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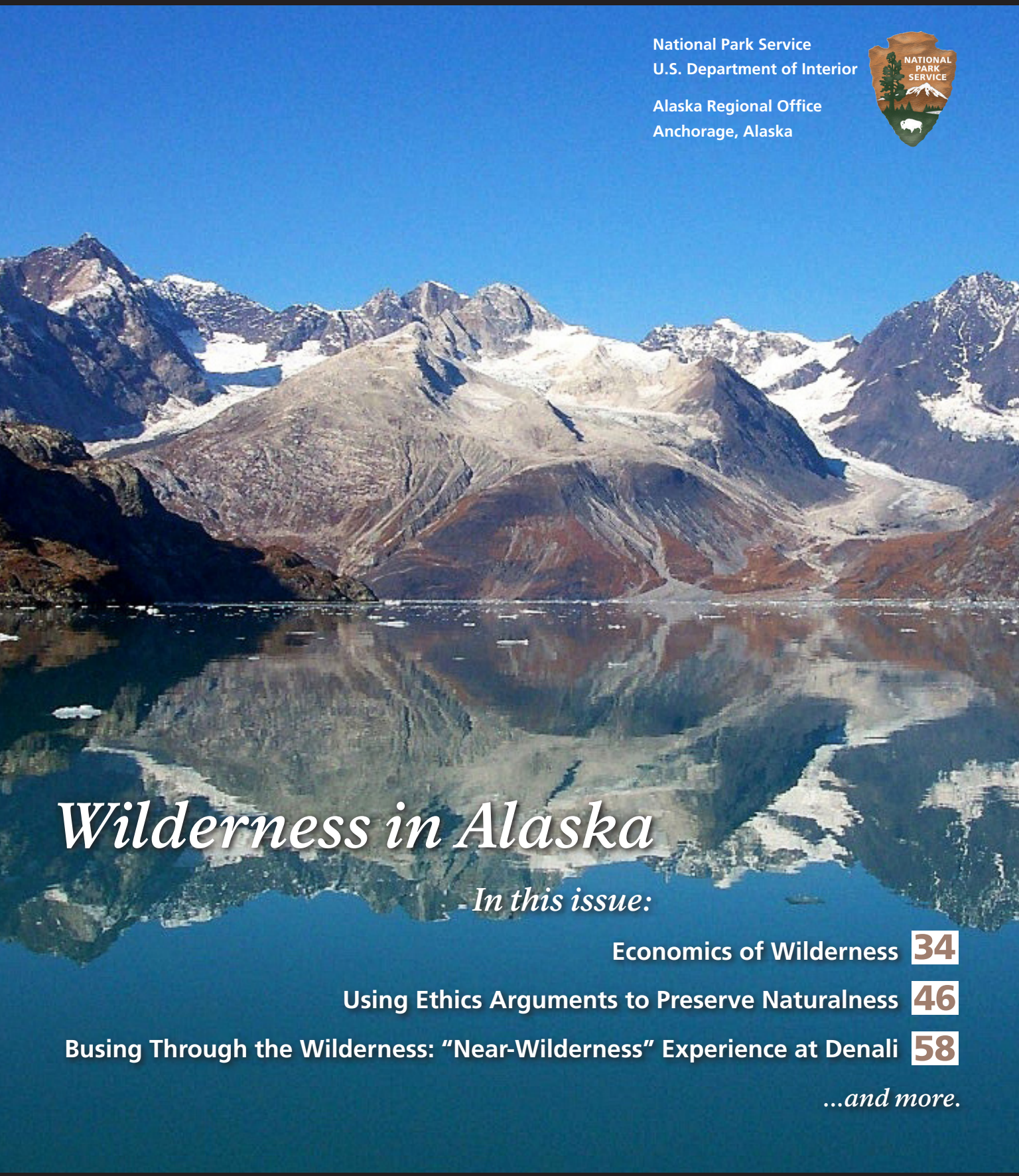

Wilderness in Alaska

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Volume 13, Issue 1

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Cover photo: Glacier Bay National Park and Preserve

Courtesy ofAdrienne Lindholm

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Wilson Justin: A skilled observer, Wilson Justin has spent a lifetime trying to match sacred songs and principles of his clan to his generation's place in a rapidly changing world.

Opposite: Noatak National Park

Courtesy ofAdrienne Lindholm

The Meaning of Wilderness

By Robert Winfree

This issue of *Alaska Park Science* celebrates the fiftieth anniversary of the 1964 Wilderness Act. The concept of wilderness has clearly existed since ancient times. When the word "wildēornes" was recorded in Old English nearly a thousand years ago, it referred to lands populated only by wild animals, uncultivated, uninhabited, inhospitable, and even dangerous for humans. Today we have legal definitions, but it's safe to say that wilderness still holds different meanings for different people.

In this issue, Ed Zahniser reflects on growing up in the nascent U.S. wilderness movement and describes his father's thinking and motivations that led directly to the Wilderness Act. Adrienne Lindholm looks over the challenges and accomplishments of the last fifty years and forward to those yet to come. Steve Colt and Ginny Fay explore the economic value of Alaska's intact wilderness ecosystems.

Karen Evanoff and Michelle Ravenmoon; Alex Whiting; Wilson Justin; and Mary Beth Moss, Kenneth Grant, Michelle Jesperson, Barbara Bruno, and Christina Mills share visions of wilderness—not as places to be alone, but as homelands, places to nourish bodies, to perpetuate long cultural traditions, and to commune with ancestral spirits.

Robert Manning and William Valliere explore visitor experiences and values in wildland areas in two Alaska parks.

Figure 1. Glacier Bay National Park and Preserve covers 3.3 million acres of rugged mountains, dynamic glaciers, temperate rainforest, wild coastlines, and deep sheltered fjords.

Jonathan Hardes shares the thrill of finding ice age fossils across park landscapes and explains how and why we must ensure that they are properly protected and preserved.

Does wilderness require management to stay wild? Grant Hilderbrand explores competing values and ethical considerations in wildlife management. Robert Winfree and Adrienne Lindholm describe National Park Service (NPS) efforts to minimize the impacts of new and pre-existing installations in and near Alaska wilderness. Roger Kaye considers a growing dilemma for today's and tomorrow's wilderness managers: Are wilderness areas sufficiently well-equipped by nature to adapt to climate change, or is human intervention warranted to perpetuate historic conditions?

NPS photo by Robert Winfree

Figure 2. Bears in Katmai National Park and Preserve

What if the unthinkable occurs? Can a profoundly disturbed area ever be restored to wilderness conditions? Forty-three years after a 1971 nuclear detonation, Merry Maxwell reflects on that question from Amchitka in the Aleutian Islands Wilderness.

What does the word wilderness mean for you?

Will it mean the same to your grandchildren?

Howard Zahniser's Vision of Wilderness—and the Whole Community of Life on Earth

By Ed Zahniser

My father, Howard Zahniser, (*Figure 1*) was the primary author of the Wilderness Act of 1964. To understand his vision of wilderness, it is good to start with his literary mentors. He was bookish: In 1945, some members of The Wilderness Society governing council thought he was not enough of "a wilderness man" to be hired that year as the Society's Washington, D.C., presence and the editor of its quarterly magazine *The Living Wilderness*. Indeed, recent writers have pictured him "more like a librarian" than an outdoorsman.

Zahnie, as he was known to friends and associates, was born in western Pennsylvania in 1906, the year President Theodore Roosevelt signed the Antiquities Act and proclaimed Devils Tower the first national monument. Zahnie grew up frugally, and later surrounded himself—and his family—with a riches of books. My mother Alice Hayden Zahniser, now aged 96, put her foot down when her husband wanted to shelve books in the kitchen, too, atop the refrigerator.

The furnace room and attic already held bookcases. Because our house, built in 1929, was not insulated, Zahnie had fashioned floor-to-ceiling bookcases to insulate the hallways on both floors. Shelving options grew scarce. As the youngest of four children, I was the last living at home. As he and my mother and I ate dinner, he would broach some topic. Then, when my mother might slip into the kitchen, he would ask me to go out to the trunk of the car where I would find a book on that topic. "Bring it in please," he'd say, "and while you're at it, why not bring in two or three more from the carton of the books?" Owners of two of Zahnie's favorite used-book shops routinely gave me a free book shortly after we arrived—to occupy me so my father could shop longer.

Photo courtesy of Wilderness.net.

Figure 2. Howard Zahniser: Principal architect of the Wilderness Act of 1964.

Figure 1. Atop Cathedral Mountain, in what is now Denali National Park, Alaska, July 1961, (left to right) Olaus J. Murie, Howard Zahniser, and Adolph Murie. Adolph Murie was working on his book *The Bears of Mount McKinley* that summer. The author and Stephen Griffith, son of The Wilderness Society Treasurer Ernest Griffith, both fifteen-year-olds, collected grizzly scat for Adolph's study, under the watchful eyes of the late Joe Hankins.

Photo by Ed Zahniser.

Zahnie mainly collected books on art, literature, and natural history and conservation. His art and literature collections especially favored books on the Hebrew Scriptures' Book of Job and by or about Italian poet Dante Alighieri, English poet and engraver William Blake, and American transcendentalist Henry David Thoreau.

In the Book of Job, after Job is wiped out of everything, including his family, God takes Job on a world tour. Old Testament scholar William P. Brown writes in "Where Job and the Wild Things Are": "The world according to God is not finely tuned to ensure humanity's flourishing, let alone dominion. No, the world is a hodgepodge of life in all its wondrous and repulsive variety. It is a world of 'ultimate pluralism,' with Job included in the mix. Singling out one particular animal, God says to Job: 'Behold Behemoth, which I made *with* you. (40:15a)'"

"The clue is in the preposition," Brown continues. "Behemoth is created with Job. . . . Job shares an identity, indeed a genetic identity, with this fearsome creature. Job's DNA . . . is linked to this lumbering, fearless, playful creature of the wild. Job is no isolated creation, and clearly not the apex of the created order."

Aldo Leopold, an original Wilderness Society council member until his death in 1948, wrote that wilderness is "an antidote to the biotic arrogance" of Homo sapiens. Preserving wilderness shows restraint and humility. Preserving wilderness makes some room for permanence as well as for change. It treats some remnant of the land as community, not commodity. These were tenets of Zahnie's vision of wilderness. To preserve wilderness and wildness was, in effect, to redefine American notions of progress. The Wilderness Act can be seen as a significant sociopolitical step that our culture has taken toward Aldo Leopold's vision of a land ethic. The Wilderness Act can be seen as a step toward drawing the biosphere into our circle of ethical regard, as a step toward recognizing ourselves as interdependent members of the whole community of life.

In his magisterial Comedy, Italian Poet Dante Alighieri (1265-1321) has a vision of Paradise but discovers that you must first go through the Inferno and Purgatory to get there. The lesson? Maybe it's that realizing a vision demands that you be consistent, persistent, and actively

patient—and hold to your vision, confident that it indeed involves a paradise. My favorite quotation about my father came from his longtime close associate Olaus J. Murie: "Zahnie has unusual tenacity in lost causes." (*Figure 2*)

English poet and engraver William Blake lived from 1757 to 1827. Blake's axis of evil was the rationalist-materialists John Locke, Francis Bacon, and Isaac Newton. Blake saw the fullness of humans being taken captive by an overbearing or overweening rationality. In The Book of Urizen, Blake illustrated Urizen—who represents rationality—immobilized in a mesh or net of his own making (*Figure 3*), and Blake called that netting a "trammel." This may well be where my father saw both the richness and the lack of physical specificity of the word untrammeled as ideal for defining wilderness. As a writer, my father also learned from Blake the engraver that, as Blake's biographer Peter Ackroyd writes, "words were precious objects carved out of metal."

Eight years before the 1964 Wilderness Act was signed, the first wilderness bill was introduced by U.S. politicians. But it took many more years to achieve the final product (*Figure 4*). In fact, The Wilderness Society council had voted in 1947 to pursue some such protection. That makes it an eighteen-year effort. But our wilderness movement can be traced back to 1894, when Bob Marshall's father Louis Marshall and others inserted the "forever wild" clause into the New York State Constitution. Or wait: Our wild lineage goes back even further, to 1864 when George Perkins Marsh published his book *Man and Nature*. Marsh's book—it has never been out of print—demonstrated that late great civilizations around the Mediterranean Basin had fallen when their forests were destroyed.

Or how about the transcendentalists in the 1830s into the 1860s? Maybe it took some 180 years to achieve 109 million acres of congressionally designated wilderness. Ralph Waldo Emerson, Margaret Sarah Fuller, and Henry David Thoreau also anchor the deep lineage of our American wilderness imagination. It is especially intriguing to contemplate how closely transcendentalist Margaret Fuller's 1830s and '40s campaign of social reform prefigures the 1950s progressive legislative agenda of Hubert H. Humphrey, the wilderness bills' chief sponsor in the U.S. Senate. The 1960s Great Society program—which included the 1964 Wilderness Act—is credited to President Lyndon B. Johnson and was brought to fruition as law in Humphrey's 1950s legislative package.

Zahnie learned a great deal about both writing and wildness from Thoreau (1817-1862). Thoreau, who would die of tuberculosis, wrote that words are precious objects formed from the breath of life itself. Thoreau also penned the intriguing mantra that "in Wildness is the preservation of the World." The word *World* here is, as Thoreau makes explicit in his essay "Walking," the Greek word kosmos. Kosmos means not only "world" but also "order, pattern, and beauty." Notice, too: Thoreau does not maintain that we preserve wildness, but that wildness preserves us, the world, beauty, pattern,

Library of Congress image

Figure 3. Plate 17, William Blake's The Book of Urizen (1815), showing Urizen, who represents humanity's overweening rationality, entangled in a fish net, for which an old term was trammel, a form of the word *untrammeled* that Howard Zahniser used in the definition of wilderness in the 1964 Wilderness Act. Designated wilderness is land onto which we choose not to project human desire.

Photo courtesy of Wilderness.net

Figure 4. Signing of the Wilderness Act, September 3, 1964; President Lyndon Johnson giving pen to Alice Zahniser (Mardy Murie looking on).

and order. Wilderness and wildness—Zahnie wrote in 1957 "the essential quality of the wilderness is its wildness"—are integral to who we are. This is perhaps the essential mystery of wilderness and wildness. It is also why the founders of The Wilderness Society insisted that the wildness of

the wilderness is not a luxury but a necessity. (*Figure 5*)

As wilderness activist and author Douglas W. Scott has shown, the language that opens the Wilderness Act was little changed throughout the many, many revisions made between the first wilderness bill, introduced in the House and the Senate in summer 1956, and the act's signing in September 1964. That language expresses a vision despite its role in defining wilderness and describing the situation of wilderness. Zahnie's vision is most clearly expressed in two of his speeches from the wilderness-bill years, "Wilderness Forever" and "The Need for Wilderness Areas." Both speeches are found on http://www.wilderness.net in the "Wilderness Fundamentals Toolbox."

Scott also points out that the full title that opens the Wilderness Act, which is seldom quoted, is hugely important: "An Act To establish a National Wilderness Preservation System for the permanent good of the whole people . . ." For the permanent good of the whole people. "The Need for Wilderness Areas" was first delivered as a speech to the American Planning and Civic Association in May 1955. In it, after quoting at length from Robert Marshall describing the values of wilderness, Zahnie said:

> Who that can see clearly these superlative values of the wilderness . . . can fail to sense a need for preserving wilderness areas?
>
> Who in a democratic government that seeks to serve the public interest even for the sake of minorities would wish to lose an opportunity to realize a policy for wilderness preservation?
>
> Who that looks on into the future with a concern for such values would not wish to insure [sic] for posterity the freedom to choose the privilege of knowing the unspoiled wilderness?
>
> But are these superlative values essential?
> Is the exquisite also a requisite?
> I think it is.

Photo courtesy of Wilderness.net

Figure 5. Left to right: Howard Zahniser, Mardy Murie, and Olus Murie.

> I believe that at least in the present phase of our civilization we have a profound, fundamental need for areas of wilderness—a need that is not only recreational and spiritual but also educational and scientific, and withal essential to a true understanding of ourselves, our culture, our own natures, and our place in all nature.

After introducing the first wilderness bill in the Senate in 1956, then-Rep. Humphrey inserted "The Need for Wilderness Areas" in the *Congressional Record*, telling his colleagues that it was the best explanation of what the wilderness bill was all about.

I think my father simply fell in love with the mystery of how wilderness is an integral necessity for human beings as part of what he called "the whole community of life on earth that draws its sustenance from the Sun." Zahnie had grown up in an evangelical tradition that assumes that we must work to leave the world a better place. He believed that the world is a better place, and that we are a better people—despite our all-too-obvious world-altering powers—for boldly embracing the humility to take some of the wilderness and wildness that have come down to us out of the eternity of the past and to project them into the eternity of the future.

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Alaska Wilderness: Looking Back, Looking Ahead

By Adrienne Lindholm

Wilderness is good for Alaska. That's what many of we Alaskans already think, and it's the message that the Wild 50 groups in Anchorage, Fairbanks, and Juneau hope to spread across the state during 2014, the fiftieth anniversary of the 1964 Wilderness Act. Comprised of federal agencies, nonprofit organizations, Native representatives, academic institutions, youth, tourism sectors, and volunteers, Wild 50 is planning commemorative events across the state to celebrate this important anniversary.

We have a lot to be excited about. Alaska wilderness serves as a unique scientific laboratory. It has been the engine for fifty years of tourism growth in Alaska. It includes landscapes that inspire countless works of art. It is a playground for hardy adventurers, a touchstone to the past, and a link to cultural identity. It conjures a sense of freedom and self-reliance that is getting harder to come by in our technology-centric world. Wilderness areas around the country contain similar attributes, but Alaska wilderness is the epitome of our National Wilderness Preservation System (NWPS) and remains an iconic symbol of wildness and freedom worldwide.

Alaska wilderness is unique and there is a lot of it. About 95 percent of National Park Service (NPS) land in Alaska falls under some category of wilderness protection—about 30 percent of the nation's wilderness. Including areas managed by the U.S. Fish and Wildlife Service and U.S. Forest Service, we're collectively talking about more than 57 million acres of designated wilderness in Alaska: watersheds, mountain ranges, glaciers, wetlands, coastlines, volcanoes, and forests that support diverse wildlife populations, protect archeological resources, provide a setting for wilderness recreation, and support the continuation of a subsistence lifestyle for local communities.

The Alaska National Interest Lands Conservation Act (ANILCA) ensures that wilderness in Alaska is unique within the NWPS by making unprecedented allowances for access and activities not normally found in Lower 48 wilderness areas. Prior to passage of ANILCA, people all over Alaska were involved in widely dispersed activities like backcountry recreation, cabin building, hunting, fishing, trapping, and small-scale mining—often in very remote and primitive settings. Their methods of transportation varied widely, from foot travel and dog sleds to snowmachines, motorboats, and airplanes. To satisfy the demand for protection of the wildlands of Alaska, Congress realized that some special exceptions would be necessary to preserve traditional activities and accommodate transportation needs between remote communities. When finally passed in 1980, ANILCA reserved federal lands on an unprecedented scale while also including similarly unprecedented special provisions to address Alaska's distinctive rural way of life and lack of infrastructure. ANILCA tried to make wilderness a good thing for everyone.

Unfortunately, not everyone saw it that way. Wilderness faced threats from adjacent resource development, and many Alaskans were fearful that land management would constrain local lifestyles and diminish potential for economic growth. Many heated debates transpired about how to make decisions that were best for our wilderness resources, Alaskans, and the American public.

Land managers confronted numerous challenges internally. They had to learn what this new ANILCA wilderness was all about and communicate that information to their own staff and to the public. They had to make sure wilderness had a seat at the table and that their colleagues were willing and able to integrate wilderness values into decision-making processes. They also had the difficult job of making park managers and field staff aware of their roles and responsibilities in managing wilderness lands; that often meant taking more time to make decisions and doing work differently than how they had done it in the past.

Wilderness stewardship in Alaska has come a long way. Proponents of resource development are now tempered by a broad spectrum of Alaskans who appreciate the benefits of wilderness. These often include conservation organizations, hunters, trappers, birders, Native groups, commercial fishing interests, photographers, outdoor sport enthusiasts, armchair adventurers, tourism organizations, and small businesses.

Figure 1. Walker Lake.

Photo by Robert Winfree

Agency personnel who steward Alaska wilderness areas are armed with a clearer understanding of the Wilderness Act's mandate to preserve wilderness character, and the *2014 Keeping it Wild in the National Park Service: User Guide to Integrating Wilderness Character into Park Planning, Management, and Monitoring* provides land managers with practical strategies and tools to do just that. Now that we are able to define wilderness character in terms that are tangible and that directly link agency stewardship to the requirements of wilderness legislation and agency policy, we are able to make more objective and defensible decisions.

