographs (*Figure 4*). Then as now, art contributed to broader understanding, appreciation, and interest in Native cultures (*Figure 6*).

By the 1850s, field photography had begun to supplement the traditional place of hand-drawn art for making detailed visual recordings (*Balm 2000*); however, the advent of photography did not stifle public interest in other art forms. In the latter half of the 19th century, most of the images from expeditions into the American West were black and white photographs, including those by Thomas Moran's protégé William Henry Jackson. While impressive in their own right, the monochrome photographs did not produce the same impact as a master artist's colorful paintings, notes Alaskan artist Mark McDermott (*personal communication*).

John James Audubon (1785-1851), George Catlin (1796-1892), and other naturalist artists had sparked public interest in the American West well before Thomas Moran joined Ferdinand Hayden's Yellowstone expedition in 1871. When Hayden reported back to Congress, he proposed setting Yellowstone aside as a public park, and accompanied his argument with images by Moran and Jackson. Moran was hard at work on his monumental painting of the *Grand Canyon of the Yellowstone* (*Figure 1*) when the Yellowstone Act was signed into law in 1872 (*Macdonald n.d.*). The painting that Congress purchased from him captured the public's attention and firmly established Moran's reputation as an artist. A year later, Moran joined Major John Wesley Powell's expedition down the Colorado River, and went on to paint many places that were destined to become national parks.

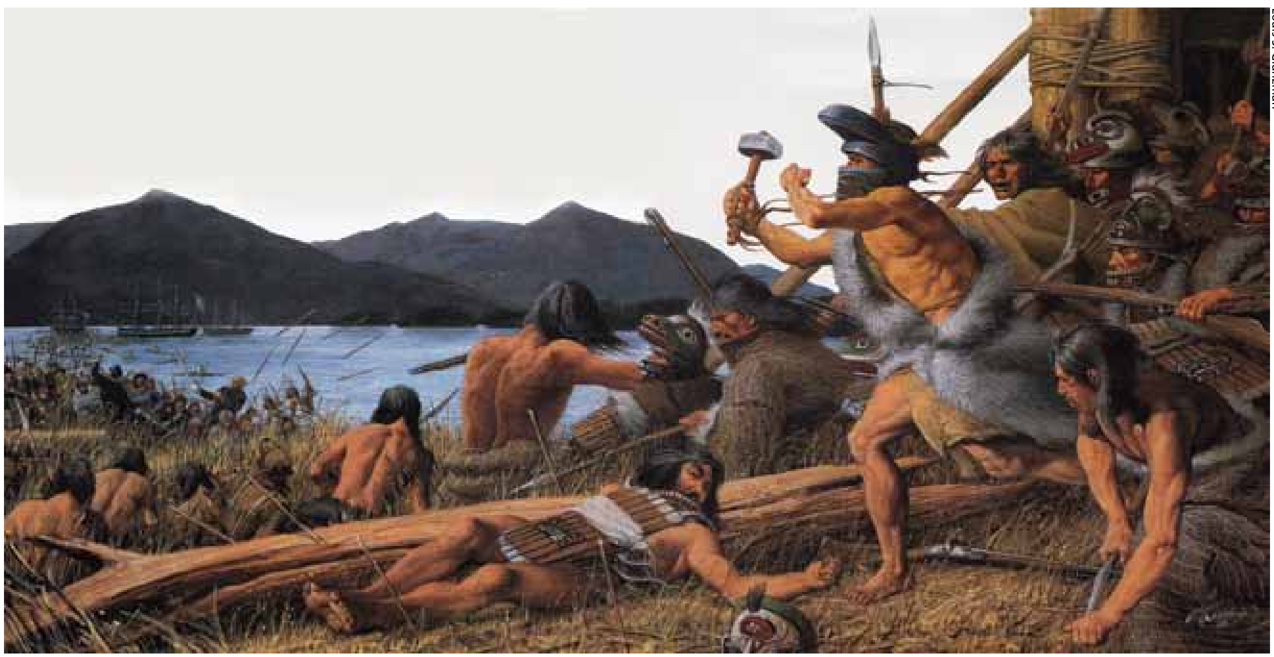
The artists and illustrators working in America's west generally relied on patrons, business commissions, and sales for income, unless they had a family fortune. In 1892, Edward Ripley, who headed the Atkinson, Topeka and Santa Fe (AT&SF) railroad, invited Thomas Moran to return to the Grand Canyon to paint at the railroad's expense. In a stroke of promotional brilliance, Ripley also asked for the reproduction rights to one painting of his choice. The AT&SF distributed thousands of lithographs of Moran's *The Grand Canyon* promoting tourism to western destinations that were served by rail. Tourists flocked west, and the railroad provided artists and illustrators with free travel and a market for selling their works (*Taggett and Schwartz 1990*).

Alaska State Library, P87-0296, Winter & Pond Photograph Collection

Figure 3. (Left) Chilkat chiefs Coudahwot and Yehlh-gouhu, of the Con-nuh-ta-di at Klukwan, photographed wearing woven dance shirts and beaded leggings, standing outside the home of Chief Klart-Reech, about 1895.

Photograph used with the permission of the Caretaker of the Wolf House

Figure 4. (Right) The spruce wood Multiplying Wolf Houseposts were carved and painted by Sitka artist Jim Jacobs (Kichxook, Yeil Nuwu) for the 1904 potlatch (*Thorsen and Knapp 2008*), and photographed by E.W. Merrill by 1929. These houseposts are are on long term loan to the National Park Service from the Kaagwaantaan Wolf House and are exhibited in the visitor center of Sitka National Historical Park.



Louis S. Glanzman

Figure 5. *Battle of Sitka*, acrylic painting on canvas by Louis S. Glanzman, 1988. The artwork depicts the 1804 resistance to Russian occupation by warriors of the Tlingit Kiks.ádi clan. War Chief K'alyaan (Katlian), wearing a carved Raven mask and armed with a blacksmith's hammer, leads the Tlingit charge from their fortified palisade *Shis'kí Noow*.

By the early 1900s, painters were feeling financial pressure from the expanding influence of photography. Some shifted away from representational art, towards other art movements, but photography did not erase the appeal of handmade art. Art's persistence through the centuries stems from the creative and expressive elements of each artist's style, their unique ways of interpreting subjects, and sometimes the artist's ability to frame images not amenable to photographic techniques, such as historic and prehistoric reconstructions (*Figures 5*).

Most of Alaska's national parks, refuges, and wilderness areas (and most of America's) owe their existence, in part, to the accomplishments and support of artists and photographers. Sitka National Monument was established in 1910, with the dual purposes of commemorating an important Tlingit-Russian battle site and preserving and displaying a collection of historic totemic art. The totem poles were originally acquired throughout southeastern Alaska by Territorial Governor John G. Brady for display at the 1904 Louisiana Purchase and 1905 Lewis and Clark Expositions (*Patrick 2002*). They remain a centerpiece of the park visitor's experience today.

Western landscape and wildlife painter Belmore Browne joined Andrew Jackson Stone's mammal collecting expeditions for the American Museum of Natural History in 1902 and 1903. Browne was an accomplished outdoorsman and explorer, who also participated in three pioneering attempts to scale Mt. McKinley between 1906 and 1912. He produced the first known painting of North America's tallest mountain in 1907 (*Woodward 1994*). Browne joined naturalist Charles Sheldon in lobbying Congress successfully for establishment of Mount McKinley National Monument in 1917 (now part of Denali National Park and Preserve).

It would be difficult to overstate the importance of the photographs, etchings, and paintings of Alaska's southern coasts produced by the Harriman Alaska Expedition of 1899 (*Burroughs et al. 1901*). Louis Agassiz Fuertes' bird illustrations, R. Swain Gifford's and Frederick Dellenbaugh's landscapes (*Figure 7*), Frederick

UA903-9, UA Museum of the North

Figure 6. *Eskimo Dance* (#3) In The Kashige, oil painting on board by Theodore R. Lambert, 1937. The dancer in movement interprets "Something Lies over in that Place".

Smithsonian Institution Archives, Record Unit 7243, box 1, folder 8, image #SIA2011-2259

Figure 7. *Camp of Indian Seal Hunters, Head of Yakutat Ba*y, lithograph of a painting by F.S. Dellenbaugh for the Harriman Expedition (Burroughs et al. 1901).

A. Walpole's botanical illustrations (*Figure 8*), Charles R. Knight's mammals, and C. Hart Merriam's and Edward S. Curtis' photographs were more than just documentary recordings. They captured the essence of lands, waters, and peoples still largely unknown to the rest of the world, and interpreted them through the focused eyes of artists. The Harriman Expedition illustrations also provided the visual baseline for assessing change, when their route was retraced by a team of scientists, artists, and writers 100 years later. Alaskan artist, historian, and professor emeritus Kesler Woodward (*Figure 9*) served as artist-in-residence for the Harriman Expedition Retraced.

In 1912, when Novarupta volcano erupted violently on the Alaska Peninsula (*Figure 10*), the National Geographic Society (NGS) sponsored five years of research by Robert F. Griggs and associates. Their work resulted in a series of stunning documentary photographs, magazine articles and a monograph (*Griggs 1922*). Griggs and the NGS used the products of their work to lobby Congress successfully for National Park Service protection, which occurred in 1918.

About the same time, artist, illustrator and author Rockwell Kent found inspiration in isolated coastal Alaska. Critics praised his illustrated book, which described the year he spent with his young son in Alaska's Resurrection Bay (*Kent 1920*). Kent's art and writing influenced the way people would view Alaska, their concept of wilderness and the area that would become Kenai Fjords National Park in 1980 (*Doug Capra, personal communication*). Kent went on to become one of the best recognized American artists of the 20th century (*Cook and Norris 1998*).

By the late 1920s, the commercial markets were in decline for artists. Magazines had shifted to photographs, and many artists and illustrators found it difficult to earn a living (*Taggett and Schwartz 1990*). When the national economy collapsed during the Great Depression, they could no longer look to their patrons for support, and thousands of artists joined the ranks of the unemployed across the country.

Four of President Roosevelt's Depression-era New Deal projects were designed to put artists back to work, use their talents to revive the dispirited American populace, and to decorate federal buildings. The Treasury Department's Section of Fine Arts established a precedent for today's popular "one-percent for the arts" programs, by allocating 1% of new construction costs to fine art (*Raynor 1997*). Similarly, the Works Progress Administration (WPA) used a 1% formula to support the Federal Art Project (FAP), which employed artists, including the 12 artists of the 1937 Alaska Art Project. Collectively, the New Deal artists created hundreds-of-thousands of paintings, murals, sculptures and limited edition prints between 1933 and 1943 (*Figure 11*). These artists

Figure 8. (Left) ***Alaska Heathers in Bed of Reindeer Moss*****, print of a painting by F.A. Walpole for the Harriman Expedition (Burroughs et al. 1901).**

Figure 9. (Middle) ***Ptarmigan at Teklanika*****, acrylic painting on paper by Kesler Woodward, 2007.**

Figure 10. (Right) W.A. Hesse filming Katmai Volcano after the 1912 eruption. Photograph taken by M. Honneg, 1913.