Land managers in Alaska benefit from wilderness training and wilderness research that is supported by the Arthur Carhart National Wilderness Training Center and the Aldo Leopold Wilderness Research Institute. Over the last fifty years, wilderness scientists, historians, legal scholars, philosophers, and writers have given us a much better understanding of the concept of wilderness, the legal mandate for managing wilderness, and the natural and cultural resources that occur within wilderness in the Alaska national parks. This new understanding and these new tools have allowed us to improve stewardship of the wilderness.

Specifically, the NPS Alaska Region now has a process in place for evaluating impacts to wilderness character in National Environmental Policy Act documents. Alaska parks use a science in wilderness evaluation framework to evaluate the benefits and impacts of proposed research projects, park staff are equipped with a better understanding of their responsibilities for preserving wilderness character, and most Alaska parks have updated maps of wilderness boundaries. These big accomplishments allow us to more adeptly steward these special places and embrace our wilderness heritage.

We continue to confront new challenges. Surely, there will continue to be pressure around the borders of wilderness areas as Alaska's population increases, and large scale mining and other resource development sectors advocate for expanded industrial activity, infrastructure, and transportation systems. Under such scenarios, public support will be critical to "hold the line" for preserving wilderness lands and waters. There are other threats too though, including some more insidious. As the 2012 *Revisiting Leopold* report points out, "Environmental changes confronting the National Park System are widespread, complex, accelerating, and volatile." It goes on to list a few of them: biodiversity loss, climate change, habitat fragmentation, invasive species, air, noise, and light pollution. These threats will tear at the fabric of the natural quality of our wilderness areas and test our will to embrace restraint and humility, central tenets of wilderness stewardship.

It will no doubt be a challenge to preserve the freedom that Alaska wilderness embodies. Freedom of the land to continue to change according to its own free will, freedom of natural processes to play out without humans intervening—directly or indirectly. The challenge for land managers will be to make the hard choices between intervening in order to perpetuate a species or landscape, and keeping

Photo by Robert Winfree

Figure 2. Mount McKinley.

Photo courtesy of Adrienne Lindholm

Figure 3. North Fork Glacier

our hands off in order to preserve a sense of wildness.

David Gessner writes about freedom in another sense: the liberating feeling of leaving society and technology behind. He writes that one of the best arguments for wilderness is one that connects "freedom from feeling like we're all under constant surveillance with the freedom to go to the natural world as a refuge—as a place apart." He goes on to say that, "This isn't the jingoistic 'freedom' that pundit politicians [prattle] . . . on about, but rather something much closer to the real, productive, pioneering freedom that—in this country, at least—has always been tied to our most fundamental ideals: independent thought, nonconformity, and the exploration of new frontiers." This sense of freedom will continue to get more difficult to find. In an era rich in technology, short on time, and characterized by instant information and instant gratification, wilderness faces a challenge with technology like never before: technology that is accessible just about everywhere. At risk is the feeling of freedom a person has when they enter the Alaskan wilderness, knowing they can leave the whir of civilization and technology behind.

It will be up to Generations X, Y, and Z to confront these challenges and preserve wilderness character. Will young people love wilderness and want to protect it? Will wilderness be relevant to younger generations without compromising wilderness ideals?

Wild 50 believes it will be. We believe wilderness will continue to be an enduring and ever more important resource for Alaska and the American people as areas outside wilderness begin to look and feel more and more different from the ways they once were. Throughout 2014 we will celebrate Alaska's wilderness as unique and irreplaceable. Wild 50 hopes you will join us in keeping Alaska wild forever, celebrating wilderness as an important part of Alaska's future, and recognizing wilderness as our gift to countless future generations.

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A Dena'ina Perspective: Respecting *Łnena* (Land)

By Karen Evanoff and Michelle Ravenmoon

Reprinted with permission from the Lake Clark Wilderness Character Narrative

The legacy of unseen footprints of the Dena'ina people has sustained the place now called Lake Clark Wilderness for centuries. The Dena'ina people of the Lake Clark area believe that everything has a spirit and should be treated with respect. We call this '*K'etniyi*' meaning 'it's saying something.' This is the power of nature's voice—an ancient connection to the spirit of the Dena'ina people. This is how we define wilderness. Our ancestors' beliefs for caring for the land has been simple—respect all living things; not taking more than you need, giving something back when you take—this can be a prayer, deep thoughtful respect or a small material item such as a safety pin. What has emerged from this relationship with the land is the Dena'ina language, spirituality, cultural connection to the land, and identity.

The land provides for us and we were taught to be respectful. This respect is not questioned and we are conscious that when we interact with nature, we are praying. We harvest our food from the land, we put up salmon every summer, we hunt for meat, and we pick berries. As we stoke the fire in the smokehouse full of drying salmon, this is prayer. As we pressure cook the meat from the black bear for canning, being careful not to waste any of the meat, this is prayer. As we pick berries this is done with prayer. The relationship with the land is filled with gratitude and respect, for we are nothing without the blessings of the land in which we were raised.

We recognize and feel the connection to weather and understand the importance of paying attention. Look to the tops of spruce trees; if there are a lot of spruce cones this means there will be a lot of snow. If there are a lot of white Hudson Bay tea blossoms, this tells us that there will be a lot of salmon this summer. Just this fall before the lakes froze, a heavy fog came over the lakes—hovering over Sixmile Lake and up through Lake Clark. A Dena'ina elder watching through the window said, "A long time ago they used to say that when the fog came in over the lakes, this means that the fog is spreading the word over the lakes—the fog is sending the message that the lakes will be freezing soon."

Fish camp continues to be an important tradition of the Dena'ina people. The comparison used, when asked what fish camp is: It's like Christmas, only better. We are not paying a price for gifts or experiencing a fleeting moment of joy and celebration. We are preparing all year long for our few months of celebration. We are coming together as family and community and sharing the gratitude of putting up fish—fulfilling our spirits, minds, emotions, and bodies from the same source and practices our ancestors did. It's hard to put into words the feeling—the connection that ignites the spirit when it comes time for fish camp. It is an ingrained, unconscious movement that is felt when spring turns into summer. Fish camp is a communion with every aspect of putting up fish. It's a relationship that has been created from the time of birth, sensing when summer comes, it's time to go back to fish camp, it's the smell, the slime, it's nature—connecting back to the water, bringing relatives home, it's knowing you have fish for winter not only for your family but to share at potlucks and with relatives and friends. It's a spiritual igniter that restores this underlying excitement after a long winter. It's a part of life that is not questioned, whether we go to fish camp or not. It's done every summer. It's the contented labor of splitting fish, of stoking the smoke house fire, and of taking care and pride in putting up fish the right way. This deep-rooted way of life cannot be measured, cannot be priced, and it can be easily overlooked by an outsider, because it's beyond the visual and the spoken.

Reflecting on the idea of wilderness, Michelle Ravenmoon noted, "I have learned to appreciate even the smallest

Figure 1. Ice fishing at the Beaver Trapping Educational Camp at Chulitna Bay on Lake Clark.

Photo by Michelle Ravenmoon

interactions between animal and land. As a child, I would watch the spiders spin webs; they put unwearied effort into their webs. I learned a respect for the work put into a web and I took great care not to destroy webs just because they were in my path. I also learned to pay attention to when spiders spun webs because spiders seem to have an ability to predict when the wind would not blow and that was web-making time. By paying attention to the spiders, I learned a technique to predict the weather. I think many people look at wilderness and think that they need to see a bear or a moose for a true experience with nature, but it is through patience and mindfulness that the true experience takes place."

To some people, the word "wilderness" conjures thoughts that we are separate from nature, that the woods are unknown, untouched, perhaps mysterious, or even dangerous. This may create feelings of fear, excitement, adventure, longing for connection to nature . . . but when all thoughts of the individual components dissolve and we let go of the attachment or judgments we've given them, all we see is the beauty of the natural surroundings. We feel right at home, we want to care for and not take from the land, and we realize that we are not separate from nature but part of it. The wilderness and all that it encompasses is not a mystery; it is us and it is home. It's as familiar as looking in the mirror.

Many places in the Lake Clark Wilderness have Dena'ina place names developed over time through stories, events, and experiences. It was not common to name a place after a person; natural places were left with a name that came from the experience and gifts it offered—'*Dilah Vena*'—fish swim in lake; '*K'dalghek'tnu*'—scraping noise (of antlers) stream; and '*Ch'kentałqeyitnu*'—someone throws spear stream. Over two thousand place names like this are spread across the region and each place holds meaning. It is important that the Lake Clark Wilderness encompasses these meanings and that we continue to honor the footprints of culture as integral to our contemporary idea of wilderness.

Photo by Karen Evanoff

Figure 2. Spider web on spruce tree in the early morning dew.

Photo courtesy of Adrienne Lindholm

Figure 3. Seining for salmon, a subsistence activity, on Sixmile Lake near Nondalton, Alaska.

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The Economic and Cultural Benefits of Northwest Alaska Wilderness

By Alex Whiting

Northwest Alaska, from Kotzebue Sound to the headwaters of the Kobuk River, is approximately the size of Indiana. It is mostly roadless wildlands dotted by eleven villages that are located on the coast or along the major rivers. The Red Dog Mine with its associated road and port site is the only large resource development project in the region, leaving most of the area in a natural state. Except for Red Dog, the relatively small rural communities, and the numerous but even smaller individual camps along the coasts and rivers, there is no obvious distinction between what is designated as formal wilderness and what is not. Federal lands in the form of parks, preserves, wilderness areas, a monument, and a national wildlife refuge comprise the majority of formal land designations in the region. Wilderness areas include the Selawik Wilderness, Noatak Wilderness, Kobuk Valley Wilderness, and Gates of the Arctic Wilderness. Given the lack of habitat demarcation between wilderness areas and other areas, it is not surprising that you would be hard pressed to find any lifelong residents of northwest Alaska who could tell you where the formal wilderness areas are, or how they differ in management from other federal lands. While most people in the region are aware that park units and other land designations exist, few are aware that formal wilderness areas occur here as well. This collective inability to identify the boundaries of wilderness areas demonstrates the intact nature of the land and local residents' strong cultural ties to it, with the only visible boundaries being on paper (*Figure 2*).

The formal designation of wilderness areas in northwest Alaska contributes to sustaining an ecosystem that is predicated on an expansive area of natural habitat that is not fragmented by human development. The nondesignated wilderness areas that adjoin formal wilderness add significantly to the benefits produced by the latter. The relatively small human disturbances in areas adjacent to designated wilderness are mitigated in part by the extensive intact ecosystem that stretches from the Chukchi Sea across the entire Brooks Range. While all species present in northwest Alaska benefit from large areas of undisturbed habitat, it is critical to highly valued cultural and ecological keystone species like caribou, Dall sheep, grizzly bears, wolves, and wolverines, in particular (*Figure 3*).

Most people born in the region trace their ancestry back to people living essentially in the same countryside that remains today (including those areas that are now designated wilderness) and a few can trace their own birth, or that of their parents, back to a dwelling located in areas currently designated as wilderness. Being born and raised in wilderness was definitely not a consideration during the development of the Wilderness Act—which by definition is a place where people are visitors and do not remain. Of course, for Arctic indigenous populations whose entire history and culture is defined by living in wilderness (whether formally designated or not), the wilderness concept is a western construct that is foreign to them. Much of the local traditions, folklore, notable landmarks, and family histories are associated with the country these wilderness areas encompass (*Figure 4*).

Most Americans think about formal wilderness as areas that are representative of natural ecological spaces where nature is allowed to carry on substantially free from human interference and where people are only occasional visitors. Specifically, the main principle of most designated wilderness is for nonconsumptive purposes where only photos are taken and footprints are left. While designated wilderness areas found in northwest Alaska definitely have the ecological traits represented by traditional wilderness areas, there remain significant differences that set these areas apart from other wilderness areas in the Lower 48 and even those portions of Alaska where the 1980 Alaska National Interest Land Claims Act (ANILCA) legislation does not apply. The most distinct difference is that these areas are treasured by local residents not for their wilderness character per se but for their economic contributions by providing food and income through hunting, fishing, fur production, and other traditional activities. This enables local people to continue their culture of living off the land and allows many to avoid having to move to distant urban centers to completely join the cash economy (*Figure 5*).

The beauty of land from a local perspective is anchored in its ability to sustain local culture through the production of high quality food and fur. The latter can be used to make warm, functional clothing that can be as much art as utilitarian garment, or sold to produce income. The former helps

Figure 1. Snowmachine packing.

Photo by Jim Dau

define a people who are first and foremost a hunting culture. Continuing a way of life based on wild meat consumption is distinct from cultures based on domestic livestock in very qualitative ways. Most of the negatives surrounding western meat production and consumption are minimal or completely reversed to become positives. For example, while petroleum products are used in transportation to secure food and other resources from the country, they are not used to grow or produce them, an important distinction from most domestic food production that has a large carbon and

Photo by Jim Dau

Figure 2. Wilderness valley in winter.

Photo by Tina Moran, USFWS

Figure 3. A herd of caribou on the move.

aquifer-depleting footprint attached. Other benefits from eating off the land include: plant and animal food species that are not genetically modified organisms; the production of meat is not industrialized with all the negative inputs and processes associated with this; the disposal of animal waste

Photo by Jim Dau

Figure 4. Stone flakes.

Photo by Susan Georgette, USFWS

Figure 5. Cleaning a caribou skin.

Photo by Martha Whiting

Figure 6. Cranberry *aamuk*.

is not a negative issue and in fact provides natural fertilizer for the system. Most importantly the meat and other food items gathered in wilderness areas are very healthy based on their own nutritional merits and even more so in comparison to domesticated meat that studies show contribute to heart disease and other health issues (*Figure 6*). The health and cultural benefits of going out into the country with family and friends to obtain these resources also contributes greatly to the quality of life for residents in the region.

Of course while food and fur production is demonstrably the most valued contribution that wilderness provides to the regional way of life, other benefits of wilderness are also present. These landscapes provide local people with a sense of freedom, a tie to the ancestors, cultural expression, and spiritual renewal (*Whiting 2004*). One of the most notable cultural contributions provided by utilizing the backcountry of northwest Alaska is the egalitarian effect it has on societal standing. The land affords greater privileges and rewards to those who earn it through experience, skill, and conditioning regardless of their net worth or formal resume. Technology and money can only compensate for a lack in any of these areas to a very limited degree. This situation allows for those that are experts at wilderness living and who may not necessarily participate in large part in western institutions to achieve a high level of societal status and self-worth. The greatest respect in Iñupiaq society is still reserved for those that are successful hunters and providers and that are knowledgeable about living and surviving off the land (*Figure 7*).

The main social challenge for managing wilderness areas in northwest Alaska lies in balancing federal and nonlocal priorities with local priorities and norms. Management of them must be generally compatible with local traditions in order for local people to support their existence, and to reduce cross-cultural conflicts. Unfortunately, there is a fundamental difference between the core of wilderness management that defines "natural and healthy wildlife populations" as being not unduly influenced by humans, and the local perspective that indigenous people have been affecting wildlife populations through their hunting for millennia and thus are a natural part of the system. It is impossible for local people to subscribe to the theory that natural wildlife populations are only those not manipulated by humans, when set against the thousands of years of local wildlife populations coexisting with a subsistence culture. When can the presence of humans be natural? It's when wild populations have evolved with their presence and influence over thousands of years, that's when. For those that are skeptical of the ecological benefit of a hunting culture that has evolved with a landscape and its wildlife populations, it would serve well to remember the attitudes of people as it related to wolves in places like the Yellowstone National Park ecosystem. At one time, not that long ago, predators where seen as only detrimental to ecosystems and their

Photo by Susan Georgette, USFWS

Figure 7. Group caribou hunting.

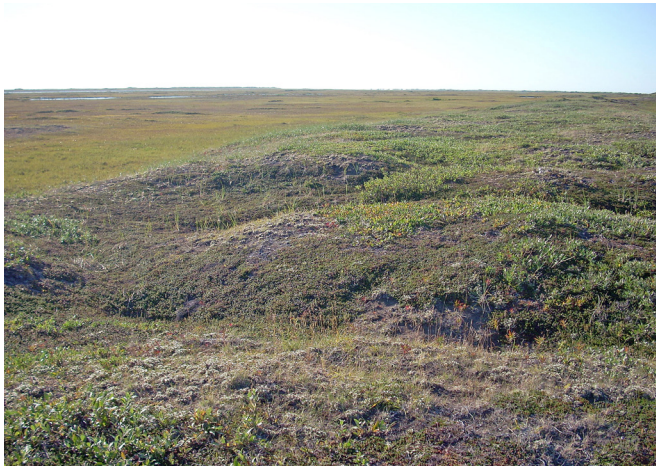

Photo by Joanne Goodsell

Figure 8. House pits.

Photo by Alex Whiting

Figure 9. Caribou skull.

removal was believed to be what was in the best interest of the nation's treasured wild areas, like Yellowstone. However, it is now well known that this understanding of ecosystems was incorrect and that predators are necessary to a healthy ecosystem. While conservation in the form of regulating human take for long-term sustainability is important, the Yellowstone example proves consumptive use of wildlife populations (within limits) promotes a healthier and more resilient ecosystem than would occur if these populations were not harvested at all, or minimally. While it is not always obvious to the casual observer, there are other ecological benefits besides the predator-prey relationship that humans have contributed to the Arctic systems. One of the clearest examples being that some of the most productive habitats on the Arctic tundra are the numerous old house pits (*Figure 8*) where more varied and productive plant species are found providing quality forage for herbivores and where raptors, foxes, rodents, and ermine find denning and hunting sites. In addition, even the smaller but more numerous butchering sites spread over the entire region provide essential nutrients for the plants and scavengers found in those locations (*Figure 9*). Human presence can be beneficial to wild systems, especially where coevolution over centuries has occurred.

Having a people with ties going back thousands of years continue consumptive use of wilderness areas should not be something that is merely "tolerated" or "allowed," but instead should be part and parcel with the celebration of these areas as national treasures. Supporting the continuation of America's indigenous Arctic populations as a managing philosophy should be equal to all other management considerations of these wilderness areas and the other federal lands in northwest Alaska. Unfortunately, the attitude of many western managers, bureaucrats, and wilderness advocates continues to be one of not fully committing to the belief that the human presence in northwest Alaska is a natural part of the ecology. Due to this cultural dichotomy, federal and nongovernmental organizations are many times at odds with local standards, uses, and philosophies.

Photo by Jim Dau

Figure 10. Wilderness hill.

Policies that are meant to protect designated wilderness areas from small scale human use impacts (including consumptive use), while likely consistent with the Wilderness Act, are generally incompatible with local perspectives and needs.

Even though management of the northwest Alaska wilderness areas is not always agreeable with the local culture, the protected habitat found in these areas is critical to the resilience of the local ecosystem and the culture that depends on it. Their fates are inextricable. Many threats remain for both; some of the more notable include climate change, long-range contaminants, predator-prey balances, and insect and zoonotic outbreaks. Additionally, recent proposals to build road systems to the mineral resources in northwest Alaska and the mines that would be developed pose real challenges to the long-term ecological integrity of this region. The wild matrix of intact wilderness (*Figure 10*) that still exists inside and outside of designated wilderness areas, from the Chukchi Sea to the Canadian border, may partly ameliorate the negative effects of these impacts to the land and animals. Whether in the end it will be enough to enable both the indigenous cultures and the wilderness areas to survive and prosper remains to be seen.

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Whispers Wispy and Wishful

By Wilson Justin

I always thought that one could see forever if one could be friends with the steep shadows that drop quickly in the autumn mountains. There is a rhythm even in the silence that marks time in a way that could never be counted in the twisting electronic glare of captured light cast harshly against houses, or glass or steel. Once turned, the trail is a different friend. A horse quickens his pace, the camp dog will bounce a bit, and the hunter feels for the moment a sense of senselessness. All is home on the trail whose call may be older than your clan but even then I can sense in the pull of the evening sky something more vast and more complete, just ahead or just around the corner or maybe next to the last lonely sun-caught rock on a distant peak. I know I have heard forever but have I seen it? Which eyes would it have been? The Nabesna? Let's see what it looked like then.

At six years of age I could only see the field lying just past the trees, and what seemed to me miles and miles of openness, reaching in a giant sweeping arc to the glacier, brilliant in the noon sun. It was only twelve miles away but I could see the broad, blue-white back snaking around the corner of the mountain in a sprawling curve that left nothing to chance, not in this eyesight or any other. The field would always have a fresh-blown feel to go with the enchanting scent of new flowers rooted in patches of purple, gold, and green. The horses would shake their manes and long after in a faraway tone I would hear the bells which hung on their necks. Time comes in patches at six years of age and choppy even without the wind. I could not see downriver because of the trees and the creaking alders, but I could see upriver and it was a child's forever right from the front of the cabin to the top of the sparkling glacier. It was there, it was always there. The noon sun would sear the river rocks and the heat waves would dance like dervishes first one way and then the other. Godfrey and I would run or walk or creep whichever was first in our minds, along the young spruce that curved up to the airfield. Very soon we would be missed and rugged brown faces would bob and crinkle in the heat behind us.