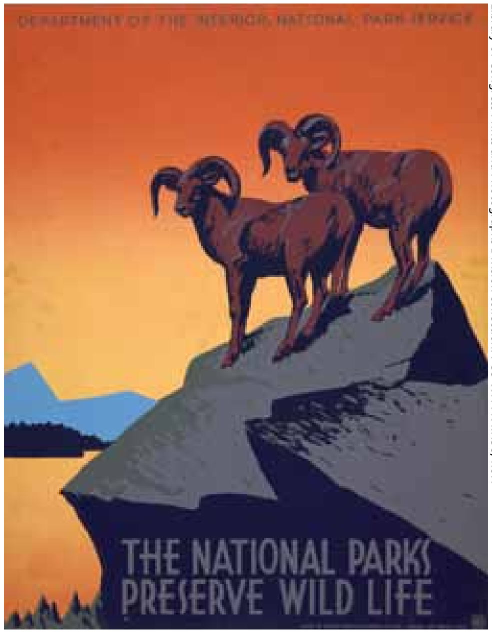
Smithsonian Institution Archives, Record Unit 7243, box 1, folder 28 image #SIA2011-2260

www.keslerwoodward.com

Alaska State Library, P66-368. Clyda Schott Greely Photograph Collection

National Park Service Collection, Sitka National Historical Park

Figure 11. New York artist Antonio (Tony) Mattei produced this painting of Sitka, Alaska, for the Works Progress Administration's 1937 Alaska Art Project.



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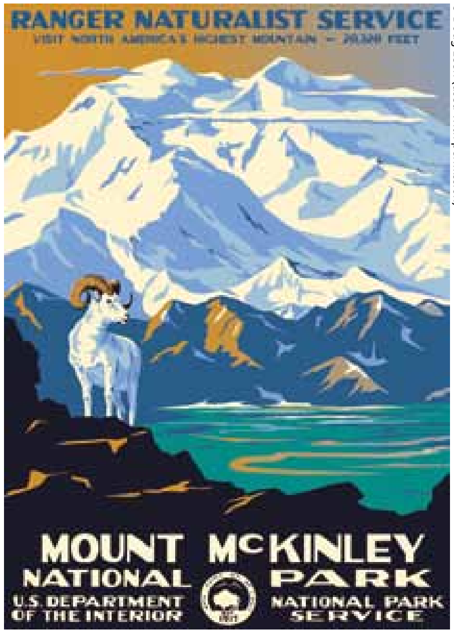

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Figure 12. (A) (Left) ***The National Parks Preserve Wild Life*****. A 1939 color silkscreen poster designed by J. Hirt for the Work Projects Administration. (B) (Right)** ***Mount McKinley National Park*****. Contemporary digital artwork inspired by the WPA park poster series. Created by Doug Leen and Brian Maebius.**

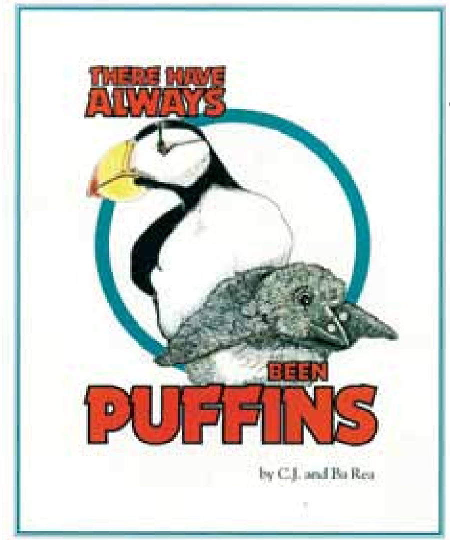
were federal employees, or sometimes contractors, so their art became public property. FAP artworks were initially offered to any city, state, or federally-supported institution, but when funding for the FAP ended in 1943, the remaining artworks were simply sold by the pound as scrap canvas (*Morse 1960*). Although WPA workshops produced more than two million posters from 35,000 hand-drawn, woodcut, lithograph and serigraph designs, only about 2,000 original WPA posters are still known to exist (*Library of Congress, Posters for the People*). The posters in the National Parks series were nearly lost, but today they continue to inspire popular contemporary works of art (*Ranger Doug*) (*Figure 12*).

Brothers Adolf and Olaus Murie were accomplished wildlife biologists, authors, wildlife artists, illustrators, and resource protection advocates (*Figure 13*). The Muries' classic ecological studies changed the way predator and prey populations were managed by federal agencies. While serving as president of the Wilderness Society, Olaus led the successful campaign to protect what would later become the Arctic National Wildlife Refuge. After his death in 1963, Olaus Murie's wife, Margaret, successfully pursued protection for more than 100 million acres of Alaska with passage of the Alaska National Interest Lands Conservation Act in 1980 (ANILCA).

America's conservation movement also owes much to art photographers like Ansel Adams and Eliot Porter. Adams' striking monochrome images of the American West have epitomized places like Yosemite and Denali since the 1930s, and they piqued public interest in seeing these places firsthand. Porter's influential second book *The Place No One Knew, Glen Canyon on the Colorado (1963)* was part of the Sierra Club's campaign to prevent flooding of Glen Canyon by the dam of the same name. Although the dam was completed and Glen Canyon submerged under the rising waters of Lake Powell, their campaign focused attention on other proposed reclamation projects and helped to ensure passage of the Wilderness Act, which had previously been stalled in Congress (*Getty Center 2006*).

Image courtesy of the Murie Center Archives

Figure 13. Olaus and Margaret Murie's 1924 honeymoon trip was by dogsled, tracking caribou across 500 miles of Alaska's Brooks Range. Olaus, an accomplished artist and illustrator, created this woodcut from sketches made during the trip.



www.basrelief.org

Figure 14. *There Have Always Been Puffins.* Scratchboard art for the children's book of the same name by C.J. and Ba Rea (Rea and Rea 1997).

What Makes Art Influential?

Artists have played major roles in the protection of most of the park lands, refuges and wilderness areas in Alaska, and by sheer size of area, for most of America… but what is it about art that makes it influential?

Art is personal and individual. People are inspired by art that reflects their ideals, dreams, and aspirations. Art that stirs strong emotions can also shift thinking and spur people to take actions. Park superintendent Paul Anderson recalls that people in the eastern U.S. who supported the creation of parks in the western U.S. had never visited those places. They saw these parks, however, through the eyes of others, such as Thomas Moran, Albert Bierstadt and John Muir, and were moved to take action (*personal communication*).

Art does not need to be realistic, or even serious, to be influential. How many people can trace their own interest in nature and science back to the illustrations in a beloved children's book (*Figure 14*), the cover of an adventure story, or even a memorable series of comic strips? Art helps people to connect to a place, and provides another way to relate new experiences to ones from before (*Mark McDermott, personal communication*). Recognition and originality are equally important for art to make an impact. People need to relate to the art, but to capture their attention an artist needs to portray things in ways that were not already familiar to the viewer (*Kesler Woodward, personal communication*). Art transforms people into active observers and provides a starting point for empathy with the subject, as people learn to see the world through the eyes of an artist (*Maria Coryell-Martin, personal communication*). When the artist is able to capture the power and the emotional impact of what they are seeing, their art will "strike a chord" with others (*Kurt Jacobson, personal communication*).

Images are more influential and sometimes more subtle than words, explains Kesler Woodward. Propaganda and advertising work so well because their images feed directly into our human consciousness, bypassing the cognitive filtering that occurs when we

Alaska Airlines Foundation, on loan to the Anchorage Museum

Figure 15. ***Mt. McKinley*****, oil painting on canvas, by Sydney Laurence, 1929.**

read or hear words. Woodward mentions the paintings of Sydney Laurence (1865-1940) as examples of how artistic perspectives can affect audience impressions for years to come. Laurence was Alaska's best recognized landscape artist, and he produced iconic works of monumental proportions, where people seemed small and insignificant in comparison to the grand landscape. Laurence's vision has become so ingrained in the culture of Alaska and the American West, suggests Woodward, that it can still lull us into imagining that any human impacts would also be insignificant on so massive a landscape (*Figure 15*).

Controversy can also bring art to the public consciousness, notes Alaska artist David Mollett (*personal communication*), referring to proposed drilling in the Arctic National Wildlife Refuge (ANWR). Mollett led many artists on trips into ANWR between 1988 and 2000, and saw the effect the landscape had on the artists, and the effect their art had on others (*Figure 16*). Photographer Subhankar Banerjee, also travelled extensively through the refuge. Banerjee's pictures (2003) were thrust into the limelight when they were shown during a contentious Senate debate over drilling, and again when his photo exhibit at the Smithsonian Institution was moved to the building's basement. His new exhibit space may have been less conspicuous, but controversy over the presumed political interference propelled Banerjee's pictures into the limelight and his career into the gallery, museum and lecture circuit for years.

Park and Expeditionary Art Programs Today

Parks preserve natural and cultural heritage and contain some of the world's most spectacular viewscapes. It is only natural that these lands and waters attracted artists long before they became parks. Artists have contributed greatly to conservation of these areas, and their artwork is now a crucial component of our heritage.

The breadth of styles, media, and materials that are available to artists has never been wider than today. Artists benefit from a broad popular market and a variety of programs that lend support to the arts, including programs focused specifically on parks, nature, culture and science.

Park-focused art in schools and communities

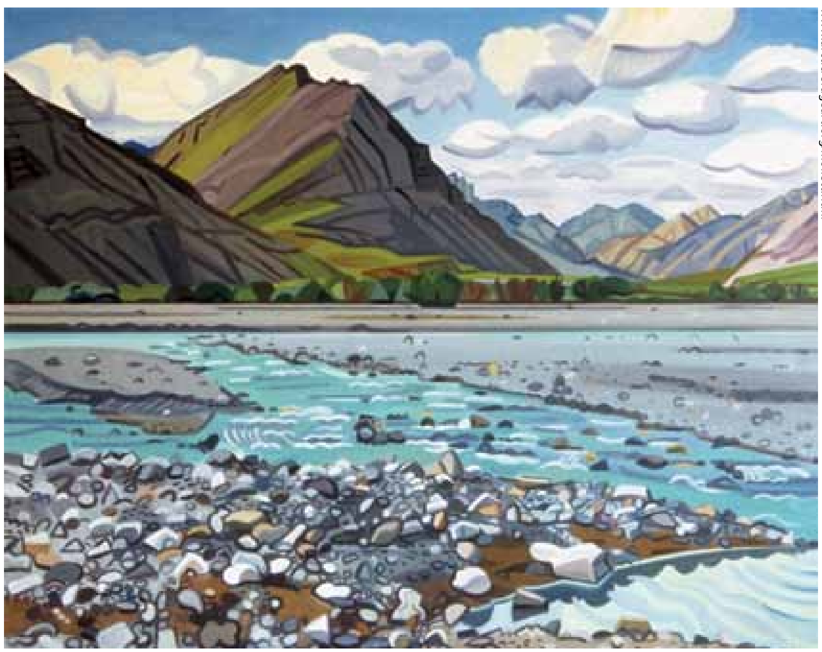
Park educator C.J. Rea has seen art work magic with youth and adults (*personal communication*). For several years, Rea has worked with Seward artists to bring art into every K-12 classroom in the community. For elementary and middle school students, the park-themed classes may be their first experience with art instruction, and for high school students, working with volunteer artists can help them to gain confidence, inspiration, and encouragement to experiment with new media and new approaches. Kenai Fjords National Park also sponsors a community Art for Parks show, where the students are encouraged to show their artwork.