Figure 1. Nabesna glacier in 1983.

Photo courtesy of Wilson Justin

Photo courtesy of Wilson Justin

Figure 2. Horses bedding down for the night.

Our village had been pulled apart by forces that were light years from our comprehension and if there were some danger in the field, it was left to one of the four remaining adults to see to our safety. I remember the evening songbirds soft and silky and the low deep murmur of the river across from us. Once night began to settle, the horses would drift down and camp out directly in front of our cabin (*Figure 2*), fearful of the occasional villainous grizzly ever mindful that there were still a few fighting dogs around the houses. The houses (*Figure 3*) were scattered along the trail leading to the watering hole three-fourths of a mile away and bearing southwest. The first little hut stapled together of small spruce and found nails belonged to my Aunt Lena (*Figure 4*). It was a teenager's house thoughtfully built for one person. The next house (*Figure 5*) was of house logs cleaned and pressed to the ground with a fine axe and fitted in a way that suggested permanence. Aunt Lena with four of her pack dogs pulling brought the beautiful timber to the site. Uncle Johnny edged the logs to form-fit arrow-straight and seal tight against the wind. It was labor in the name of duty. Three sisters and the brother put to a decency test on behalf of a semi-invalid elder. The house on the other side, a little bigger built to family size by Uncle Johnny and his brother-in-law. Again, pack dogs (*Figure 6*) built to power shoulder-deep snow aside were put to pulling in harnesses. In quick succession, Frank's house and finally ours the last in line. Still caught, two other homes never completed, abandoned in mid-stride as it were when the

Photo courtesy of Wilson Justin

Figure 3. Jack Justin's cabin.

Photo courtesy of Al Clayton Sr.

Figure 4. Wilson Justin, Aunt Lena, and Calvin Justin.

Photo courtesy of Wilson Justin

Figure 5. Jack the Vietnam veteran's cabin about sixteen miles from Nabesna Village.

Photo courtesy of Wilson Justin

Figure 6. Pack dogs.

village emptied out. The next trail over, Shorty Frank took the shadows and hammered out a name there in the woods. Scattered here and there were tent frames, some of Northway, some of Chisana, but all empty and foreboding by the time I began to run the short footpaths between the non-neighbors. Even as new houses were left to gleam in the sun I could look up far past the trees and sudden flatness of the airfield and see right past the big outcrop of rock that defined the meeting room for the Jacksina River and the Nabesna River. It would always be there, the big white fortress of ice spilling light into the valley, resisting the night, never resting, never sleeping.

Godfrey went off to another village late that summer. His Dad came down and took him to the trail and then there was only the quiet wind and low murmur of the river. I stayed with my Aunt Lena. In the early morning she would take her 22 rifle and go to the hills for supper beckons early in our lives. I would climb up on a small platform of crossed saplings with a dog tied to the tree underneath and I would wait the day out until sometime late when my aunt would return from the snare line or the fish creek. The rare days when my aunt was able to stay close to the settlement, I would walk out to the field, and try as I might, I could not fathom the why of being the only two persons in a settlement still new. I did not know the lessons nor did I care that I was being tutored. The day would linger, the trees would sigh, eventually all the little critters would make their way to the dens or to the nesting places. I would look long at the falling sunlight and turn to the last cast of the glacier. It would be there; it would always be there.

The summer had not ended when I, too, was put to the trail. We were the last two out of Nabesna. My Aunt Lena, me, and her four pack dogs. I don't remember the trip, but I can always feel the upwelling that comes when understanding finally sinks in that something had taken over and it was all really shadows. Somewhere down the trail we found a second home, or I guess I should say, another place to camp. But it wasn't the same and I wanted to go back, and I did as I grew through the 1960s into the '70s. I went back over and over for any number of reasons, but I never saw Nabesna again, in that light, of that summer under a glacier that promised to be with us forever, me and my faithful friend Godfrey. Jack came back and began painfully to rebuild his life from the sickness that put him into a sanitarium for a good while.

Photo courtesy of Wilson Justin

Figure 7. The river in 1980, eating away at the WWII airfield.

Photo courtesy of Wilson Justin

Figure 8. Taking the family back to Nabesna.

Photo courtesy of Wilson Justin

Figure 9. Horse packing.

He came back to the cabin built for him and stoically began measuring the years by the decades. The river rose and fell, told elsewhere in other stories of climate change and such. The first time I could look up the river again right out of high school in 1968, I could see a lot of brush and new growth along the airfield. I could also see clearly the glacier was crumbling, and with it all of the sounds of youth and freedom. The why of being left behind was never answered and never spoken. No one said anything about the glacier eating itself up finally to seep into the rocks under its once mighty wings. The river changed, too, from friend, then, to foe (*Figure 7*).

Between 1987 and 1997 I took the family back down to Nabesna (*Figure 8*). Each trip was a short burst of joy and freedom, but the leaving would be painful and gasping. The glacier was long gone and so I finally quit going back to where it was where I was born, and where my blood runs so deep.

I stayed in the mountains after high school, close to the ice that filled all the peaks and all the meadows under the ridges. I grew to be a horseman (*Figure 9*) and I could tell what the weather was going to be like days ahead of it happening. I grew to be one with the sounds of the mountains and moved under the late autumn full moon with the ease of a wolf passing amongst the shadows. But each decade the ice was less. When finally the last of the seven-thousand-foot peaks opened itself to the blue skies, I found myself no longer willing to be out there. I didn't know why then but I knew what had passed was more than what men would know. There were a few times that I did go back. During a week's worth of riding the old trails in 1993, the immense loneliness stayed with me every step of the way. I returned again in 1997, but that time I came short. After three days, I turned towards home and left it at that.

Now that all the horses are gone and there is no chance of covering those high mountain trails ever again, I sometimes wonder if forever didn't come too soon. Maybe I should have been five years old and then jump to seven years old and skip the summer in between. And so, I turn eyes now and then to distant peaks and think, how could the wind not have told me I would see footsteps of forever and not know that I did? Our trails are still out there (*Figure 10*). Our songs still linger in the trees, our laughter can still be felt in the shift of the noon sun, but how did I miss it even when I was right there? So as the shadows steep in the quiet of the pastures and stop at the edge of the ravines, I can look back and I can still see that six-year-old sometime on the edge of the trees and sometimes on the corner of house. But he always is looking away and I cannot, although I try, to see what it is he is looking at.

Photo courtesy of Wilson Justin

Figure 10. Looking back.

At'oowu: Tlingit Homeland

By Christina Mills and Mary Beth Moss

Glacier Bay National Park and Preserve contains almost 2.7 million acres of designated wilderness and is one of few national parks that protect wilderness marine waters. The area is also the traditional homeland of two Tlingit tribes; the Gunaaxoo Kwaan who claim the northern coastal reaches and the Huna Kawoo who settled Glacier Bay proper, Icy Strait, and long stretches of the outer coast.

Glacier Bay is like a set of concentric circles of meaning, and to the Tlingit, a community of spirits lie at the very core. The Tlingit Clans have lived in Sít' Eeti Gheeyí, the "Bay in Place of the Glacier" and along Icy Strait and the outer coast for countless generations; the Tlingit say since time before memory. For them, the vast stretches of wilderness are inhabited places, alive with sentient and non-sentient beings, as well as the spirits of the living and those who have gone before. Mountains, waterways, rocks, and animals are all imbued with spirits; each is respected as an individual and an equal. A deep and enduring connection with this greater community of life is ingrained in the Tlingit world view and respectful interaction with all beings ensures community health. A traditional Tlingit tale recounts the cataclysmic events that occurred when a young woman spoke disrespectfully to a glacier, and even today, the tribal members respectfully refrain from pointing at the slopes of Mt. Fairweather—Yeik Yi Aaní or "Land of the Spirits."

Humans have always been an inextricable part of Glacier Bay's web of life; the Tlingit are as closely connected to the land, the water, and the inhabitants of both as they are to each other. They believe that their continued interaction with homeland is a sustaining—indeed vital—characteristic of this place. The Tlingit come to Glacier Bay Wilderness not to be alone, or to explore a previously unvisited place, but rather to be in communion with ancestral spirits and to retrace the footsteps and actions of all those who have visited before them. In a place that is now called wilderness, the Tlingit people are never alone, but always in the company of their living and nonliving relatives; the bear people, the ice people, and all the spirits of the homeland. While many visitors come to Glacier Bay to witness the spectacle of a whale breaching or a glacier calving, and are understandably awed by nature's exhibitions, the Tlingit would perhaps experience the whale's breach and the crumbling ice as communication between the leviathan, the glacier, and their human clan relatives.

Tlingit culture was shaped by, and remains dependent upon, continued interaction with homeland. Gathering food resources is a particularly important traditional activity, as the process of harvesting is not only a means of sustaining physical needs, but also a ritual for reconnecting and engaging with ancestral spirits. Southeast Alaska's abundant resources—salmon, halibut, seal, gull eggs, and berries—allowed the Tlingit ample leisure time to develop complex social and political systems as well as sophisticated artistic and ritualistic practices. In essence, Glacier Bay's rich array of marine and terrestrial foods made the Tlingit who they are—a highly structured society with a well-developed political, social, artistic, and spiritual tradition. Traditional foods are gathered and eaten not only to sustain the body, but also to sustain the culture itself. Restrictions and regulations that reduce opportunities to hunt, fish, and gather pose a threat not only to traditional diets and ways of life, but to the Tlingit ability to participate in the web of life and connect with the present, past, and future.

The Tlingit concept of at.óowu, meaning "something owned or purchased" is central to traditional people's relationship to Glacier Bay. When an advancing glacier forced the ancestors from their homeland, a woman remained, sacrificing her life to appease the glacier. Other clans were washed out of Lituya Bay by a tidal wave that decimated their villages and drowned many inhabitants. To the Tlingit, the loss of these precious lives paid for their homeland and the stories, songs, clan crests, and regalia commemorating these losses are the Tlingit "deeds" to place.

The concept of wilderness as defined in the Wilderness Act is a modern construct that emphasizes the value of places with little evidence of human change. But the continued relationship of the Tlingit clans with their homeland is as much a part of the wilderness character of Glacier Bay as the glaciers, the trees, and the opportunity for an unconstrained experience. To some, without Tlingit ties to the spirits and ancestors, the Glacier Bay Wilderness would become like a static museum. Perpetuating the Tlingit language and traditional practices ensures that the spiritual connection to this place is not lost and that the Glacier Bay Wilderness remains a living community.

Figure 1. (Inset) The Chookaneidi Clan commemorates their ancestors at the face of Margerie Glacier in Glacier Bay National Park.

Photo by Mary Beth Moss

Figure 2. Ken Grant, T'akdeintaan Clan Elder at the Ghaanaxháa sea arch on the outer coast of Glacier Bay.

HIGH SIERRA

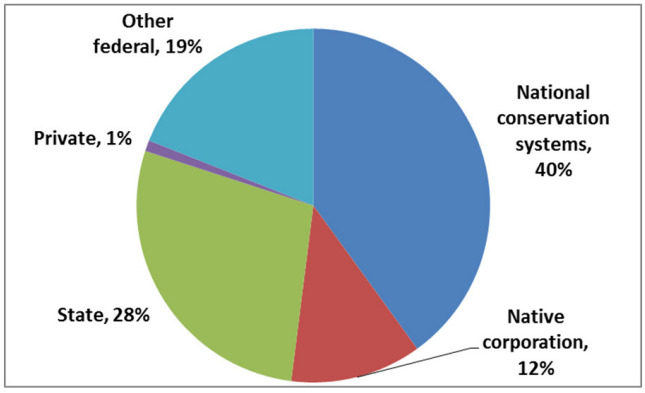
Economics of Wilderness: Contribution of Alaska Parks and Wilderness to the Alaska Economy

By Steve Colt and Ginny Fay

Introduction and Background

What is the economic contribution of wilderness and wilderness-protected ecosystems to Alaska's economy? Tourism by nonresidents is the primary link that we consider between wilderness and the Alaska economy, although subsistence harvests and resident recreation clearly generate value for Alaskans. Here, we synthesize and apply existing data and research. We do not consider global ecosystem services provided by Alaska park lands and waters, nor do we assess activity that is not captured within the Alaska economy.

Figure 1 shows the allocation of Alaska's 375 million acres. Approximately 40 percent are in federal conservation units, and approximately 38 percent of these 150 millions acres are designated wilderness. The Alaska National Interest Lands Conservation Act (ANILCA) of 1980 added most newly designated conservation units in the form of national wildlife refuges. The second most important category of additions was new national parks and preserves.



Source: Hull and Leask, 2000.

Figure 1. Alaska lands by ownership status.

Wilderness and Tourism

The Alaska visitor industry is the only private sector basic industry that has grown almost continuously since statehood and continues to grow. Almost 1.6 million visitors came to Alaska in summer 2011, and 91 percent of them came primarily to see the state's mountains, glaciers, and wildlife (McDowell Group 2012). Alaska's visitor industry accounted for an estimated 37,800 full- and part-time jobs from May 2011 to April 2012, including all direct, indirect, and induced employment. Estimated peak employment was 45,000. These jobs resulted in total labor income of $1.24 billion. Visitors spent $1.7 billion in Alaska, most of it in the summer months (*McDowell Group 2013*).

While these economic impacts cannot be completely attributed to the presence of designated wilderness, wilderness characteristics are a significant driver of Alaska visitation. In the summer 2001 Alaska Visitor Statistics Program (AVSP) Visitor Opinion Survey, specific questions regarding wilderness were included. For over 80 percent of respondents, Alaska's wilderness character and the opportunity to see or spend time in wilderness places influenced their decision to come to Alaska and was an important factor in trip planning (*Table 1*). Wilderness was also important to a decision to visit Alaska again in the future by 73 percent of respondents. Protecting the wilderness character of Alaska was also important to 87 percent respondents. Most also of strongly supported rationing the use of popular wilderness areas to protect the natural environment (80 percent) and animal populations (84 percent). Rationing use to protect opportunities for visitors to be alone and away from crowds was also supported (47 percent) but not as strongly.

Data from summer 2012 confirms that Alaska tourism activity revolves around Alaska's national parks, especially Denali (433,000 visitors) and Glacier Bay (359,000 visitors) (McDowell, 2013). Our analysis of summer 2001 expenditure diaries collected by AVSP suggests that more than half the total amount spent by tourists in Alaska comes from people who visit Denali. Visitors to Denali in summer 2001 stayed in Alaska for an average of fourteen days, while all other visitors averaged only eight days. Denali visitors spent $2,300 per party per trip, compared with only $1,100 spent by all other visitors. Similarly, visitors to Katmai National Park and Preserve also spent more days in Alaska and had higher expenditures per trip than the average Alaska visitor (*Fay and Christensen, 2010*).

Several other studies confirm the economic significance of other parks and wilderness areas in Alaska. Fay and Christensen (2010, 2012) found that Katmai National Park and Preserve generated $52.1 million in annual visitor spending, providing approximately 650 jobs and $24.3 million in labor income (*Figure 2*).

Figure 2. Bear viewing at Katmai National Park and Preserve.

Photo by Robert Winfree, NPS

	Importance				
	Most	Very	Medium	Somewhat	Not
Importance of the wilderness character of Alaska in making the decision to visit Alaska	16	27	20	20	17
The importance of the possibility of seeing or spending time in wilderness places in making trip plans	12	22	24	24	18
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The opportunity to visit or see wilderness would be important to my decision to visit Alaska in the future	2	4	21	39	34
I do not think the wilderness character of Alaska is important to protect	50	37	8	2	3
Use of popular wilderness areas in Alaska should be rationed if needed to protect:					
> the natural environment	2	4	14	49	31
> natural animal populations	1	3	13	43	41
> opportunities for visitors to be alone, away from crowds	4	12	37	31	16

Source: Alaska Visitor Statistics Program, summer 2001 data.

Table 1. Importance of wilderness to Alaska Visitors.

Goldsmith and Martin (2001) used a time-series approach to assess the effect of Kenai Fjords National Park on the growth of the economy of Seward, Alaska. They found a number of indications that the tourism industry grew rapidly throughout the 1980s and sustained the Seward economy through the 1990s:

> Most of the economic growth, particularly since 1990, has been driven by the visitor industry. Although there is no direct way to track this industry, employment in trade, services, and transportation—the sectors that provide the most visitor-related jobs—grew at an annual rate of 5.9 percent. Retail sales from summer visitors have grown at a 9.9 percent annual rate (inflation adjusted) since 1987. Park tourism is a $52 million-a-year business for Seward.

Goldsmith, Hill, and Hull (1998) analyzed the economic activity associated with the Alaska Peninsula, Becharof, Izembek, and Togiak Wildlife Refuges. They found that these four refuges supported 3,225 average annual jobs and $127 million of personal income in 1997. Commercial fishing accounted for about 90% of the jobs and income. The remaining 362 jobs were attributed to sport fishing, refuge management, subsistence-related activities, and hunting. If subsistence activity were treated as wage labor, it would equate to an additional 750 jobs, and the authors estimated that subsistence also generated more than $50 million in net economic value.

One of the earliest and most thoughtful studies of the effects of wilderness on tourism was the master's thesis done by Larry Bright (1985). Bright attempted to measure changes in tourism use patterns resulting from the creation of six designated wilderness areas within the Tongass National Forest. He collected primary data directly from tourism business operators.

Bright was very careful not to read too much into his survey results. Nonetheless, he concluded:

> I have come to the conclusion that designation [of Misty Fjords Wilderness] has played a significant role [in the increased use of the area]....The dramatic jump in Misty Fjords use occurred during and immediately following the designation (1980/81), while use in surrounding areas continued to grow at a much slower pace.
>
> Some of the most convincing evidence supporting the designation effect comes from the operators themselves. Every Misty Fjords operator I interviewed stated that they used its official designation promotionally. The operators offering services in 1980 told me that the designation gave them a nationally recognizable name to advertise. (p. 33)

Bright also proposed that wilderness designation was likely only one of six distinct inputs to the increased production (and consumption) of tourism in southeast. Designation as a special area was one (p 68). The others, in Bright's own words, were:

1. access—a site must be reachable within a reasonable amount of time and by a reasonable mode of transportation . . . In most cases, boat or plane are the two most reasonable mechanisms of transportation.
2. the tourists must be "reachable"—there must be an available market in which the tourism operator can

"peddle the goods." If cruise ships did not stop in Ketchikan and provide a market, scenic flights of [sic] Misty Fjords would not have developed to the present day level.

3. a single, dramatic attraction—like a large glacier (Hubbard), many glaciers (Glacier Bay), or an outstanding salmon stream (Situk).
4. promotional skills and equipment—in many parts of Southeast boats or planes must be available to access an area. As well as the equipment, individuals must be present with the promotional skills to initiate a tourism enterprise.
5. facilities—probably less a factor in Alaska than in other parts of the U.S. (p. 68)

Haley, Fay, and Angvik (2007) found that proximity to national parks was the strongest predictor of the number and variety of businesses in small rural Alaska villages with populations less than 1,400 people, places where wage income is especially scarce. This study's conclusion echoes other studies using U.S. data. These studies show that rural areas endowed with natural resource amenities, such as wilderness, experience higher regional economic growth rates (Deller et al. 2001, Rasker et al. 2004). Both the amount and proximity of public land was correlated with faster economic growth of adjacent areas (Rasker et al. 2004). Recent studies of western counties and states have shown that population, income, and employment growth increased as the percentage of wilderness increased, and the West's popular national parks, monuments, wilderness areas, and other public lands offer its growing high-tech and services industries a competitive advantage (Headwaters Economics 2012; Holmes and Hecox 2004).

Maximizing the Economic Value of Alaska Wilderness

Both economic theory and the evidence to date suggest that to maximize the long-term economic benefits of conservation lands, Alaskans and federal land managers will need to do three things.

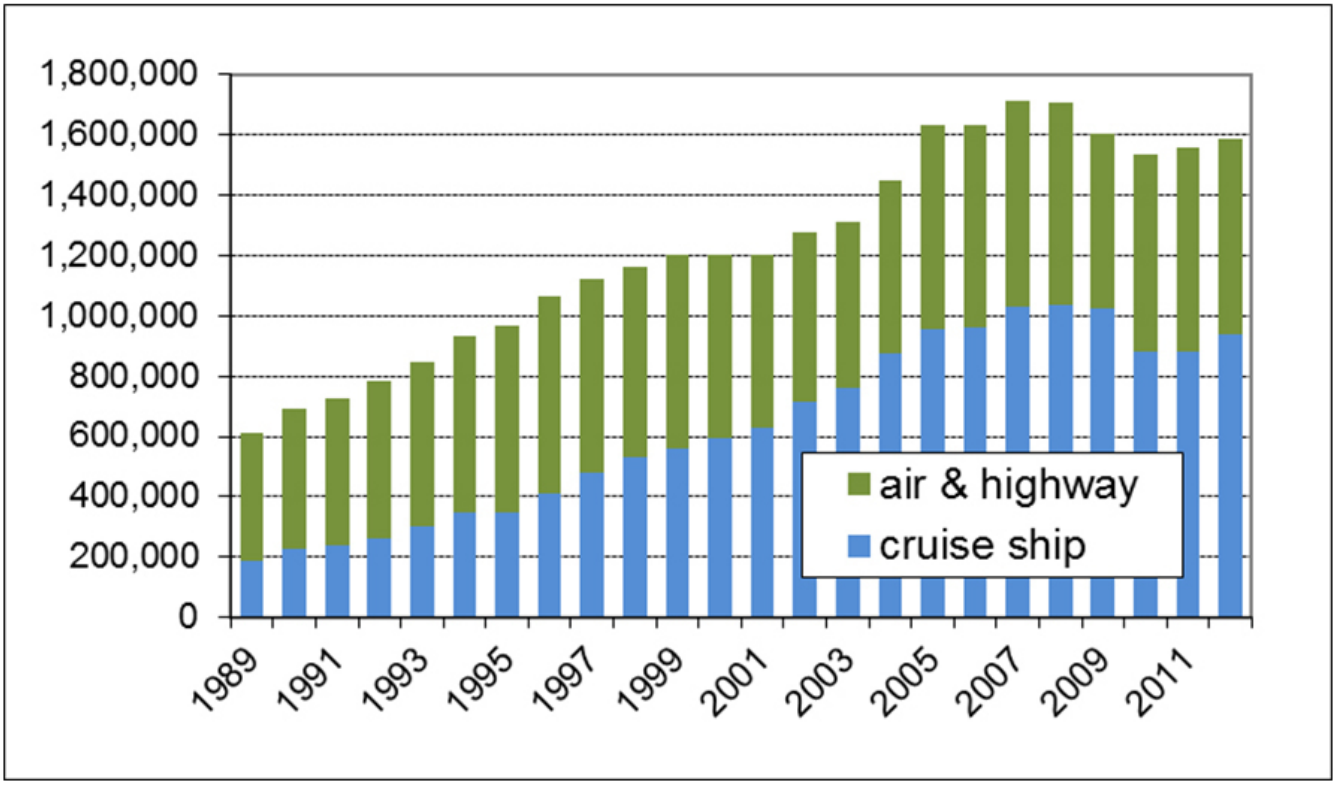
The first and most important task is to protect the "Alaska difference"—those fundamental attributes of Alaska's large intact ecosystems and their wilderness character. This is easier said than done. It is almost inevitable that individual residents, businesses, and visitors will, consciously or not, chip away at the integrity of Alaska's wildness. In some areas the degradation has been rigorously measured (Twardock et al. 2010).

Second, Alaskans must be somewhat patient. Time is on our side when it comes to extracting economic value from wilderness. The global supply of wilderness is decreasing while the demand for Alaska nature-based tourism is

Photo by Robert Winfree, NPS

Figure 3. A cruise ship navigates through Glacier Bay National Park and Preserve.

Figure 4. Buses in Denali National Park and Preserve carry thousands of tourists into the park each summer.



Source: Alaska Visitor Statistics Program

Table 2. Alaska summer visitor arrivals by major transportation mode.

growing (Colt et al. 2002, Dugan et al. 2009). Taken together, these shifts in supply and demand mean that the "effective price" of Alaska's wilderness is likely to steadily increase.

Finally, it is important to remember that wilderness and conservation lands are just one of many required inputs to tourism, subsistence, and fish production. Other important inputs include environmentally benign physical access, business talent, and capital investment in supporting infrastructure. Innovative transportation options that can bring more people into the Alaska wilderness with less environmental impact are a good place to start. Cruise ships (*Figure 3*) could be powered by natural gas. Double-decker Denali buses (*Figure 4*) might increase road capacity without affecting wildlife (assuming they can be accommodated without major road reconstruction). Increasing opportunities for remote rural gateway communities to participate in park planning could also help local residents to capture more jobs and income from their neighboring lands (*Fay et al. 2005*).

Looking ahead, it is clear that Alaska's wilderness ecosystems will become increasingly valuable assets in a crowded urban world. If Alaska's wildlands, wildlife, and ecological integrity are cared for with respect, the contribution of wilderness and conservation lands to the Alaska economy and to people everywhere will be significant, positive, increasing, and enduring.

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What Future for the Wildness of Wilderness in the Anthropocene?

By Roger Kaye

Of all the sweeping conservation laws of the 1960s that came about in response to concern over the worsening environmental degradations accompanying the prosperous post-World War II march of progress, the Wilderness Act of 1964 most expanded the boundaries of conservation thinking. The rapid loss of natural landscapes, the destructive logging, mining, and agricultural practices, the spread of pollution and pesticides, and the awesome power and fallout of the atomic bomb had signaled a new order of environmental threat. Biologist and Wilderness Society president Olaus Murie (*1960*) summarized it as "the real problem of what the human species is to do with this earth." He and other leaders of the growing wilderness movement sought legislation reaching beyond the traditional conservation of resources to the protection of entire ecosystems. But their Wilderness Act went beyond protecting all components of a designated area's natural condition. Going further than any previous conservation initiative, it also specified perpetuation of the evolutionary process of their origin, their wildness.

Compromises have been made in meeting the act's mandate for preserving both an area's natural conditions and its wildness. Nevertheless, wilderness status has been quite successful in protecting both from development, resource exploitation, harmful public uses, and the like—the focal threats of the 1950s and early 1960s.

Visionary as it was, however, the Wilderness Act did not anticipate today's human-driven, global-scale changes. Nor did the act anticipate how such changes undermine basic assumptions about "natural" conditions. It could not anticipate the emerging post-natural era of the Anthropocene.

The Anthropocene

Figure 1. A wolf pack moves across frozen river ice in Yukon-Charley Rivers National Preserve.

Photo courtesy of Sandy Hamilton, Arctic Air Alaska

NPS photo

Figure 2. A meandering river within the Western Arctic National Parklands.

Nobel laureate Paul Crutzen and other Earth-system scientists who advanced the Anthropocene concept describe the state it encapsulates:

> Human activities have become so pervasive and profound that they rival the great forces of Nature and are pushing the Earth into planetary terra incognita. The Earth is rapidly moving into a less biologically diverse, less forested, much warmer, and probably wetter and stormier state. (*Steffen et al. 2007*)

Since Bill McKibben's 1989 pronouncement of "The End of Nature," findings from the ecological and physical sciences have documented the pervasive globalization of human influence on protected areas, including wilderness. Everywhere, the degree to which broad scale environmental changes are anthropogenic or "natural" in origin are becoming less distinguishable, and more synergistic. The recent text Beyond Naturalness (*Cole and Yung 2010*) raised awareness of the now problematic goal of maintaining natural conditions—that is, apart from human influence—that had always guided stewardship of protected areas. And now National Park Service (NPS) director Jonathan Jarvis has declared that "the paradigm of allowing nature to rule the parks is no longer viable." "Now the challenge before us," he said, "is to see the world with nature and humans intertwined." (*Jarvis 2010*).

This increasingly intertwined world of the Anthropocene will exacerbate tensions between the goals of perpetuating a wilderness area's wildness and its other natural conditions. One underlying problem is that the act specifies that a wilderness be managed to perpetuate its wild "untrammeled" condition and also "so as to preserve its natural conditions" (Sec. 2[c]). Although the act did not define "natural conditions," the Congressional Record shows that proponents intended that wilderness would perpetuate resource conditions such as wildlife species, their habitats,

NPS photo

Figure 3. Caribou in the Western Arctic National Parklands.

ecosystems, and historic viewsheds, "unimpaired" (Sec. 2[a]); or essentially as they were at the time of designation.

A larger problem is that the act also specifies that its purposes are to be "within and supplemental" to the purposes of national parks, wildlife refuges, forests, and Bureau of Land Management (BLM) areas that are designated as wilderness (Sec. 4[a]). National park wilderness areas, for example, remain subject to the 1916 NPS purpose of conserving scenery, natural objects, and wildlife "unimpaired". National wildlife refuges, for example, retain their statutory purposes and other mandates to perpetuate specific high value species.

The Dilemma of Wilderness Stewardship

The dilemma of wilderness stewardship (*Cole and Yung 2010*), as this has come to be called, is that in many and perhaps most wilderness areas, focal species and other favored natural conditions will not be perpetuated without management interventions. These will be needed if areas are to resist or adapt to global-scale impacts. Where the hope is to regain lost conditions, restoration efforts may be needed. Such actions would compromise or be antithetical to preserving the area's wild, untrammeled condition.

What then should we as wilderness stewards do? We should start with the admonitions of Howard Zahniser, chief author of the Wilderness Act, who warned against management programs that would erode wild character. "We must always remember," he stated, "that the essential quality of wilderness is its wildness" (*Zahniser 1992*). Interventions in wilderness should never be considered unless absolutely essential to meeting other mandates.

But in light of the emerging conflict among purposes that Zahniser and the other framers of the Wilderness Act could not have foreseen, and considering the inevitable calls to prevent loss of favored resources, can we realistically expect that all 109 million acres of the nation's 757 wilderness areas will be managed for real wildness?

Unfortunately, no. As a solution, ecologist Daniel Botkin (*1990*) proposed a divided wilderness system. Some areas would be designated as "pre-agricultural wilderness" wherein conditions would be maintained as they were when first viewed by Europeans. "No-action wilderness" would remain "untouched by direct human actions, no matter what happens." Fearing a homogenized wilderness system wherein both wildness and natural conditions are "compromised everywhere, and optimized nowhere," ecologist David Cole (*2000*) proposed an approach for "allocating separate lands to each opposing value and embracing diversity." Some wilderness units could be designated as true hands-off, nonintervention areas where wildness is preeminent. Within them, ecological systems would be allowed to adapt and evolve as they will.

We would need to accept that "natural conditions"

NPS photo

Figure 4. Musk ox in Cape Krusenstern National Monument.

will change and some preferred species, for example, will decline or be replaced by others more suited to changing conditions. In such areas we would accept that their purpose is not to perpetuate their current components and biotic assemblages. Instead, their purpose would be to protect the unfettered processes of their creation.

True, anthropogenic effects will have changed the conditions that evolution responds to, but the processes by which evolution responds would remain autonomous. They would remain untrammeled, free of conscious intent, and not otherwise subject to the projection of human desire. This approach would require forgoing all interventions and restoration efforts—even, for example, removal of invasive species. Hold them off at the border if you can, but once established, they are part of the "natural order" of what may become a novel ecosystem.

Neither remoteness nor a wild-by-default strategy will assure permanent perpetuation of wildness anywhere. Deliberate, proactive choices need to be made. To facilitate them, agency wilderness policies would need to be revised to prescribe a procedure for deciding where or to what degree each wilderness area's wildness purpose or its other purposes will have primacy, where maintaining one would compromise the other. Some laws underlying these policies may need to be amended. Decisions would need to be informed by science, but they must be made in the social and political arenas, considering many factors, including probable effects on high-value resources and effects on adjacent lands. Difficult choices and painful tradeoffs would be inevitable.

Yes, the prospect of a divided wilderness system is awfully disconcerting. The alternative, however, is incremental and cumulative erosion of wildness everywhere.

But in an era of ubiquitous anthropogenic effects that influence, if only ever so slightly, the evolutionary trajectory of every landscape, can we perpetuate real wildness anywhere? Yes, wildness, that evocative and elusive quality of wilderness, can be a permanent legacy, if correctly understood.

What is Wildness?

Delving into the etymology of *wild*, historian Roderick Nash (*1982*) traces its early Teutonic and Norse language origins to the root word will, meaning self-willed, or uncontrollable. This follows Henry David Thoreau's

NPS photo

Figure 5. Backpacking on Sanford Plateau in Wrangell-St. Elias National Park and Preserve.

NPS Photo by Cindy Gonterman

Figure 6. Wolves in Denali National Park and Preserve.

NPS photo

Figure 7. A curious wolverine in Gates of the Arctic National Park and Preserve.

NPS photo

Figure 8. A backpacker on glacial moraine in Wrangell-St. Elias National Park and Preserve.

succinct definition: "Wild—past particle of to will, self willed" (*Turner 1996*). But Thoreau knew nature has no will per se; he began the tradition of describing wildness in terms of its antithesis: not subject to human will.

Early wilderness movement leader Robert Marshall summarized this central condition of wilderness as "its entire freedom from the manifestations of human will . . ." (*1956*). Marshall's friend Zahniser went on to describe this freedom as "untrammeled" which he defined as "not being subject to human controls and manipulations that hamper the free play of natural forces" (*Zahniser 1959*). *Untrammeled* became the key word in the Wilderness Act's definition of wilderness as "where the earth and its community of life are untrammeled by man." Murie (*1960*) called it simply "nature's freedom." Based on the intent of those who most influenced and wrote the Wilderness Act, wildness can thus be defined as . . . *a condition of a landscape characterized by its freedom from the human intent to alter, control, or manipulate its components and ecological and evolutionary processes*.

Wild, then, is not synonymous with pristine or virgin. Rather, it is the state wherein those evolutionary processes of an area's genesis—free from human purpose, utility, or design—are allowed to shape its future. Thus, not requiring the absence of all human effect, wildness can persist in environments that have been altered or continue to be influenced by external human factors such as climate change—as long as we refrain from interfering with nature's autonomous response.

The Human Relationship Dimension

Challenging our understanding of wildness is the fact that it depends upon our willingness to leave an area's functioning outside the realm of our volition. And because it is therefore a landscape condition dependent upon human intent, wildness is at once both a landscape condition and a human-nature relationship. Both are legacies we should leave to the future.

Most readily recognized by the managing agencies are the ecological and scientific reasons for perpetuating the wild landscape condition. As Aldo Leopold (*1949*) espoused, wild areas can serve as baselines for understanding how unmanaged ecological systems respond to anthropogenic change. They can serve as a "control" for assessing the effectiveness of interventions and restoration efforts implemented elsewhere.

"The Need for Wilderness Areas" (*1956*), is Zahniser's canonical essay explaining the intent of his pending wilderness bill (and part of the act's legislative history). In it Zahniser included these and recreational and aesthetic values as among the reasons for the legislation. But he emphasized that most importantly, wild areas could serve as reference points "essential to a true understanding of ourselves, our culture, our own natures, and our place in all nature." He went on to explain:

> This need is for areas of the earth within which we stand without our mechanisms that make us immediate masters over our environment—areas of wild nature in which we sense ourselves to be, what in fact I believe we are, dependent members of an interdependent community of living creatures that together derive their existence from the Sun.

Therein Zahniser summarized a need underpinning the wilderness idea (and now, also the Anthropocene concept). That is the need for an expanded world-view, to see ourselves in relation to all life, in the larger scheme of things.

Why Wildness?

When we left our origins as creatures of the wild and embarked on the Neolithic project of altering, then controlling our immediate environment, we began changing the Earth, and changing who we are in relation to it. Today

we are not "part and parcel with nature" as Thoreau (*1862*) understood nature. We are no longer the same members of the life community Zahniser (*1956*) described. We are already well past being "only fellow voyagers with other creatures in the odyssey of evolution" as Leopold (*1949*) wrote.

We should acknowledge and look beyond this reality of our time. We should look well beyond, to the next century or two of the Anthropocene. Imagine when synthetic environments, novel and designer ecosystems, domesticated DNA, planetary geoengineering, and who-knows-what come to be integral to the world formerly known as natural. We can only speculate as to which "natural" conditions of wilderness our distant descendants might wish we had attempted to perpetuate through efforts to resist or control change. Who knows what conditions would evolve in areas left free to evolve, or the consequences of interfering with their adaptation? Areas left wild can serve as a baseline for understanding how ecosystems function and transform when left alone.

So too, areas set apart for wildness may serve future generations as a baseline for understanding their own nature and their place in nature, whatever forms nature then takes. Left as living museums of unhampered evolution, wild areas can be touchstones to ways of knowing and relating to the world that shaped us as a species. They can serve as reference points as humankind reshapes its world. On a planet increasingly permeated with human intentionality, areas we allow to be there for themselves, that we allow to become what they will, can stand in contrast to human hubris. They can counter the dominating presumption that everything exists in relation to us. As Nash (*1982*) emphasizes, their perpetuation would be a gesture of environmental humility, and an encouraging demonstration and reminder of our capacity for restraint.

As the naturalness of natural areas continues to recede, remnant enclaves of wildness can better serve the age-old quest to understand who we are in relation to the world. The notion of naturalness has always been subjective and culture-bound. But wildness, the eternal process of evolution—of our species and all life, of this planet, its sun and universe and all others—is the objective, ultimate, and unifying reality. Wildness is our true, ongoing creation story. It can be a grounding point, if we will, for creating an ethic to confront, as Murie (*1960*) said, "the real problem of what the human species is to do with this earth." Intangible, immeasurable, nonutilitarian: The otherness of wildness is a resource in itself.

The question of what future for wildness within our conservation estate confronts us with paradox, the notion of areas, as Zahniser said, "that are so managed as to be unmanaged." Wildness challenges us with the irony that self-willed places will only continue through our will. To have areas free of human purpose must be a resolute human purpose.

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Using Ethics Arguments to Preserve Naturalness: A Case Study of Wildlife Harvest Practices on NPS Lands in Alaska

By Grant Hilderbrand

The Challenge

The majority of Alaska National Park units identify wildlife conservation as a central purpose in their founding legislation. Further, most of these lands are also designated wilderness where the National Park Service (NPS) is required to preserve naturalness. Thus maintaining and preserving natural populations, behaviors, and systems—that is, naturalness—is a core function of the Alaska region (*Figure 2*).

The responsibility to maintain natural wildlife populations is challenging due to both inherent and external factors. By their nature, populations of many wildlife species vary dramatically in response to natural ecological processes or as part of their life history (for example, caribou, lynx and hare). In addition, they migrate to and from parks both seasonally and as part of longer term range shifts (*Figure 1*). Climate dynamics will no doubt add to the complexity of wildlife population management in the future.

Because wildlife does not honor political boundaries, Alaska NPS shares management duties with others (federal agencies, the State of Alaska, Native organizations, private land owners, and our Canadian counterparts). Over the past decade, the State of Alaska has emphasized the production of preferred game species through liberalized predator harvest and management programs (*Figure 3*). This approach is difficult to rectify with the NPS mandate to maintain natural processes.

Photo by Robert Winfree, NPS

Figure 2. Coastal brown bear in Katmai National Park and Preserve. Maintaining and preserving natural populations, behaviors, and systems (for example, naturalness) is a core function of the National Park System areas in Alaska.

Figure 1. For caribou, long-distance migration can require multiple, sometimes hazardous, river crossings.

Photo by Tina Moran, USFWS

Wildlife Stewardship on NPS Lands in Alaska

Recognizing the challenges described above, an interdisciplinary group convened in the winter of 2012 to develop a single source for consolidated guidance on the NPS's roles and responsibilities regarding wildlife stewardship in Alaska. Participating members from the NPS included staff from the Alaska and Midwest regions, the Washington, D.C., office, and the Biological Resources Management Division. Disciplines represented included regional directorate members, superintendents, biologists, social scientists, program managers, law enforcement, solicitors, subsistence specialists, and university faculty. Hilderbrand and Joly et al. (*2013*) developed a peer-reviewed report following the meeting to serve as a focused reference on Alaskan wildlife stewardship for NPS staff as they evaluate the myriad issues and decisions facing the agency and the wildlife held in its trust. Key findings from the report include: (1) the NPS is an ecosystem steward and this role extends to all components of the ecosystem, both living and nonliving, and the processes that link them (*Figure 4*); (2) the primary objective of the NPS in Alaska is to maintain natural processes, including the natural distributions, densities, age-class distributions, species assemblages, and behaviors of native species; (3) these responsibilities apply to all NPS lands (that is, parks, preserves, and monuments) equally and without exception; (4) sport and subsistence harvest are allowed on preserves and subsistence harvest is allowed within specified parks and monuments; (5) harvest activities must be consistent with NPS resource mandates and the duty to maintain natural processes supersedes harvest authorizations; and (6) when uncertain, NPS should err on the side of conservation.