Community-based art programs help forge connections between residents, organizations, trails and landscapes (*Bianchi and Tracy 2008*). Kurt Jacobson (*Figure 17*) sees art competitions and art events in parks as wonderful ways to encourage adults and youths to get outdoors and engage with their parks (*personal communication*). Jacobson is working with the Alaska State Parks, other plein air painters, and visual and performing artists to create a continuing series of artistic performances, demonstrations, and community events at parks across the state.

Park-focused art competitions

The public sometimes attributes art to natural talent, but artists say it is more a product of passion refined by continuous practice (*Maria Coryell-Martin, personal communication*). Success as an artist takes "miles of experience behind a brush", perseverance, and sometimes a thick skin for receiving critical review (*Kurt Jacobson, personal communication*). The artist's work also needs to be seen by others, preferably those who can make a difference. Juried competitions can be great ways for early- to mid-career artists to have their work seen by broader audiences and for parks to publicize themselves (*Kesler Woodward, personal communication*).

For more than two decades, starting in 1986, the Arts for the Parks program provided nationwide exposure for park-focused art and artists (*Wolf 2000, Art for the Parks 2008*). The tradition of a nationwide competition and travelling art show about the national parks has since

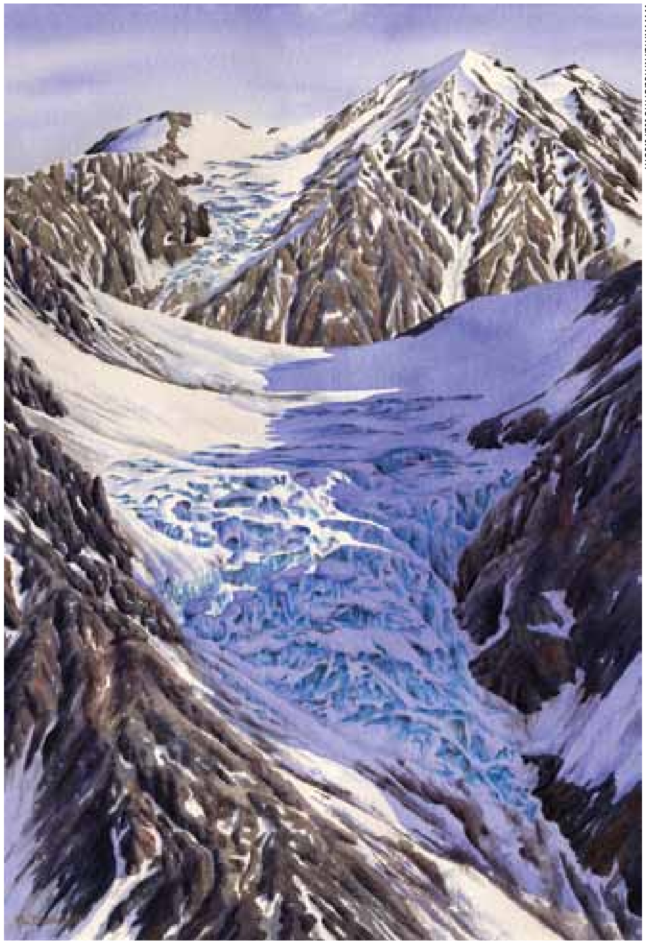


www.arcticrefugeart.org/mollett.html

Figure 16. ***Marsh Fork of the Canning River,*** **oil painting on canvas by David Mollet, 1993.**

www.kurtjacobson.com

Figure 17. ***Gentle Generations*****, acrylic painting on hardboard by Kurt Jacobson.**



www.markmcdermottart.com

Figure 19. ***Hanging Glaciers*****, watercolor painting by Mark McDermott.**

www.expeditionaryart.com

Figure 20. ***Accumulation Zone*****. This watercolor painting by Maria Coryell-Martin shows the high part of a glacier, where snow falls more quickly than it thaws or sublimates.**

been picked up by *Paint the Parks* (*Paint America 2011*). Kerri Bellisario is working with the NPS to organize new juried exhibitions reflecting on the art, artists, and impact of national park artist in residence programs across the country. Park-focused artists welcome the opportunities provided by such competitions, says Mark McDermott (*Figure 19*), who reflects that the shows provide good exposure, both for the artist and for the featured parks.

Shows closer to home are also important to artists, to receive feedback from peers and exposure to local audiences. Since 2006, the Alaska Artist's Guild has sponsored the annual *Art for Alaska's Parks* competition to celebrate Alaska's beauty and showcase representational art inspired by Alaska's public lands.

Park Artists in Residence

The NPS has a long tradition of welcoming artists. The NPS invited artists to help celebrate America's bicentennial through its Artists-in-Parks (AIP) program, and in 1984 the NPS established an Artist-in-Residence (AIR) program to perpetuate and expand on the tradition of artists working in parks (*NPS 2010*). Most artists working in and around parks come as visitors, at their own expense, and on their own time. Superintendent Anderson sees artist in residence programs as another way to help people to make personal connections to the parks, in creating new works of art and experiencing art created by others (*personal communication*). At least 10% of the national parks have established competitive programs to further encourage artists, performers and writers by offering amenities ranging from a place to stay (more common), to studio space, a modest expense stipend, or transportation assistance (all less common) (*NPS 2009*). Many public lands also offer other types of volunteer opportunities, such as campground hosts and tour guides that can provide artists with access to remarkable places and allow spare time for art and other self-directed activities. A few parks also provide paid opportunities for artists to create and interpret art in a public venue.

The artists selected for a formal residency gain direct and sustained access to park resources, in exchange for which they may be asked to donate an inspired work of art, provide public demonstrations, or both (*Kesler Woodward, personal communication*). Many artists compete for opportunities to work in an inspirational park setting, gain exposure from park publicity and recognition, and even stay in historic lodgings. As more artists discover the opportunities in parks, and as more parks begin to utilize online application systems (*AKGEO 2011*), the competition for relatively few residencies increases (*Kesler Woodward, personal communication*).