Photo by Tina Moran, USFWS

Figure 3. NPS conservation policies favor continuity of natural processes over expanded production of preferred game species (such as moose shown here) through liberalized predator harvest and management programs.

Wildlife Stewardship in Practice: The Case Study of Bear Baiting

The harvest of black bears (*Figure 5*) over bait under both state and federal regulations and on state and federal lands has long been legal in Alaska. In 2012, the State of Alaska authorized the harvest of brown bears over bait in portions of Alaska, including several national preserves. Prior to this regulatory change, the harvest of brown bears over bait was not legal in any North American state or province. To evaluate the potential effects of this authorization on brown bear harvest on national preserves, Hilderbrand, Rabinowitch et al. (*2013*) evaluated the only relevant data available: historic harvest records of black bears over bait on National Park Service (NPS) lands. The authors concluded that there was little to no conservation concern as less than 2 black bears per year were harvested over bait during 1992-2010 on the 55 million acres of NPS lands in Alaska (*Hilderbrand, Rabinowitch et al. 2013*).

However, NPS has specific regulatory and policy guidance to (1) prohibit the feeding of wildlife; (2) maintain natural behaviors; and (3) maintain natural ecological processes (36 CFR 2.2 (a)(2), NPS Management Policies 2006). Further, both the General Authorities Act of 1978 and NPS Management Policies (*2006*) direct the NPS to promote "park values." Thus, the data did not indicate any adverse impacts to bears at a population scale, but an explicit value decision remained.

A Rigorous and Objective Evaluation of a "Value" Issue

Recently, the field of conservation ethics and applied argument analyses has emerged as a way to address value-centered issues through an objective, transparent, and rigorous process. The North American model of wildlife management (*Nelson et al. 2011*), assisted colonization (*Lawler and Olden 2011*), reintroductions and wilderness

Photo courtesy of Robert Winfree, NPS

Figure 4. National park managers are ecosystem stewards, a role that extends to all components of the ecosystem, both living and nonliving, and to the processes that link them. Dall sheep, shown here in Denali National Park and Preserve, have evolved for using the relative safety of rocky crags to avoid wolf predation.

Photo by Robert Winfree, NPS

Figure 5. The harvest of black bears over bait has long been legal in Alaska on state and federal lands and under both state and federal regulations.

(*Vucetich et al. 2012*), endangered species management and recovery (*Vucetich et al. 2006, Carroll et al. 2010*), sustainability (*Vucetich and Nelson 2010*), and ethics of animal research (*Vucetich and Nelson 2007*) have been informed by logic models and argument analysis.

The applied field of conservation ethics originates in the humanities, not in science, and addresses the fundamental question of what "should" or "ought" we do (*Vucetich and Nelson 2012*). Arguments constructed of premises and conclusions are developed through an iterative process. If all the premises are true or appropriate, no premises are missing, and the conclusion is supported by the premises, then a valid argument has been developed. Much like a scientific hypotheses, these arguments are never proven and can change through time as premises (for example, empirical, ethical, societal) change (*Vucetich and Nelson 2012*).

The hunting of black bears over bait is an authorized harvest practice in many states and provinces in North America. The practice of bear baiting touches on a variety of social or ethical issues including fair chase, habituation, food-conditioning, public safety, and naturalness (*Herrero 2002, Teel et al. 2002*). Due to these nonbiological complexities, the application of argument analyses was used as a tool to inform a wildlife regulatory decision. The initial argument was developed and shared with nine initial reviewers. Following iterative revision, the argument was sent to four additional reviewers. The reviewers included bear managers (including those managing bear baiting programs); bear researchers; state and federal agencies; universities; and the fields of ecology, wildlife management, and ethics. Following further revision, the argument was presented to the 22nd International Conference on Bear Research and Management held in Provo, Utah, in August of 2013. Comments and discussion at the conference led to further refinement and the argument that follows (*Hilderbrand, in review*):

The Argument

Empirical Premises

- Bears exhibit strong attraction to food (both natural and anthropogenic (*Figure 6*) and a variety of these food items can be used successfully as bait;
- The use of bait facilitates the harvesting of bears by predictably attracting them to a known location (*Figure 7*) and is thus essentially equivalent to other forms of food conditioning;
- Anthropogenic food-conditioned bears are more likely to be killed in defense of life or property than bears that are not conditioned to anthropogenic foods;
- Anthropogenic food-conditioned bears are more likely to pose a public safety risk than bears that are not conditioned to anthropogenic foods in areas where hunting or firearms are prohibited;
- Bears are successfully harvested without using bait, though baiting can greatly increase opportunity and success rate in some areas; and
- Feeding of wildlife is prohibited under state and NPS regulations.

NPS Photo by Cindy Gonterman

Figure 6. Salmon spawning seasonally attracts large aggregations of bears to many Alaska rivers, including Katmai National Park and Preserve, shown here. Given bears' naturally strong attraction to food odors, a wide variety of natural and anthropogenic foods can also be used successfully as bait.

Ethical Premises

- Creating unnecessary risks to bears, a public trust resource, should be avoided;
- Creating public safety risks should be avoided; and
- Natural animal behaviors and ecological processes should be maintained.

Societal Premises

- Bears have intrinsic value to humans (for example, cultural, economic, ecological);
- Opinions on hunting in general and bear hunting and use of bait specifically, vary; and
- Subsistence harvest is part of the natural processes of Alaska NPS units.

Conclusion: Use of bait should not be an allowed method of harvesting bears on NPS lands in Alaska.

Complex management decisions regarding our natural resources are derived from a combination of scientific information and social influences. Taken in total, the decision to prohibit the harvest of bears of either species over bait is logically and ethically sound. This outcome was largely driven by the desire to preserve naturalness, promote public safety, and maintain the value of bears as a public trust resource.

Next Steps

The NPS has prohibited the harvest of brown bears over bait through formal closure provisions in federal statute and regulations since the authorization of the practice in 2012. As part of the closure process, NPS provides notice, holds hearings, and receives public comment on proposed closures or restrictions. As part of these comments, numerous individuals have inquired about the appropriateness of the harvest of black bears over bait on NPS lands. The Alaska Region of NPS is currently developing a permanent regulations package addressing several wildlife harvest-related topics. As part of this process, we are explicitly requesting input from the public on the topic of brown and black bear harvest over bait. Thus, the decision to prohibit or allow this practice will likely be addressed definitively in the near future.

Photo by Rich Richotte, NPS

Figure 7. A black bear bait station within Wrangell-St. Elias National Preserve.

Conclusion

As resource professionals, our typical role is to design research programs, collect and analyze scientific data, and then present and publish our work through credible professional organizations and journals. The information is then used to support decisions that benefit the conservation of NPS natural resources and processes that link them. The ultimate goal, succinctly, is the preservation of populations, behaviors, and systems (that is, naturalness) (*Figure 8*).

However, the answer rarely, if ever, lies solely in the data. Often the question is not even one of biology, but rather one of values. In these cases, nonscientific tools such as argument analyses that are rigorous, transparent, and objective are available, appropriate, and informative. For natural resource professionals, using such tools may be the correct approach to support or enhance NPS decisions related to wildlife.

Photo by Robert Winfree, NPS

Figure 8. Parallel tracks of bear and wolf in river mud, encountered along a caribou migratory route in Gates of the Arctic National Park and Preserve.

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Searching for Wilderness: Amchitka Island, Alaska

By Merry Maxwell

*I arrived on Amchitka Island (*Figure 1*) in the early spring of 2011. The island was low lying and covered with fog; everything looked gray. Puffins flew in and out of crevices and grass covered burrows; gulls called as we left the ship. Lupines (figure 2) were blooming everywhere and before I left the island I would rename the forty-two-mile-long Infantry Road "Lupine Highway" because of the lilac, plum, violet, and white flowers found in abundance along the disturbed roadway. The quiet of this place was a bit unnerving, but I was on an island in the western Aleutians, more than thirteen hundred miles from the state's largest city, and it felt wild to be there. For just a moment I reflected on how I was standing on a mountain top that began five miles below me on the ocean floor, a fog covered island surrounded by the North Pacific Ocean and the Bering Sea.*

Amchitka Island was used by the Aleuts for more than ten thousand years following their migration from Asia over the southern end of the Bering Land Bridge (*Merrit and Fuller 1977*). The Aleuts depended on marine resources for their survival in the rich Aleutian environment where upwelling and deep turbulent mixing created waters rich with nutrients. In 1741, Russians discovered the islands and began to exploit these resources, including the Aleuts. They dominated the area until 1867 when the United States purchased the State of Alaska, including the Aleutian Islands.

The Aleutian Islands have always been recognized for wilderness qualities. These far-flung islands are home to millions of birds (*Figure 3*); many evolved where only aerial predators like eagles threatened their young. As exploration and fur trade activities continued, some people began to realize the very real threat to the fragile island ecosystems.

To protect the ecological value of these islands the Aleutians NIslands Reservation was established by Executive Order 1733 signed by President William H. Taft on March 3, 1913 (*Department of the Interior 1973*). The reservation was originally established as a preserve and breeding ground for native birds, for the propagation of reindeer and fur bearing animals, and for the encouragement and development of fisheries. In the executive order establishing the reservation, a subordinate paragraph included the following phrase: "the reservation shall not interfere with the use of the islands for lighthouse, military or naval purposes."

Amchitka Island is the largest in the Rat Island group, and is about forty miles long and 4.5 miles wide with lowlands on the eastern side and highlands on the western side. Because of its extreme western location, Amchitka and other islands in the Aleutians became important strategic defense posts during WWII, and later during the Cold War were important listening posts.

Courtesy of the U.S. Fish and Wildlife Service

Figure 2. Lupines (*Lupin nootkatensis*) cover the island each spring.

A History of Disturbance and Violence

During the spring of 1942, the American Doolittle raid on Tokyo raised the Japanese army's interest in American air bases on the Aleutian Islands (*Chandonnet 2008*). This resulted in the subsequent Japanese occupation of Kiska, Little Kiska, and Attu Islands. Amchitka suddenly became a vital forward base for defense of the Aleutians and recapture of Japanese-occupied islands, and to this end, infrastructure for more than sixteen thousand troops was constructed on the island. The military continued using Amchitka Island following the war for more than seven years (*Merrit and Fuller 1977*) and officially pulled out in 1950, but a legacy of military use remains (*Figure 4*).

More was in store for this island strategically located near Asia. In 1951, the U.S. Atomic Energy Commission and the Department of Defense began using Amchitka for underground nuclear testing. Three nuclear tests were conducted on Amchitka. The first (Long Shot, eighty kilotons) (*Figure 5*) was to differentiate seismic signals generated by underground nuclear tests. The second test (Milrow, 1.2 megatons) was a calibration test to test safety (O'Neill 1994). The third and final test (Cannikin, 5 megatons) was the largest underground nuclear test in U.S. history. The blast from Cannikin lifted the ground more than twenty

Figure 1. Rocky southwestern shore of Wilderness Area, Amchitka.

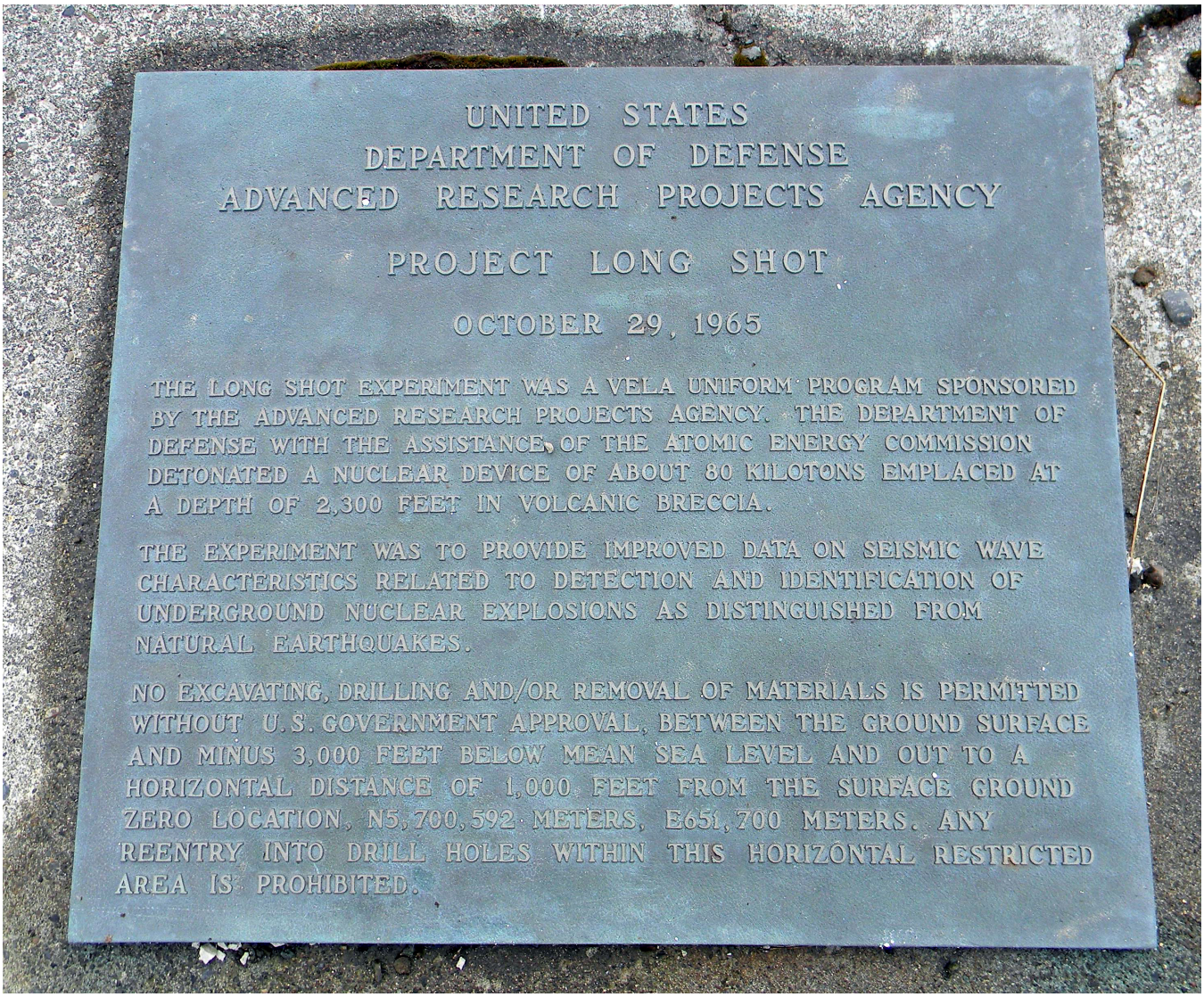
Courtesy of the U.S. Fish and Wildlife Service

Courtesy of the U.S. Fish and Wildlife Service

Figure 3. Tufted puffins (*Fratercula cirrhata*) use the island for nesting.

Courtesy of the U.S. Fish and Wildlife Service

Figure 4. Anti-personnel stakes (known also as Rommel stakes or screw pickets) were deployed on Amchitka Island by American soldiers during WWII. Many remain.



Courtesy of the U.S. Fish and Wildlife Service

Figure 5. A commemorative plaque marks each nuclear detonation site.

feet and was equal to about four hundred times the power of the Hiroshima bomb, shifting the ground and killing animals and birds violently (*Rausch 1973*). The uplift and following subsidence created a lake over the blast area. The Alaska Department of Fish and Game reported that seven hundred to two thousand sea otters were killed by pressure changes created by the blast (*Kohlhoff 2002*).

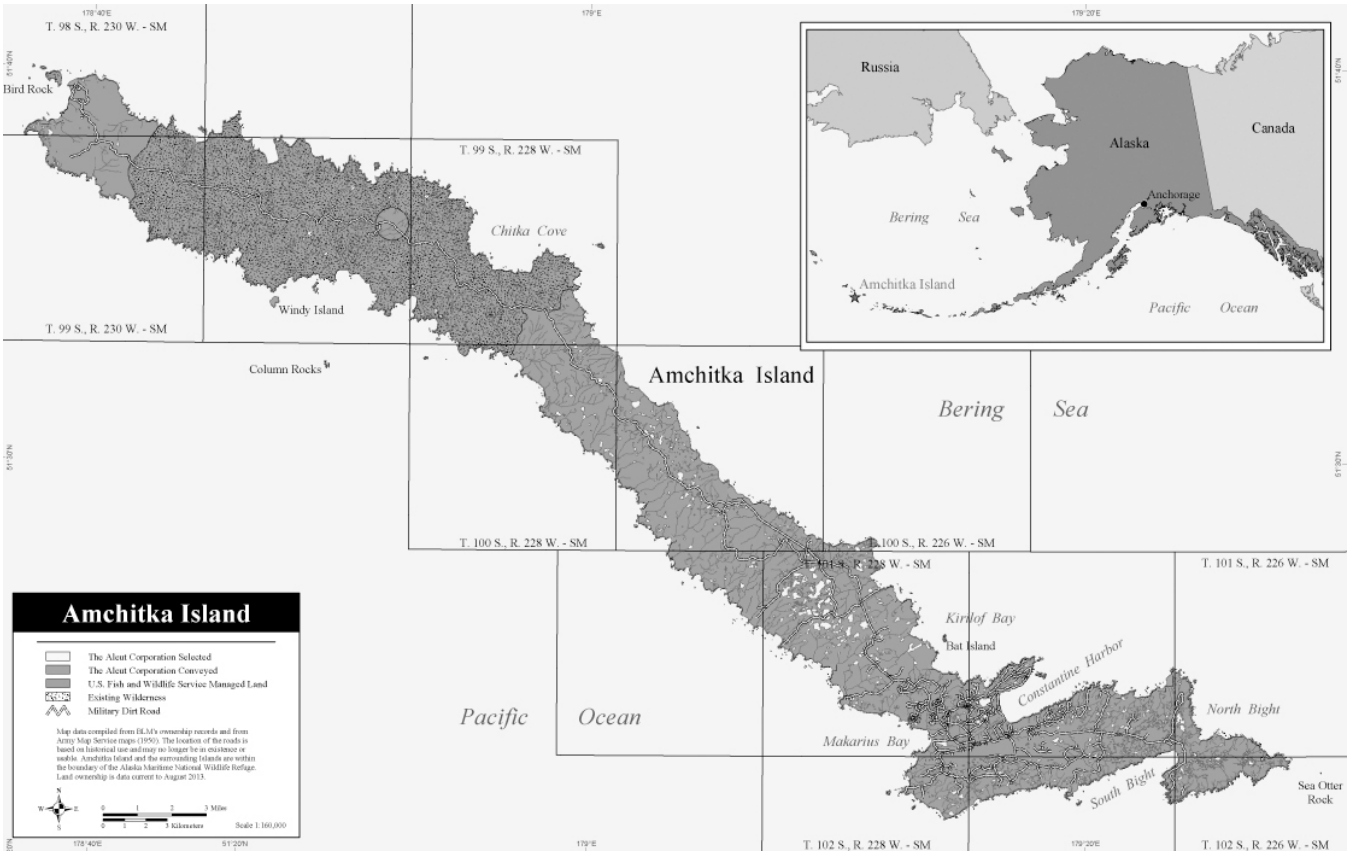
*In 2011 I arrived at Amchitka with a party of ten from the U.S. Fish and Wildlife Service (*Figure 6*), University of Alaska, Department of Energy, S.M. Stoller Corporation, Aleutian and Pribilof Islands Association, Alaska Department of Environmental Conservation, and the Argonne National Laboratory. We were on island to test the waters…literally. We planned to test a small lake downstream from an abandoned Navy sewage lagoon known to have polychlorinated biphenyls or PCBs in it; sample sea creatures, wildlife, and plants for plutonium and uranium associated with nuclear testing, and test the waters around Amchitka for tritium which might indicate leaks from the underground blast chambers. My personal goal was to visit the designated wilderness area of Amchitka Island.*

The Aleutian Islands Wilderness Area, (1,395,357 acres) was proposed in 1974 in recognition of unique values of the Aleutian Islands. When Amchitka was considered for wilderness three parcels were withheld for possible defense purposes. These areas included the most southerly and northerly areas of the island, the highest point on the island and a road connecting the areas. In other words, the wilderness area would be surrounded by areas withdrawn for possible future military use, and a forty-two-mile road (*Figure 7*) would bisect it (*Department of the Interior 1973*).

Indeed, military use of Amchitka was not over. The Cold War (sustained military tension primarily between the Soviet

Courtesy of the U.S. Fish and Wildlife Service

Figure 6. D. Rudis samples sediments on Amchitka in 2011.



Courtesy of the U.S. Fish and Wildlife Service

Figure 7. Amchitka Island, bisected by infantry road.

Union and the United States) escalated in the 1980s and Amchitka was again a point of focus for the United States. The Navy built and maintained a prototype Relocatable Over-The-Horizon Radar (ROTHR) system in order to listen to the Soviet Union from 1991 until 1993 (*Figure 8*).

Cleanup and removal of supporting infrastructure began in earnest after 1993. Buildings were removed and runways were demolished or abandoned all together. Remarkably, the two-mile-long Baker Runway, built for bombers but never used, remains. Today, areas on the south end of Amchitka are still a concern for the U.S. Army Corps of Engineers, responsible for cleanup of Amchitka and other sites within the Aleutians Refuge, now part of the Alaska Maritime National Wildlife Refuge. These areas include landfills (*Figure 9*), unexploded ordnance and buried and surface fuel drums contaminating soils and the ocean as they disintegrate and product is released. Other contaminants remain in lakes and streams following abandonment of sewage lagoons and other supporting structures.

On our last day on island we drive north through the wilderness area to check on a ROTHR site at the north end of the island. As we start up the hills to the west I see the Pacific Ocean in the distance, green and gold hills, and lakes reflecting in a shroud of fog and am struck once more by the stillness of this place. I am on a national wildlife refuge, in the middle of the Aleutian Chain and my first glimpse of the ROTHR site shocks me; I am staring at what I will later describe as a lost Mayan Village—a huge formidable black rock structure several stories tall. I turn away and spend an hour walking the black sand beaches, reflecting on the value of wilderness.

What Does the Future Look Like?

The Aleutian Islands are wild. This primeval state is the result of where these islands are located. Most of the Aleutians are inaccessible except by ship and are subject to violent seismic activity and extreme weather, and they see very few visitors. Established communities are small and isolated.

While restoration on Amchitka progresses and the refuge works with the military to clean up the island, the future for this island is still very uncertain. On Amchitka, the natural healing process has been threatened and disturbed in a profound way. The legacy of war and nuclear tests remains; the contaminants and rats introduced during this time may never be removed, forever changing the diversity of this island. Ecosystems can usually recover from naturally occurring disturbances but Amchitka may be irreversibly changed, preventing literal restoration (*Coates 1996*). The actions taken outside of the wilderness area of the island and the reservation made for future military use should bring into question the expense and efforts of cleanup and restoration. Will we restore it and allow it to be compromised again?

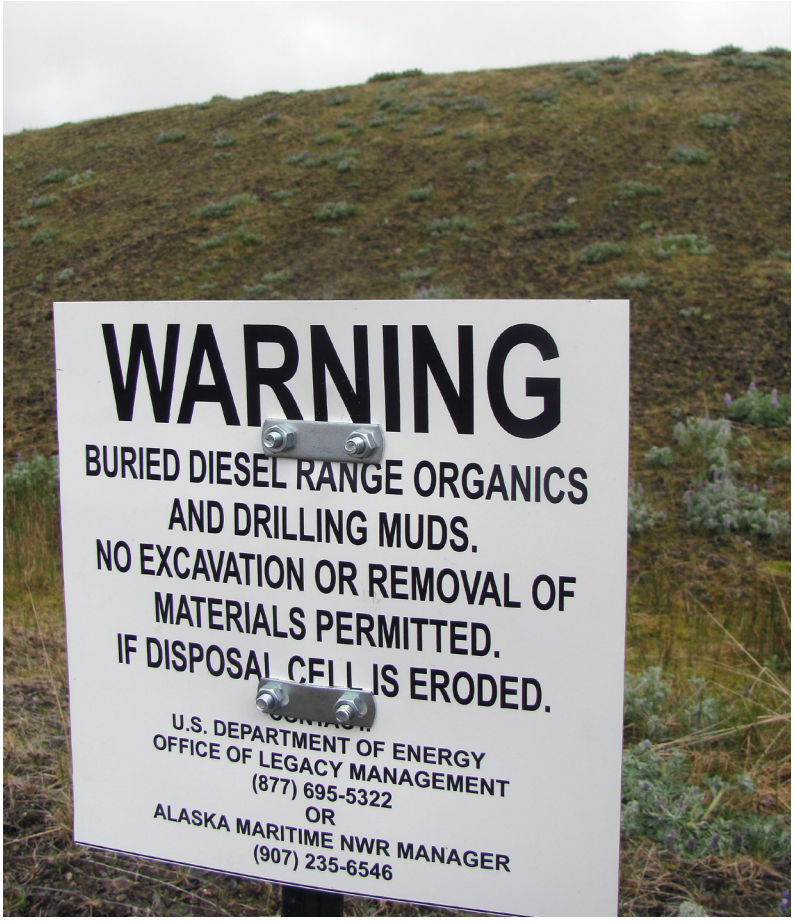
But the value of wilderness is more than a place. The wilderness experience is not determined solely by the naturalness of the habitat or the biological factors related to the land; it can also be determined by our experience as we interact with it. Wilderness is not an artifact or static place but a system where natural processes will assert themselves in an effort to heal and flow toward ecological balance (*Elder 2013*).

On my last day on Amchitka I walk and reflect on what we might learn from the history of this place. Could we consider our nation's changing military capabilities and allow this island to return to its purpose as a refuge? Will future generations wonder if we did our very best to protect it?

The past use of Amchitka is complicated, violent, and disturbing, but I am hopeful. As I prepare to leave I walk on the dust of urchins, ground to fine gold and washing up on black sand beaches. I can still hear the music of life in this place, and the whisper of a promise we made to preserve wildlife and wilderness.

Courtesy of the U.S. Fish and Wildlife Service

Figure 8. "Mayan Ruins," the three-story platform for a northern Relocatable Over-The-Horizon Radar (ROTHR) site.



Courtesy of the U.S. Fish and Wildlife Service

Figure 9. Buried drilling fuels sign in front of earthen cap.

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Busing Through the Wilderness: Managing the "Near-Wilderness" Experience at Denali

By Robert Manning, William Valliere, and Jeffrey Hallo

Introduction

Six-million-acre Denali National Park and Preserve is widely known as a wilderness park. But this vast tract of wild land is bisected by the ninety-mile Denali Park Road, which crosses boreal forests, subarctic tundra, large glacial rivers, and prime wildlife viewing areas. The road corridor is a mere three hundred feet wide, offering an up close and personal view of wilderness to the hundreds of thousands of visitors each year who travel the road on the park's innovative Visitor Transportation System (VTS) bus system and commercial tour buses.

This way of experiencing wilderness—it's been called a "near-wilderness experience"—is increasingly important (*Hallo & Manning 2010*). At Denali, it provides the vast majority of visitors their primary experience with the park's wilderness, allowing visitors to observe wildlife in their natural habitat and enjoy outstanding scenery. More broadly, the iconic roads of the national parks such as Going to the Sun Road at Glacier, Tioga Road in Yosemite, and Acadia's Park Loop Road, along with thousands of miles of other roads that penetrate or skirt many of the country's wilderness areas, offer "access" to wilderness to the greatest number of "wilderness visitors." This near-wilderness experience should be managed to help ensure that it is of the highest quality.

Development of a new plan for the Denali Park Road over the past several years has been a good opportunity to explore this type of near-wilderness experience. Initial phases of research to help support this plan identified a number of potential indictors of quality for the Denali Park Road experience (*Manning & Hallo 2010*). Indicators of quality are measurable, manageable variables that help define the quality of recreation experiences (*Manning 2007; Manning 2011*). Qualitative and quantitative surveys of visitors, along with other forms of public input, found that potential indicators of quality include: (1) the number of buses seen along the road at any one time; (2) the number of buses seen at informal wildlife stops; (3) the number of buses at rest stops; (4) the percentage chance of seeing a grizzly bear; (5) the accessibility of buses (for example, chance of getting a seat on a bus); and (6) trip length. Respondents and participants reported that all of these indicators were important to the quality of the visitor experience.

But which indicators are most important? This question is especially relevant when some indicator variables may conflict with others. For example, increasing the number of buses on the road would enhance accessibility, but it would also increase the number of buses seen along the road and at rest stops and informal wildlife stops (see figures 2-4 for a range of conditions for these indicator variables). Increasing the number of buses might also reduce the chance of seeing a grizzly bear and other iconic wildlife (though the relationship between these variables is complex). We used a survey and statistical procedure called stated choice analysis to help determine which indicators of quality are most important to visitors.

Figure 1. Tour buses in Denali National Park and Preserve.

NPS photo

Study Design

The primary study method was a survey administered to representative samples of bus riders on the Denali Park Road. The study employed stated choice analysis, a procedure that was pioneered in business and marketing applications to evaluate consumer preferences and tradeoffs among product and service attributes (*Green et al. 1988; Louviere & Timmermans 1990; Lourviere et al. 2000*). Stated choice analysis has also been used in natural resource and environmental applications (*Haider & Ewing 1990; Schroeder et al. 1990; Adamowicz et al. 1994; Boxall et al. 1996*) and increasingly in park and wilderness management (*Lawson & Manning 2002; Lawson & Manning 2003; Newman et al. 2005; Hunt et al. 2005; Arnberger & Haider 2005; Cahill et al.*

Figure 2. Visual simulations for the range of conditions presented for the "buses seen along roads" indicator variable, with zero, two, and six buses seen along the road.

Figure 3. Visual simulations for the range of conditions presented for the "buses seen at rest stops" indicator variable, with zero, two, and six buses (and zero, 36, and 108 people, respectively) seen at rest stops.

Figure 4. Visual simulations for the range of conditions presented for the "informal wildlife stops" indicator variable, with zero, two, and six buses at these informal stops.

2008; Bullock & Lawson 2008; Pettebone et al. 2011; van Riper et al. 2011). The survey was designed so that respondents would be presented with a series of "paired comparisons," each consisting of two different descriptions of the Denali Park Road experience. Respondents were asked to choose which scenario they preferred for each of the paired comparisons. The paired comparisons were prepared using a range of potential standards of quality for each of the six indicators of quality noted above. Standards of quality define the minimum acceptable condition of indicators of quality (*Manning et al. 2001; Manning 2007; Manning 2011*). The resulting matrix (three standards of quality for each of six indicators of quality) is shown in table 1. As shown in the table, two versions of the survey questionnaire were prepared, one for VTS bus riders and one for tour bus riders. These versions were identical except for the indicators and standards of quality for access to these types of trips; this was due to the very different ways in which visitors access these two types of buses – a first-come, first-served system for VTS buses and a reservation system for tour buses.

The six-by-three matrix results in 729 potential combinations of trip characteristics for each type of bus. Since this is too many combinations to present to respondents, an orthogonal fractional factorial design was used to create thirty-six paired comparisons that were "blocked" into four versions of the questionnaire that were presented to visitors (*Louviere et al. 2000; Kuhfeld 2000*). "Blocking" simply means that four versions of the questionnaire were created that included nine paired comparisons for each of the two types of buses; the four versions of the questionnaires each included nine paired comparisons, resulting in visitor responses for all thirty-six paired comparisons. Combinations of photographs and written descriptions of the indicators and standards included

in table 1 were used as noted in the table. An example of a paired comparison for VTS bus riders is shown in figure 5.

A systematic sampling protocol was used to select survey respondents and each respondent was asked a screening question to prevent multiple responses from the same visitor. The sampling period was designed to include the park's peak use period. Sampling was conducted on thirty randomly selected days during July and August. Visitors were approached by a trained survey administrator and asked to complete the questionnaire. At the onset of the survey, the administrator gave instructions about how to complete the questionnaire, made sure that the respondent understood the instructions, and provided assistance with posters that presented the paired comparison scenarios. Response rates of 91 percent and 56 percent were achieved for VTS bus riders and tour bus riders, respectively. This yielded 392 completed VTS questionnaires and 398 tour bus questionnaires. A total of 3,528 choice comparisons were made by survey respondents who rode on VTS buses and 3,573 choice comparisons were made by survey respondents who rode on tour buses.

Data Analysis

Data analysis was conducted in two phases. First, a multinomial logit (MNL) model was constructed with data from respondents who rode on the (1) VTS buses and (2) tour buses. The second phase of data analysis consisted of determining the relative importance of each of the indicators of quality by using a Log-likelihood Ratio (LLR) test. The LLR chi square values were used to rank the indicators, assuming that the coefficients with larger chi square values had a greater influence on the overall fit of the model (*Holmes & Adamowicz 2003*).

Study Findings

Results from the first phase of data analysis are shown graphically in figure 6. The bar graphs in the figure show the "utility" for the standards of quality presented for each indicator variable (*Holmes & Adamowicz 2003*). Utility values may range from -1 (strongly not preferred) to +1 (strongly preferred). In general, VTS bus riders preferred seeing fewer vehicles along the park road, at wildlife stops, and at rest areas; having a greater chance to see grizzly bears; having the highest level of access to the buses they wish to be on; and longer trip lengths. Results from tour bus riders were quite similar to those of VTS bus riders with the exception that tour bus riders prefer an intermediate length trip.

Results from the second phase of the analysis are presented in table 2. This phase of analysis examines the relative importance of each of the six indicators of quality. This was done by comparing data from the MNL models for VTS and tour bus rides using the LLR test. The resulting chi square values were used to rank the

Indicators	VTS Bus Standards	Tour Bus Standards
1. Number of vehicles seen along the road at one time	1. Photo with 0 buses 2. Photo with 2 buses 3. Photo with 6 buses	1. Photo with 0 buses 2. Photo with 2 buses 3. Photo with 6 buses
2. Number of vehicles seen at informal wildlife stops	1. Photo with 0 buses 2. Photo with 2 buses 3. Photo with 6 buses	1. Photo with 0 buses 2. Photo with 2 buses 3. Photo with 6 buses
3. Number of vehicles seen at rest stops	1. Photo with 0 buses 2. Photo with 2 buses 3. Photo with 6 buses	1. Photo with 0 buses 2. Photo with 2 buses 3. Photo with 6 buses
4. Percent chance of seeing a grizzly bear	1. 25% 2. 50% 3. 75%	1. 25% 2. 50% 3. 75%
5. Accessibility of buses	1. Most visitors would be able to get on a bus on the day and time they prefer. 2. Many visitors would have to get on a bus earlier or later in the day than they prefer. 3. Many visitors would have to wait a day to get on a bus.	1. You would need to make a reservation for a bus trip about a month in advance. 2. You would need to make a reservation for a bus trip about 6 months in advance. 3. You would need to make a reservation for a bus trip about a year in advance.
6. Trip length	1. Bus trips would average about 4 hours (reach the Teklanika area). 2. Bus trips would average about 6 hours (reach the Toklat area). 3. Bus trips would average 8 hours or more (travel most or all of the road, including the Eielson, Wonder Lake/Kantishna areas).	1. Bus trips would average about 4 hours (reach the Teklanika area). 2. Bus trips would average about 6 hours (reach the Toklat area). 3. Bus trips would average 8 hours or more (travel most or all of the road, including the Eielson, Wonder Lake/Kantishna areas).

Table 1. Stated choice matrix for VTS and tour bus riders, with indicators and standards of quality for the stated choice questions.

Which of the following two scenarios would you prefer?
(Circle one number at the bottom of the page.)

Scenario A	Scenario B
A. You would have a 25% chance of seeing a grizzly bear on your trip	A. You would have a 75% chance of seeing a grizzly bear on your trip
B. You would see the number of buses along the road as shown in the following photograph: [FIGURE 1B]	B. You would see the number of buses along the road as shown in the following photograph: [FIGURE 1C]
C. You would see the number of buses at informal "wildlife stops" along the road as shown in the following photograph: [FIGURE 3C]	C. You would see the number of buses at informal "wildlife stops" along the road as shown in the following photograph: [FIGURE 3B]
D. You would see the number of buses at rest stops along the road as shown in the following photograph: [FIGURE 2A]	D. You would see the number of buses at rest stops along the road as shown in the following photograph: [FIGURE 2A]
E. Many visitors would have to wait a day to get on a bus.	E. Most visitors would be able to get on a bus on the day and time they prefer.
F. Bus trips would average about 6 hours (reach the Toklat area).	F. Bus trips would average about 4 hours (reach the Teklanika area).

1. I would prefer **Scenario A**

2. I would prefer **Scenario B**

Figure 5. Sample paired comparison for VTS bus riders.

importance of each of the six indicators of quality. The order of ranked importance for each of the indicators for both the VTS and tour bus riders were very similar. The percent chance of seeing a grizzly bear was by far the most important indicator, with the number of visitors seen at rest stops being the second most important. Bus accessibility and the number of buses seen at wildlife stops were the third and fourth most important indicators, respectively. For VTS respondents, trip length was the fifth most important indicator while the number of buses seen on the road was the least important indicator. The order of importance for these last two indicators was reversed for tour bus respondents.

Conclusions

Findings from this study have helped inform development of the recent Denali Park Road Vehicle Management Plan (*National Park Service 2012*). It's clear that the ability to see grizzly bears (and other iconic wildlife) is the most important indicator of quality for the near-wilderness experience on the Denali Park Road, and the new plan will monitor wildlife and wildlife sightings and consider adjusting elements of road and vehicle management if bus and other traffic on the road are found to be impacting wildlife, with special attention to grizzly bears and Dall sheep. The number of buses seen along the road is also important to visitors, especially at rest and informal wildlife stops, and the new plan limits road use to a maximum of one hundred sixty vehicles per twenty-four-hour period to help maintain a reasonable sense of "solitude" as defined by near-wilderness visitors. Visitors are also concerned about maintaining reasonable access to both VTS and tour buses and the new plan provides that a majority of seats on both types of buses will be available by reservation, thus helping to ensure access to those who plan ahead. Trip length was more important to VTS bus riders than tour bus riders and VTS bus riders prefer a longer trip than tour bus riders. In the new vehicle management plan, VTS riders have options for long trips while tour buses are limited to shorter trips.

This study was part of an interdisciplinary program of research conducted to help inform development of the recent Denali Park Road Vehicle Management Plan (*Phillips et al. 2010; Manning & Hallo 2010; Morris et al. 2010*). The program of research included visitor surveys, wildlife tracking, and simulation modeling of vehicle use patterns. Based on this program of research, other information, and public input, the new plan includes a series of indicators and standards of quality for the near-wilderness experience, a commitment to monitoring these indicators of quality, and a program of adaptive management to ensure that standards of quality are maintained.

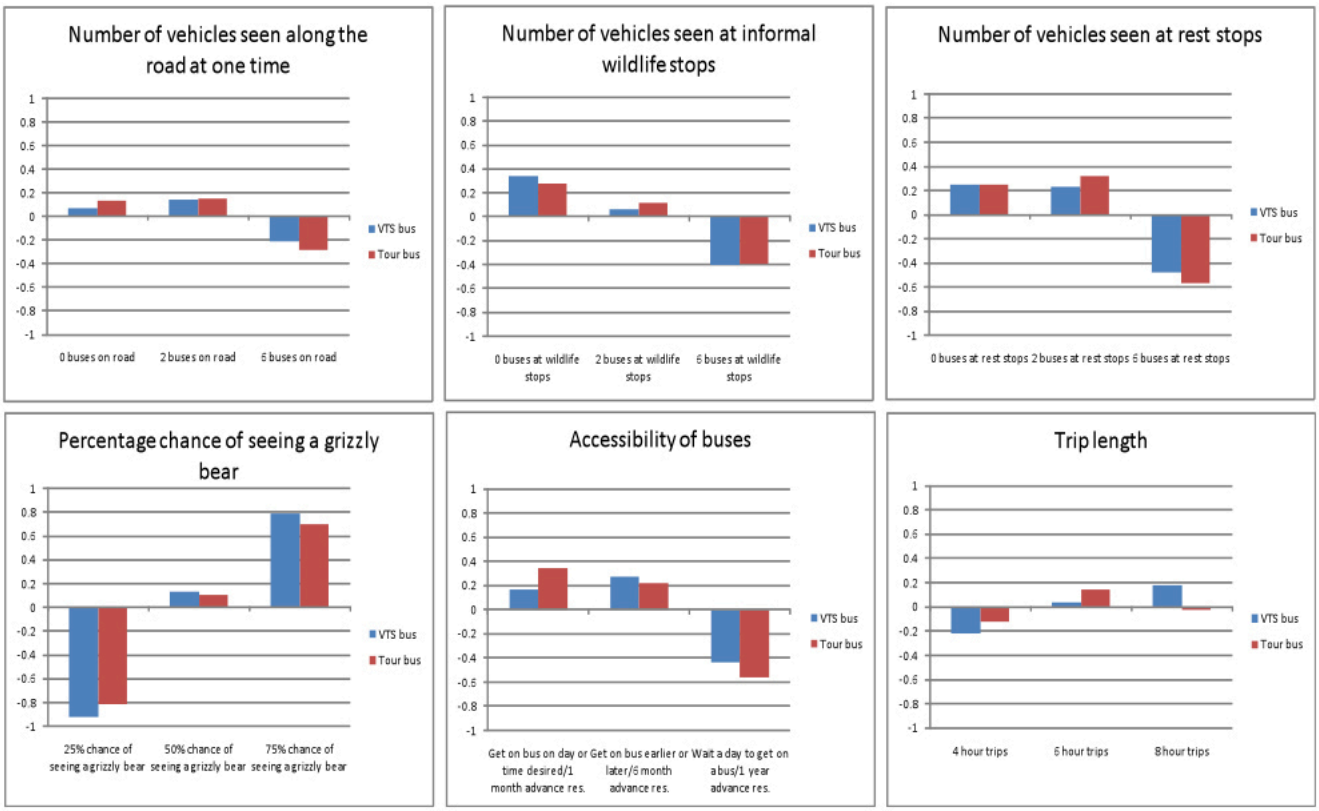

Figure 6. Multinomial logit model results.