Artists on scientific and exploratory expeditions

The National Science Foundation (NSF) has long recognized the contributions that artists can make to public understanding, and after more than 50 years, the NSF continues to provide in-kind support for artists and writers to work in Antarctica (*Office of Polar Programs 2011*). The NSF was deeply involved in International Polar Year (IPY), which raised global consciousness of the Arctic and Antarctic, as did it its forerunner 50 years earlier, the International Geophysical Year. From 2007 to 2009, the IPY organized hundreds of individual science projects, some of which incorporated artistic components, into a coordinated international program. Maria Coryell-Martin has worked as an artist in both the Arctic and Antarctic, developing contacts for fieldwork as an expeditionary artist through networking with polar scientists and managers (*Figure 20*). Coryell-Martin's cold climate experience has enabled her to see that wildlife must be highly specialized to survive in harsh polar and glaciated environments, and to understand how that same specialization makes them highly vulnerable to environmental change. On returning home, Coryell-Martin uses art and education to tell stories and raise public awareness of the world's cold regions. Polar Science Weekend events in her hometown of Seattle, Washington, provide Coryell-Martin with venues for connecting with thousands of people of all ages (*personal communication*).

Encouraging Artists to Contribute to Parks: "America's Greatest Idea"

Attracting artists into the parks

Artists clearly have a role in parks today, and parks have a long history of welcoming artists and publicizing art, but is this enough? Artists understand that most parks were not created to celebrate the arts, and few artists would expect parks to cater to their needs. At the same time, many more would welcome opportunities to share their creative visions with others. Park managers have not always understood or fully appreciated the power and influence that artists can have with the public, how to attract or how to work with artists, or what to do with contributed art. An artist interested in a well-known park like Denali or Rocky Mountain will find a wealth of information on the internet, but that's not true for every park. Application processes for artist residency programs vary considerably, and sometimes the application can appear as complicated as an application for employment. Artists interested in working in more than one park may need to learn and use new computer programs, reformat the images in their portfolios to different specifications for different applications, provide letters of reference, and develop a suite of specific information products for each park.

Park access and facility use

What parks can do best for artists is to provide a place for inspiration. For artists coming from outside the local commuting area, providing a place to stay and work, and perhaps helping with travel expenses can be an attraction. Artists looking to show the park from fresh points of view can also benefit greatly from logistical support, especially in remote wilderness parks. This can be accomplished by pairing one or more artists with staff members already planning field work, and sometimes by organizing trips for several artists at the same time. For example, the Grand Canyon Trust and Forbes magazine hosted a select group of 15 artists on a 1999 trip down the Colorado River, to raise environmental awareness about the park. Two years later, they held exhibitions for the art in major US cities, published a book, and used the proceeds from sales of donated art for conservation purposes.

Exposure and publicity

Most artists have at least a hint of extroversion… they want their work to be seen by others, and they want it seen in a quality venue. Well organized park-focused shows, designed and publicized with the help of experienced artists and galleries, can be a great boon for artists and parks alike, as can press releases and interviews of the artists.

The rights and responsibilities of owning original art

Providing a piece of art for a prestigious permanent collection can be an honor for any artist. The collections of national and state agencies and museums are no exception. Peer-reviewed (juried and judged) competitions have been used for more than a century to identify and select art for shows and permanent collections. Artists are more likely to donate their best works when they are confident that the work will be well cared for into the future, or that they will receive a fair share of the proceeds if their work is sold. It is important for artists to be informed in advance, and invited to help set a fair price, if a park contemplates selling donated artwork to support the program or manage collection size. While it is appropriate for a park to ask sponsored artists to provide images for interpretation, education, scholarship, reporting and promotion, the artist's interest in working in a park should not impair their ability to reproduce, sell and license their work to others.

Conclusions

People experience wild and historic places in different ways. Many people who care deeply about wildlife, culture, science and history may never visit Alaska's remote parks in person. Art can provide people with a rich park experience wherever they may be, without which many might never appreciate the diversity of special places that are preserved as parks. Art helps people to appreciate our heritage and to understand that such places must still be protected for our children and grandchildren to experience. The historic images captured by landscape, wildlife, portrait and scientific artists and photographers continue to be enjoyed by enthusiasts of art, history and parks today. While the legacy of earlier generations of artists remains strong, art is not static, and it is not limited to what our eyes can experience. As new media are developed, artists will continue to expand in new directions and stimulate more of our sensibilities. Today, several federal, state and nongovernmental organizations continue to encourage artists to work in parks, sometimes providing venues for exhibiting and interpreting their art, benefiting artists, parks, and the public in the process (*Figure 21*). Partnerships with and among artists working in parks provide rich opportunities for people to experience and learn about parks today, and expand the heritage for future generations to share.


www.winfree-studio.com

Figure 21. Detail from *Bearly a Thought*, a 2011 Paint The Parks selection by Robert Winfree. Winfree encountered the pensive Alaska brown bear in Lake Clark National Park. Acrylic paint on board.

Acknowledgements

Most of the artwork that illustrates this article is copyrighted, and is used with the permission of the artist or their institution. The author wants to express thanks to the many people who provided information and images for the article including (in alphabetical order): Ellen Alers, Paul Anderson, Kerrie Bellisario, Doug Capra, Maria Coryell-Martin, Kirk Dietz, Louis S. and Francine Glanzman, Mareca Guthrie, Carol Harding, Kurt Jacobson, Sandra M. Johnston, Doug Leen, Maria Lin, Brian Maebius, Mark McDermott, David Mollett, Wade Myers, C.J. and Ba Rea, Richard Sorensen, Stephanie Stephens, Bryan Taylor, Sue Thorsen, and Kesler Woodward.