	Unrestricted LL	Restricted LL	Chi-square	Rank
VTS Buses				
Percent chance of seeing grizzly	-1982.864	-2277.844	589.96	1
Buses seen at rest stops	-1982.864	-2061.355	156.982	2
Wait to get on bus	-1982.864	-2044.414	123.1	3
Buses seen at wildlife stops	-1982.864	-2034.132	102.536	4
Length of trip	-1982.864	-1999.111	32.494	5
Buses seen on the road	-1982.864	-1996.938	28.148	6
Tour Buses				
Percent chance of seeing grizzly	-1976.775	-2218.961	484.372	1
Buses seen at rest stops	-1976.775	-2091.112	228.674	2
Advance reservation	-1976.775	-2078.982	204.414	3
Buses seen at wildlife stops	-1976.775	-2021.510	89.47	4
Buses seen on the road	-1976.775	-2000.205	46.86	5
Length of trip	-1976.775	-1985.107	16.664	6

Table 2. Relative importance of indicators of quality.

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Commercial Use of Wilderness at Klondike Gold Rush National Historical Park

By William Valliere and Robert Manning

Introduction

In 1898, thousands of Americans and others rushed north in search of newly discovered gold in the Yukon Territory. The standard route took them by boat to the head of the Taiya Inlet and the boomtown of Dyea, but from here they had to trek into the wilderness, up and over Chilkoot Pass and on to the gold fields of the Yukon. Klondike Gold Rush National Historical Park (Klondike) commemorates this mass movement of humanity and this important period of North American history.

More recently, Klondike has been the subject of another sort of human migration. And once again, most of these people are arriving by boat. But these visitors are "tourists" and they are traveling on cruise ships. Alaska has become a major destination for cruise ships, and the port town of Skagway is on the itinerary of most of these ships. It's not unusual for several cruise ships a day to call at Skagway, with some of these ships carrying as many as several thousand visitors.

While most visitors to Klondike remain in and around the historic town of Skagway, the developed part of the park, increasing numbers are venturing further afield to the Dyea portion of the park. During the gold rush period, the population of the town of Dyea exploded to ten thousand, but population declined just as quickly when the gold rush period came to a close. Very little physical evidence of the town remains as the site has retreated to a wilderness-like condition; evidence of previous human use is virtually invisible to the untrained eye, offering current visitors the feel of wilderness. Although the Dyea portion of the park is not designated wilderness under the provisions of the Wilderness Act, it might best be considered wilderness with a lower case "w." The Dyea portion of the park includes the trailhead of the famous Chilkoot Trail, the thirty-three-mile route over Chilkoot Pass that led to the Yukon gold fields. This is now a popular backpacking trail. Most visitors to the Dyea portion of the park are participants on short commercial "excursions" sold by cruise ship companies and conducted by local entrepreneurs.

Because of increasing demand for commercial use of the wilderness-like area of Dyea, Klondike is preparing a new plan to manage this use. Among other issues, the plan will address the carrying capacity of the Dyea area for recreation. To help inform this plan, a series of visitor surveys were conducted to address this issue. This article describes these studies.

Figure 1. Visual simulations of 0, 4, 8, 12, 16, and 20 hikers on the Chilkoot Trail.

The Studies

The National Park Service (NPS) has adopted an approach to determining carrying capacity called Visitor Experience and Resource Protection (*National Park Service 1997; Manning 2001; Manning 2007*). This framework relies on formulation of standards of quality. Standards of quality define the minimum acceptable condition of park resources and the visitor experience (*Manning 2011*). The visitor surveys at Klondike were commissioned to help formulate standards of quality for the Dyea area. Use of the Dyea area is comprised of four types of visitors: (1) commercial "hike and float" trips (visitors hike the first mile of the Chilkoot trail and return to Dyea by raft on the Taiya River); (2) commercial bicycle tours (a guided bike tour of the Dyea area); (3) commercial "horse adventure" tours (a guided horseback ride in the Dyea area); and (4) independent visitors (noncommercial visitors, most of whom participate in a ranger-guided hike). Similar questionnaires were administered to all four types of visitors in the summers of 2010 and 2011. The overall response rate was 73.2 percent and yielded 614 completed questionnaires.

Crowding is an important measure of the quality of the visitor experience in parks and wilderness, and is often used as an important measure of the experiential component of carrying capacity (*Vaske & Shelby 2008; Manning 2011*). Therefore, measures of crowding (meaning the number of other visitors encountered) was a focus of the Dyea studies.

Figure 2. Visual simulations of 0, 2, 4, 6, 8, and 10 groups of rafters on the Taiya River.

Figure 3. Visual simulations of 0, 5, 10, 15, 20, and 25 visitors at the False Front, presented in the survey of bicycle tour visitors and independent visitors.

Figure 4. Visual simulations of 0, 5, 10, 15, 20, and 25 visitors at the Warehouse site, presented in the survey of bicycle tour visitors and independent visitors.

Figure 5. Visual simulations of 0, 4, 8, 12, 16, and 20 visitors at the Nelson Slough Bridge, presented in the survey of bicycle tour visitors and independent visitors.

Figure 6. Visual simulations of 0, 4, 7, 11, 14, 18, and 20 visitors on the road, presented in the survey of horse tour visitors.

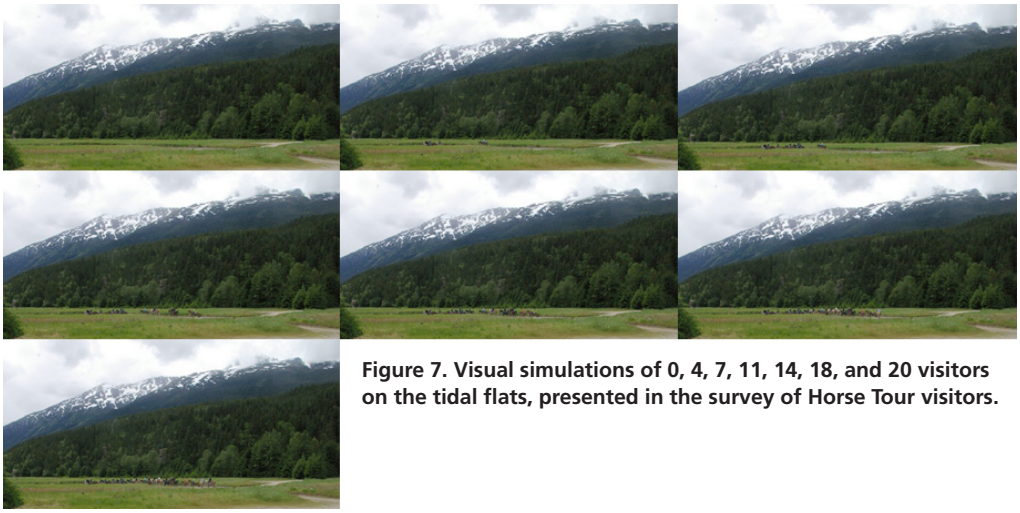
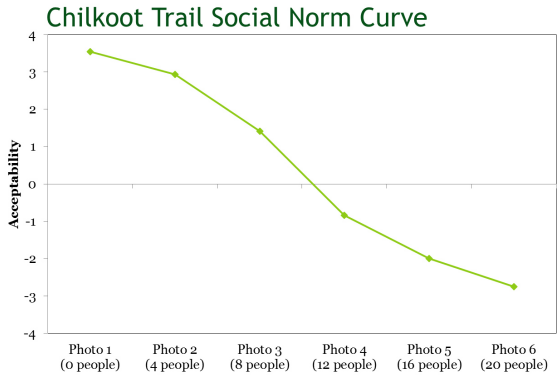
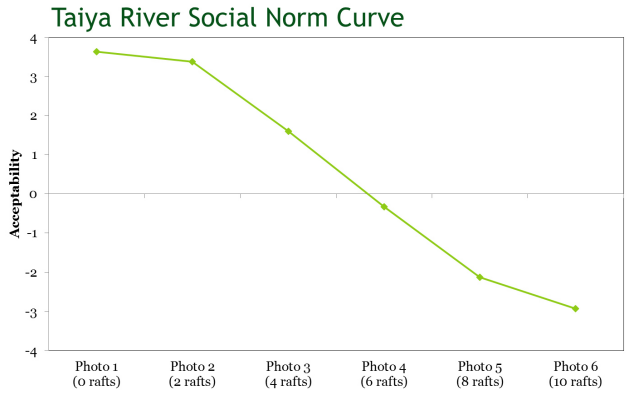
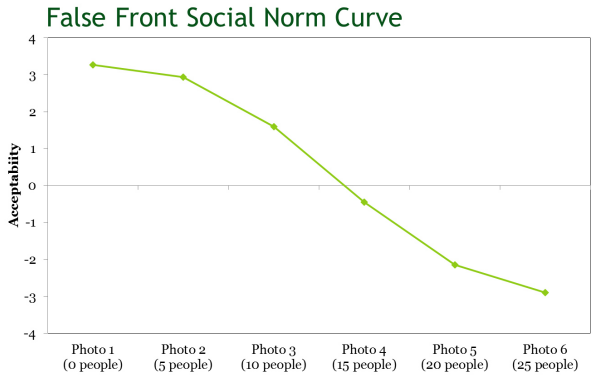
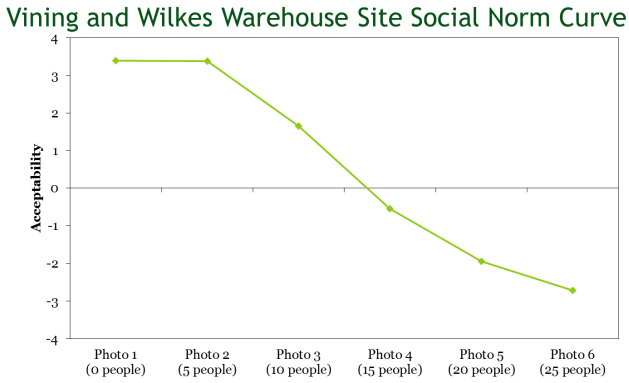


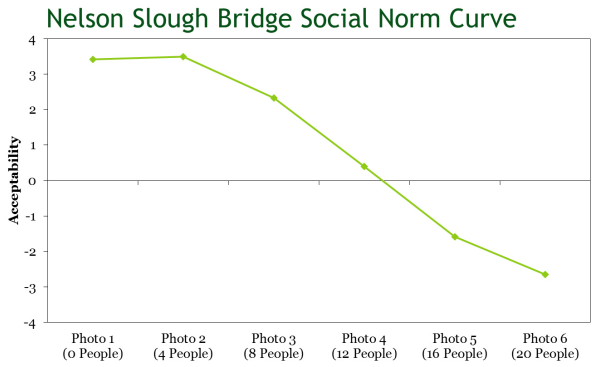
Figure 7. Visual simulations of 0, 4, 7, 11, 14, 18, and 20 visitors on the tidal flats, presented in the survey of Horse Tour visitors.

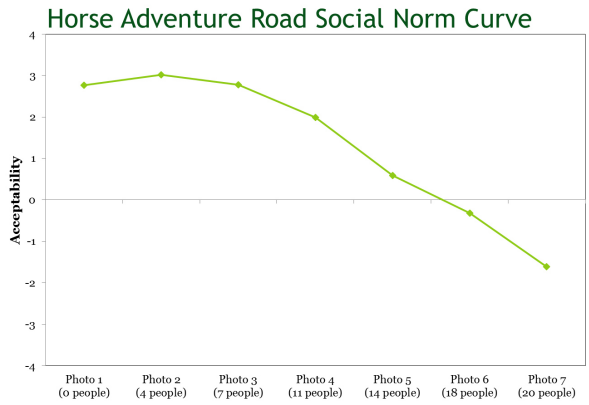


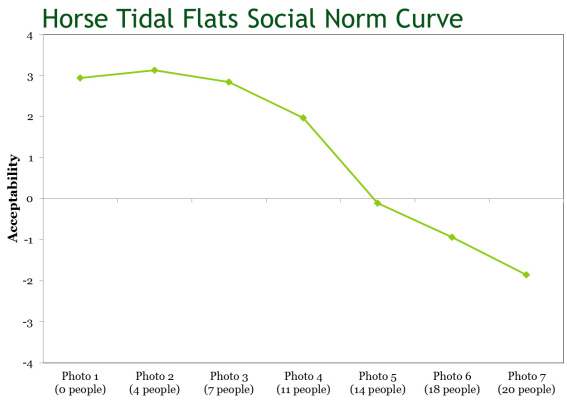












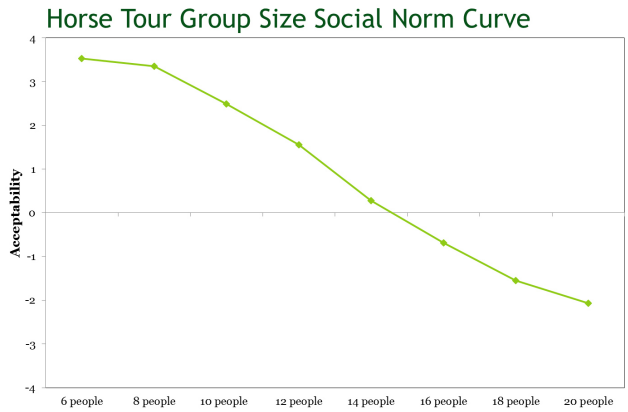
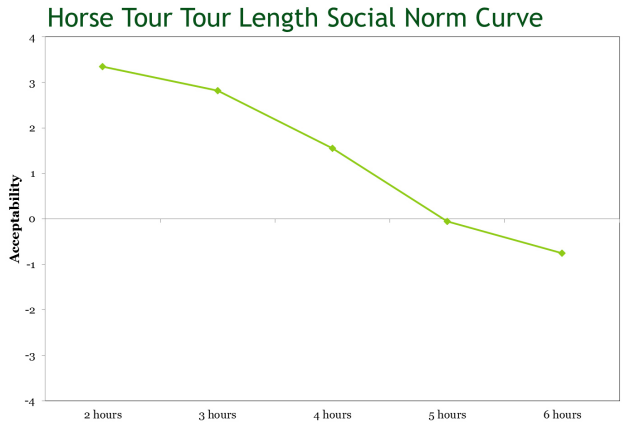
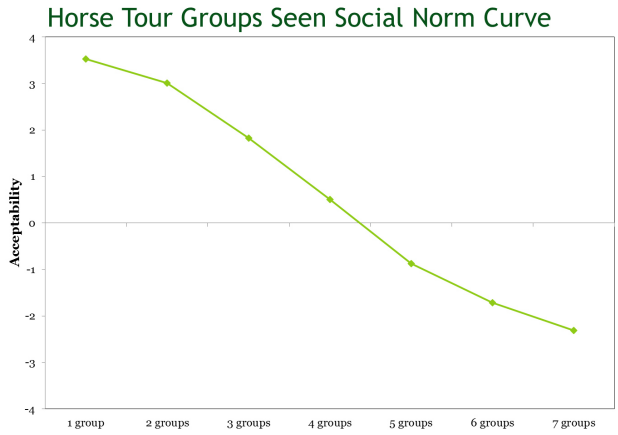
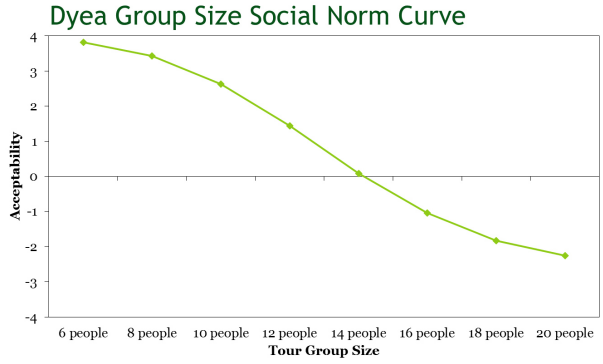
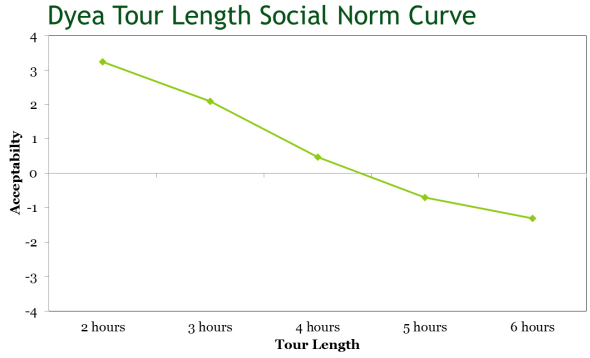


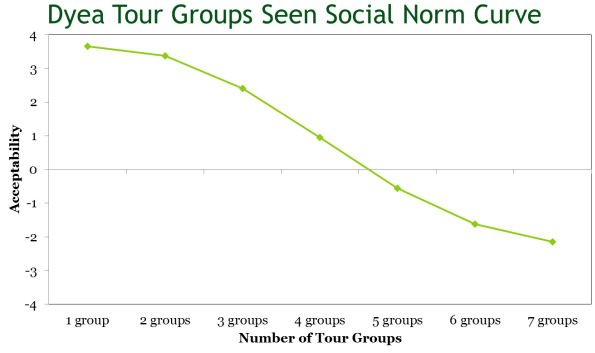
Figure 8. Crowding-related standards of quality for each of the sites (Chilkoot Trail, Taiya River, False Front, Warehouse, Nelson Slough Bridge, the road, and the tidal flats).

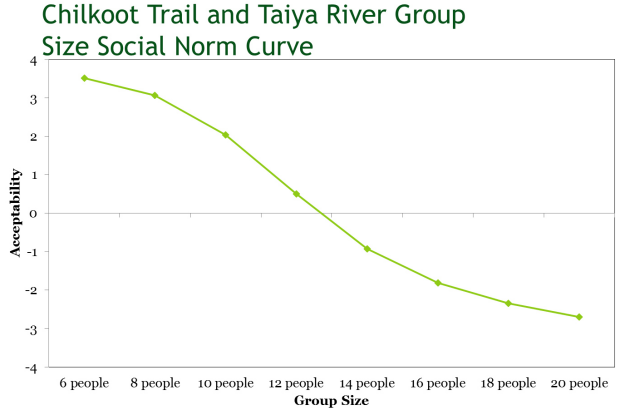


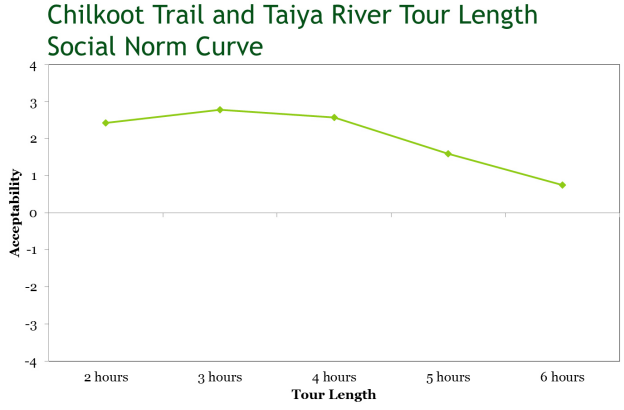












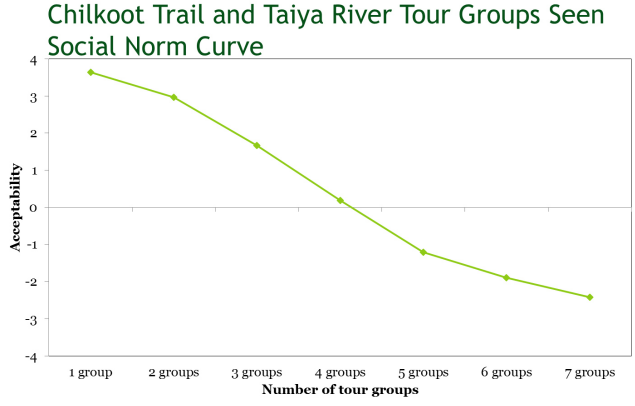


Figure 8. (Continued)

Questionnaires administered to all four categories of visitors included batteries of questions addressing crowding-related standards of quality. For example, the survey of hike and float visitors included a set of visual simulations of a range of visitors at two key locations – hikers on the Chilkoot Trail (*Figure 1*) and groups of rafters on the Taiya River (*Figure 2*). Respondents were also asked to report (1) the photo showing the number of visitors they would prefer to see ("preference"); (2) the photo showing the number of visitors that was so high they would no longer visit the area ("displacement"); (3) the photo showing the highest number of visitors the NPS should allow ("management action"); and (4) the photo showing the number of visitors they saw ("typically seen"). The survey of bicycle tour visitors and independent visitors included sets of study photos for three sites (the False Front (*Figure 3*), the Warehouse (*Figure 4*), and Nelson Slough Bridge (*Figure 5*)). The survey of horse tour visitors included sets of study photos for two sites: (the road (*Figure 6*) and tidal flats (*Figure 7*)).