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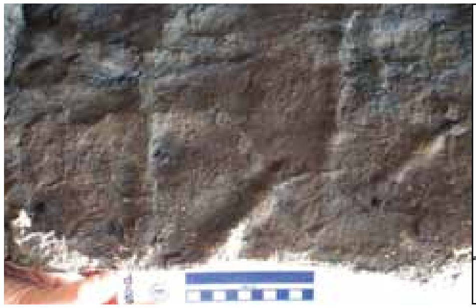
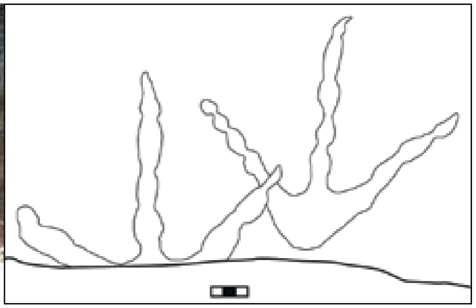
Fossil birds of Denali National Park and Preserve

Along with the thousands of dinosaur tracks known from Denali National Park and Preserve dating back 70 million years, two new types of fossil bird tracks have been discovered and named. The revelation was made following a series of paleontological digs led by Dr. Tony Fiorillo of the Museum of Nature & Science in Dallas, Texas as a result of a long-term scientific partnership with the Alaska Region National Park Service originally funded from the Challenge Cost Share Program.

Fiorillo's team found abundant bird tracks in the heart of the park, many of which were named from other places in either North America or Asia, but two types of tracks were a little different. The larger set of new bird tracks were so big, Fiorillo and his team settled on the name *Magnoavipes denaliensis*, utilizing the Athabascan name for the region. The second, smaller bird's name, *Gruipeda vegrandiunis*, roughly translates to "tiny one."

The discoveries were announced in the academic paper, Bird tracks from the Upper Cretaceous Cantwell Formation of Denali National Park, Alaska, USA: a new perspective on ancient northern polar vertebrate biodiversity in early 2011.





Two *Magnoavipes deniensis* tracks

Fiorillo says two things in this most recent (of many) groundbreaking paper. First, some 70 million years ago Denali National Park had remarkable bird biodiversity. Rocks there record the richest record of avian biodiversity from a single rock unit anywhere in the world. And second, the fact that some of the forms of bird tracks we found in Alaska are also found elsewhere in the U.S. and Asia suggests that birds used Alaska as a seasonal nesting ground some 70 million years ago… just like modern birds use Alaska today.

Submitted by Dr. Anthony Fiorillo and Guy Adema

Invasive Plant Management

The Alaska Exotic Plant Management Team (EPMT) was first formed in 2003 and provides invasive plant management assistance to the 16 parks and over 52.8 million acres of National Park Service managed lands in Alaska. These lands are home to dynamic landscapes created by natural processes such as deglaciation, landslides and hydrologic events. Newly exposed or disturbed lands are colonized, and through the process of succession, develop into native vegetation communities. Non-native invasive plants are a threat to this natural process as they have the ability to outcompete and displace native species. Alaska is unique in the EPMT program as most Alaska parks have limited invasive plant infestations, occurring primarily in front country areas, and

Annual data collection has shown that manual treatment efforts have not been effective in controlling invasive plants in some areas of KEFJ.

management efforts are focused on Early Detection Rapid Response .

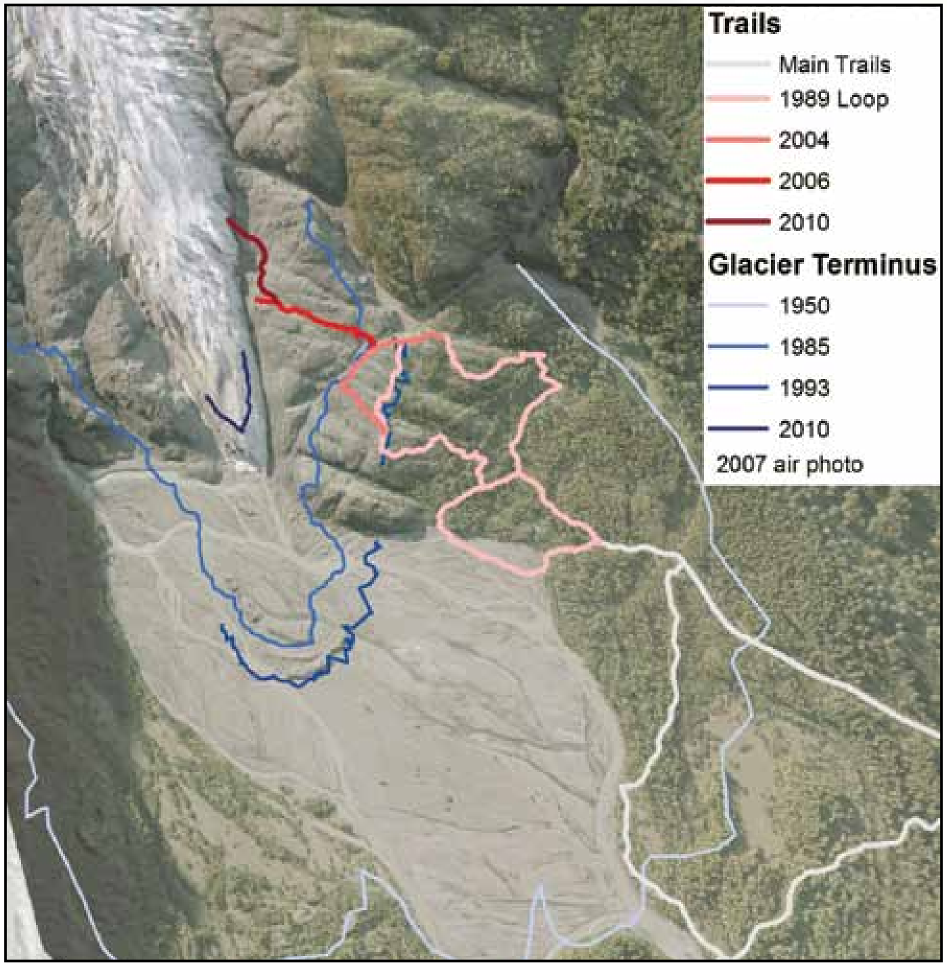
In early 2010 the Alaska Region approved an Invasive Plant Management Plan, which considered the use of herbicides for controlling invasive plants in Alaska for the first time. This plan outlines a decision process to guarantee the judicious use of herbicides as one part of an overall integrated pest management approach to controlling invasive plants. The process takes into account several environmental factors prior to supporting herbicide use, to ensure minimal impacts to sensitive habitats, water, or subsistence uses. With herbicide use in the toolbox, the Alaska EPMT will more effectively address situations with invasive plant species that are resistance to manual controls.

A perfect example of this new process in action is at Kenai Fjords National Park (Kenai Fjords). For more than a decade staff have worked to prevent the introduction of invasive plants into the park. For the last seven years staff managers have joined forces with the Alaska EPMT to sets standards for the documentation and decision-making regarding invasive plant management. Using GPS and GIS technologies, Kenai Fjords and Alaska EPMT staff monitor known infestations and generate consistent data on the effectiveness of control methods. The multi-year records reveal that one backcountry site is not showing improvements based on manual control methods. By following the herbicide decision process, the Alaska EPMT has determined that this site is suitable for an herbicide application and implemented this management method in the summer of 2011. These actions may have important implications for the future of the strategies used and the ecological health of the park's ecosystems.

Submitted by Bonnie Million and Luke Rosier

Terminus Position of Exit Glacier

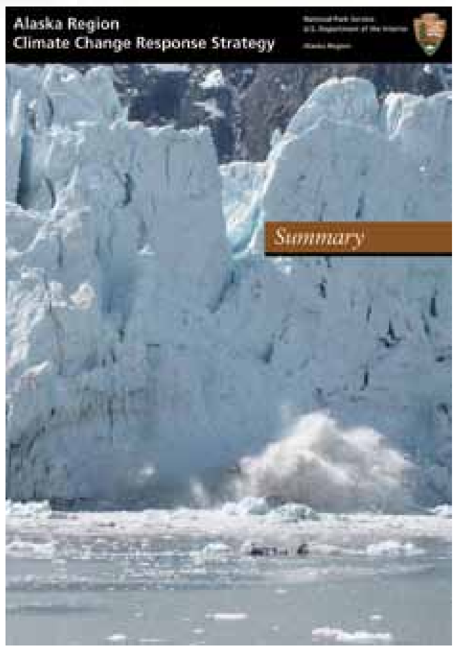
Exit Glacier in Kenai Fjords National Park has been retreating from its Little Ice Age maximum since the late 1800s. However, when visitor facilities were first constructed at Exit Glacier in the early 1980s, the glacier terminus position was



relatively stable or even slowly advancing. During the late 1980s and early 1990s parts of the trail system were overrun by the advancing ice. This costly variation emphasized the importance of studying Exit Glacier's terminus position.

The terminus position of the glacier fluctuates annually, typically advancing approximately 10-15 meters in the winter and retreating 20-30 meters in the summer. Kenai Fjords scientists have been mapping the terminus changes by converting existing aerial photos to GIS data and manually mapping the terminus with handheld GPS units. Park staff are then able to make more informed decisions regarding management of the visitor facilities such as the glacier viewing trail system. For example, as recently as 2010, the trail to the edge of the glacier was lengthened to bring visitors closer to the retreating ice. With an ongoing mass balance study and ground penetrating radar surveys, Kenai Fjords continues to examine the glacier to gain a better understanding of its fluctuations.

By Luke Rosier



NPS Climate Change Response Strategies

The National Park Service (NPS) *Alaska Region Climate Change Response Strategy* outlines current and expected impacts of climate change on park resources, assets and operations in the Alaska Region and recommendations for addressing those effects. It envisions a future where the NPS works effectively with numerous partners to preserve and restore park resources, assets, and opportunities for visitor enjoyment. The strategy explains why climate change matters for managing national parks and how it affects NPS operations and resources. The vision and four broad goals also reflect components of the NPS national Climate Change Response Strategy: Science, Adaptation, Mitigation, and Communication. A number of objectives are identified to advance these goals. The strategy also includes a set of specific action items that were identified and prioritized by representatives of parks, programs, and advisory groups in the Alaska Region. The final section of the strategy identifies a set of initial implementation steps and actions, most of which are underway.

This issue of *Alaska Park Science* includes an article about Climate Change Scenario Planning, one of several exciting new and expanded efforts underway by NPS. It remains to be seen whether the international community can achieve consensus about climate change actions, while they can still influence the amount of change. However, we are confident that within the next few years, NPS will be better informed about potential effects and appropriate responses in Alaska, and we'll be sharing our information with many others.

Copies of the NPS national and regional climate change strategies are available at: http://www.nps.gov/akso/climatechange.html

Submitted by Robert Winfree

Have You Missed an Issue of *Alaska Park Science*?

This is our 19th issue of Alaska Park Science, which has been published twice a year since December, 2002. We'd welcome hearing from you about what you like (or don't like) about the journal and why; how you use it; which topics particularly interest you; and whether we provide too

much, too little, or the right amount of information. We also welcome suggestions for future articles and authors.

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