Study Findings

Findings for crowding-related standards of quality are shown in the graphs in figure 8 and are summarized in table 1. The figures graph mean acceptability ratings for the study photos. In all cases, increasing numbers of visitors are rated as increasingly unacceptable. In figure 3 (hike and float visitor ratings of hikers on the Chilkoot Trail), mean acceptability ratings fall out of the acceptable range and into the unacceptable range at ten people. This threshold represents a potential standard of quality. However, as shown in the first row of table 1, visitors on the hike and float trip reported that, on average, they preferred to see about five people, they would be displaced if they saw about fifteen people, they think the NPS should allow a maximum of about eleven people, and they typically see about five people. These findings, from five to fifteen people, represent a range of potential standards of quality for crowding.

Several other findings have potentially important management implications. Standards of quality were also measured for tour group size, length of tour, and the number of other tour groups seen; application of these findings can help ensure high quality commercial tours. Visitors on commercial tours were nearly always cruise ship passengers (91.9 percent to 97.4 percent across the three types of tours) while independent visitors were rarely cruise ship

	Acceptability	Preference	Displacement*	Management Action**	Typically Seen
Hike and Float Tour Visitors					
Chilkoot Trail (people)	10.0	4.9	15.2	10.6	5.1
Taiya River (rafts)	5.1	1.8	7.4	4.7	1.2
Bicycle Tour Visitors					
False Front (people)	12.9	5.8	22.1	13.3	5.4
Warehouse (people)	12.6	5.5	19.4	13.7	5.0
Nelson Slough Bridge (people)	12.4	4.7	15.4	10.9	5.4
Independent Visitors					
False Front (people)	15.1	5.5	19.6	14.2	6.2
Warehouse (people)	14.7	5.6	20.2	14.0	5.5
Nelson Slough Bridge (people)	12.6	5.2	15.5	10.2	4.9
Horse Tour Visitors					
Road (people)	16.6	7.5	n/a	n/a	n/a
Tidal Flats (people)	13.8	6.7	n/a	n/a	n/a

Table 1. Summary table of crowding-related standards of quality for each of the sites and visitor groups.

*Displacement is defined as the level of use that would cause visitors to not return to the areas they are visiting. The estimates in Table 1 are underestimated since respondents were given the option to indicate that none of the use levels presented would be high enough to prevent them from returning.

**Management action is the point at which respondents feel that use levels are high enough to require the NPS to limit use of the area. The estimates in Table 1 are underestimated since respondents were given the options to indicate that none of the use levels presented would be high enough to restrict use, or that use should never be restricted.

passengers (6.7 percent). While there were relatively few statistically significant differences between commercial and independent visitors, independent visitors were sometimes less tolerant of higher use levels. Only a minority of commercial visitors knew that Dyea is managed by the NPS before they arrived at the site, and learned about this from their tour guide (61.5 percent to 78.2 percent across the three types of tours). Moreover, most commercial visitors (77.7 percent to 85.3 percent) do not stop at the park's visitor center in Skagway before traveling to Dyea, while most independent visitors (68.5 percent) do. Length of stay at Dyea is quite short, averaging between two and three hours.

Conclusions

The surveys at Dyea offer insights into visitors to this area of the park and have a number of management implications. For example, data on visitor perceptions of crowding can help guide decisions about appropriate visitor use levels in the Dyea portion of the park. This is especially important given the large and growing levels of use at Klondike, the most heavily visited unit of the national park system in Alaska. Respondents to the four surveys conducted as part of this study generally reported that they saw about the number of visitors they prefer to see, but given trends in use, this is likely to change without explicit management attention. While study data suggest a range of potential crowding-related standards of quality (from preference to displacement), the NPS is setting crowding-related standards of quality at the low ("preference") end of this range. This will maintain a very high quality experience and will offer a type of recreation opportunity that is in contrast to the often very high density visitor experience in the developed Skagway portion of the park. This would contribute to a spectrum of visitor experiences that is often desirable in national parks and related recreation areas (*Manning 2011*).

Park managers should take note of the potentially important role that commercial tour operators play in the visitor experience at Dyea. The vast majority of commercial tour visitors weren't even aware that the area is part of the national park system (until they were told by tour guides). Moreover, the majority of commercial tour visitors had not stopped at the park's visitor center before traveling to Dyea. Commercial tour guides are the primary source of information for the vast majority of visitors to the Dyea area, and the NPS should work closely with these guides to help ensure that visitors are given the information they should have to fully enjoy their experience and appreciate and protect this area.

Perhaps most importantly, the studies at Dyea suggest the importance of planning for commercial use of national parks, even wilderness (or wilderness-like) areas. The wilderness portions of national parks have been important destinations of commercial tour groups such as Outward Bound and the National Outdoor Leadership School for many years. But the experience at Klondike illustrates that commercial tour visitors can quickly become a major user of these areas and that this use is quite different from conventional wilderness and backcountry recreation (Abbe & Manning 2007). This use should be managed through concession and commercial use plans that guide appropriate levels and types of use and the NPS should work closely with commercial operators to ensure that visitors have a high quality experience and that visitor behavior is fully respectful of the wilderness/wilderness-like character of these areas. Klondike offers a model of this type of planning and management.

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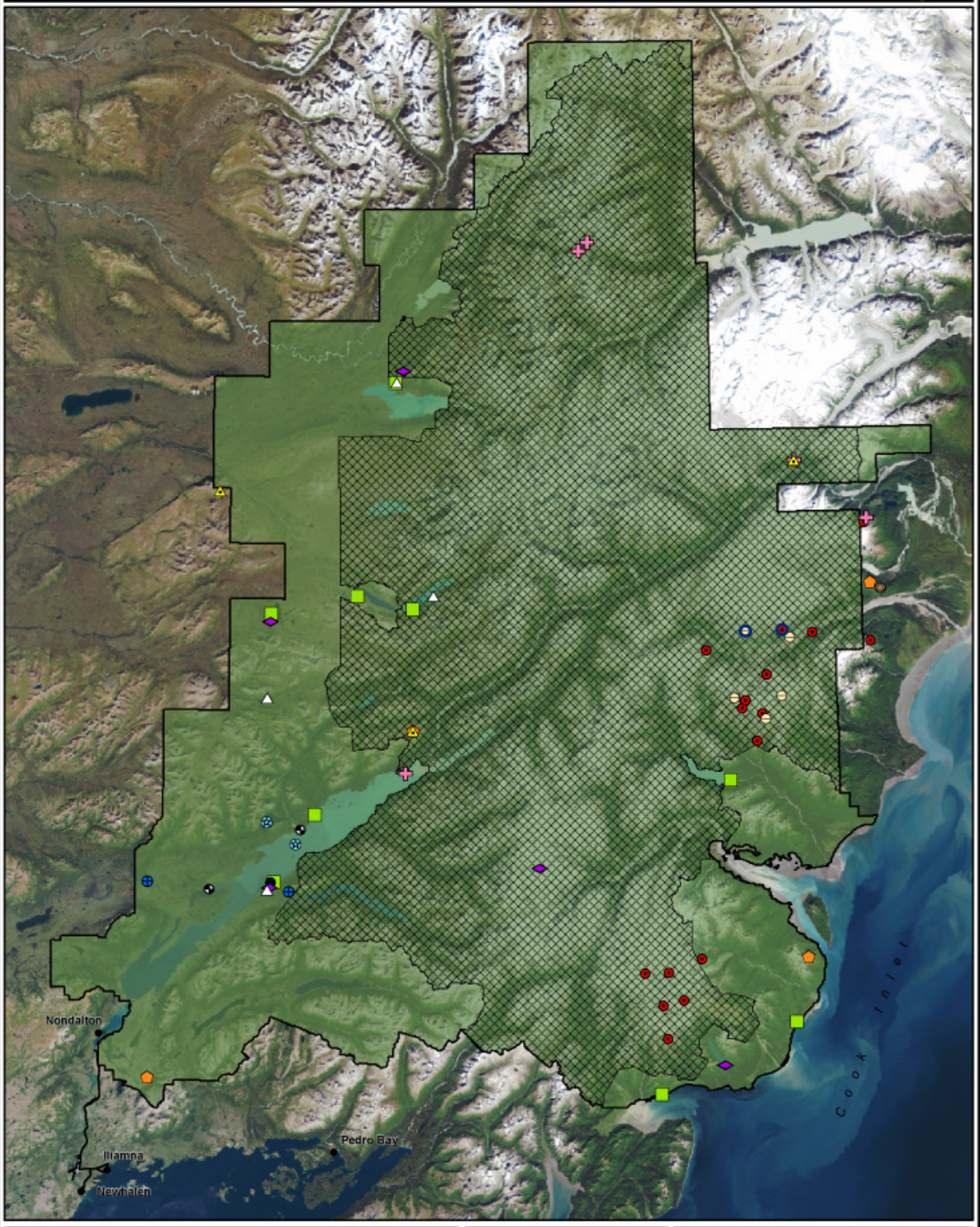
Installations and Structures Cumulative Impacts

Lake Clark National Park and Preserve

Alaska Region
National Park Service
U. S. Department of the Interior



Legend

- FAA Weather Camera
- RAWS Site
- NWS COOP Weather Station
- Radio Repeater
- AVO Seismic Station
- AVO Webcamera
- AVO Continuous GPS
- AVO Voice Repeater
- PBO Site
- Water Temperature Array
- Water Gauge
- Telemetry Tower
- Snow Course Site
- Ranger / Administration Cabin
- Wilderness
- National Park and Preserve

0 5 10 20 30

Miles

Alaska Albers Projection, North American Datum 1983

National Park Service
Alaska Regional Office, GIS Team
September 2010

Assessing and Mitigating the Cumulative Effects of Installations in Wilderness

By Robert A. Winfree, Adrienne Lindholm, and Angie Southwould

Introduction

This article describes the basis for and application of a GIS-based approach to assessing installations in the national parks in Alaska, a collaborative product of the National Park Service (NPS) Alaska Region's Science in Wilderness Workgroup and the regional GIS (geographic information system) Team. Baseline maps of installations in wilderness allow park staff to more effectively determine cumulative effects to the undeveloped quality of wilderness character as staff evaluate requests for additional installations. Land managers can reduce impacts from installations by considering mitigation measures and by following a four-step process for reducing cumulative impacts.

Purpose of Wilderness

The overarching mandate of the Wilderness Act is to preserve wilderness character. Wilderness character is composed of five qualities that directly link agency stewardship and wilderness conditions to the statutory language of the 1964 Wilderness Act and NPS policy (*NPS 2006*), and apply to every wilderness regardless of size, location, agency administration, or other attribute. These qualities of wilderness character are:

Natural – wilderness ecological systems are substantially free from the effects of modern civilization.
Solitude or primitive and unconfined recreation – wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation.
Undeveloped – wilderness retains its primeval character and influence, and is essentially without permanent improvement or modern human occupation.
Untrammeled – wilderness is essentially unhindered and free from the actions of modern human control or manipulation.
Other Features – tangible features that provide scientific, educational, scenic, or historical value to the wilderness.

Figure 1. This map was generated from a geographic information system (GIS) database of installations and structures at Lake Clark National Park and Preserve. The types of data attributes recorded for a single installation are illustrated in Table 2.

NPS map

The Wilderness Act identifies six public purposes of wilderness: "recreational, scenic, scientific, educational, conservation, and historical use" (Public Law 88-577, Sec. 4. (b)). The act also prohibits temporary roads, motor vehicles, motorized equipment, landing of aircraft, structures, and installations "except as necessary to meet minimum requirements for the administration of the area for the purpose of this act (including measures required in emergencies involving the health and safety of persons within the area)" (Public Law 88-577. 4. (c)). The Alaska National Interest Lands Conservation Act (ANILCA) modifies certain provisions in the Wilderness Act for Alaska conservation system units by allowing certain types of motorized transportation methods, access to and use of subsistence resources, and certain types of installations and structures. However, even though a use or activity is legal, it may still degrade wilderness character. The challenge for wilderness managers in Alaska is to preserve an area's wilderness character in light of the special provisions found in ANILCA and in spite of exceptions the agency may make to Section 4(c) in its administration of the wilderness unit.

Preserving the Undeveloped Quality of Wilderness Character

The undeveloped quality of wilderness character runs through every definition of wilderness. The Wilderness Act states that wilderness is "an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation," "where man himself is a visitor who does not remain" and "with the imprint of man's work substantially unnoticeable." This quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment (*Landres et al. 2008*).

Installations are one of the main factors that degrade the undeveloped quality. The term installation is commonly understood to include site markers, ecological monitoring instruments, communications facilities, and navigation-related facilities. In fact, it includes any object that is assembled or created outside the wilderness and is left behind when the installer leaves the wilderness.

In order to preserve the undeveloped quality and wilderness character as a whole, agencies must track

changes to the undeveloped quality over time. Landres et al. (*2005*) developed a methodology for tracking change in wilderness character. This methodology has been refined specifically for the NPS in the 2013 NPS Wilderness Character User Guide. The first step in tracking change in the undeveloped quality is to identify a baseline condition for the elements that comprise it. The baseline for comparison could hypothetically be at any point for which reliable data is available. It could, for example, include data from resource inventories, historic maps and photos, administrative records, and local and traditional knowledge.

Photo by Robert Winfree

Figure 2. Wildlife research and monitoring have long been vital to well-informed decision making throughout the National Park System. Such studies are especially important where human activities show potential to alter animal behaviors or population dynamics. This wolf wears a collar designed to track its movement in and around Denali National Park and Preserve.

NPS photo

NPS photo

Figures 3a and 3b. Two views of Mount McKinley (clear and hazy days in August 2013) from the Denali National Park and Preserve webcam located at Wonder Lake, about 85 miles from the park entrance. High resolution photos are archived for visibility documentation and posted on the internet. The solar-powered webcam is located along the Denali Park Road, a three-hundred-foot-wide non-wilderness corridor. http://www.nature.nps.gov/air/webcams/parks/denacam/denacam.cfm#

Establishing a Baseline for the Undeveloped Quality of Wilderness Character

While the effects of individual activities may sometimes seem minor by themselves, accumulated small effects can be significant. During the early 2000s, NPS Alaska Region superintendents expressed concern over the growing number of installations in wilderness and their cumulative effect on wilderness character. Acting on the recommendations of the NPS Alaska Region Science in Wilderness Workgroup, and under the direction of the Alaska Leadership Council, the region began in 2010 to develop a GIS database of all known installations in parks, including relevant information for determining intrusiveness. As the regional GIS team began its work, high priority was given to documenting larger, more obtrusive, and higher-tech types of wilderness installations (*Table 1*).

Existing datasets and GIS data layers as well as interviews with park staff were used to identify locations of known installations, while recognizing that the first generation of maps would likely underestimate the actual number of installations. An initial geodatabase was developed and released for use. Table 2 shows an example of the type of data that was collected for each installation.

The number of documented installations is expected to increase with time, as more pre-existing installations are recorded and added to the database. Distinguishing between newly documented and newly created installations is also important for determining whether a new data point simply adjusts the baseline or is considered to be an additive effect.

- **Communication Systems**
- **Geologic Monitoring Stations**
- **Weather and Climate Monitoring Stations**
- **Navigation related facilities**
- **River/Water gage stations**
- **Webcams**

Table 1. Types of installations included in geodatabase.

Field Name	Field Value	Notes
Installation_Type	Weather/Climate	-
Installation_Subtype	SNOTEL Station	-
Installation_Physical_Desc	Installation consists of an 8 ft tall shelter house, 10 ft tall alter shield precipitation gage, 8 ft tall MET tower with attached equipment, and a 6 ft wide hypalon snow pillow.	-
Installation_Purpose_Desc	Snowpack and climate monitoring	-
Installation_Name	McNeil Canyon	-
Installation_ID	51K14	-
Installation_Status	Installed – good condition	-
Installation_Setting	Set in ground	-
Installation_Width_FT	50	Width of cumulative site footprint.
Installation_Length_FT	50	Length of cumulative site footprint.
Installation_Height_FT	10	Height of the tallest site component
Relation_To_Surface	Above surface	-
Installation_Organization	USDA, Natural Resources Conservation	-
NPS_Program_Name	Service	-
Actual_Install_Date	SWAN Inventory and Monitoring	-
Has_Seasonal_Deployment	08/01/1986	-
Seasonal_Deployment_Desc	No	-
Removal_Is_Anticipated	-	-
Expected_Removal_Date	No	-
Actual_Removal_Date	-	-
Geometry_ID	-	-
	{FFFD8575-E4DA-4DE7-A9CE-3197978CBCB5}	-

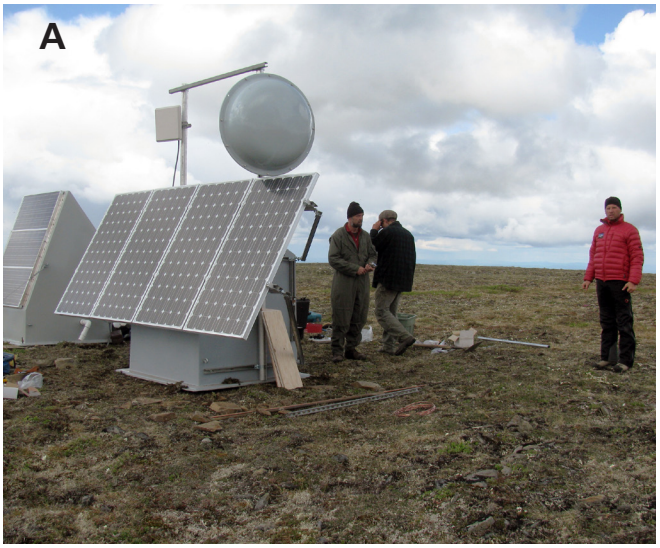
Table 2. Example attribution for a SNOTEL (Snow Telemetry) station installation

Baseline maps of installations in wilderness allow park staff to more effectively determine cumulative effects (*CEQ 1997*) to the undeveloped quality of wilderness character as staff evaluate proposals that include additional installations (*Figure 1*).

Mitigating and Reducing Impacts to the Undeveloped Quality of Wilderness Character

The first opportunity to mitigate cumulative impacts and help preserve the undeveloped quality of wilderness character is by reducing the potential for incremental impacts, and preferably by working cooperatively in the initial stages of developing project proposals. While even the smallest long-term placements of markers or instruments are installations, their effects on wilderness character can be quite different from larger installations (*Figure 2*). There is a substantial body of knowledge and a number of highly successful examples of ways to minimize the physical and ecological impacts of installations, as well as to make their visual and auditory imprint "substantially unnoticeable." The definitions provided by Landres et al. (*2010*) suggest ways for reducing use of visibly unnatural components to minimize installation effects. Site-specific design is typically part of the "cost of doing business" when considering large and critical installations in areas of significant public use, and should be for wilderness as well. When the estimated costs of concealment are factored into early planning, there may also be more consideration of alternative sites that might at first be dismissed as infeasible.

The most obvious opportunity for reducing the impacts of installations would be a unified effort to avoid adding unnecessary new installations, removal of nonfunctional or obsolete installations, and replacement of individual installations with others that serve multiple functions while meeting the needs of multiple users. Doing so can largely be a question of opportunity and expense when all the components are owned and used by the NPS. However, some are installed and operated by other stakeholders, including agencies, institutions, and scientists, with permission from the NPS. Trust and equity are important considerations under such conditions, because such installations can involve major professional and budgetary investments. Some also serve public safety needs. Unilateral decisions to remove operable installations without clear cause can have chilling and long-lasting effects on NPS relationships and impact future ability to attract cooperators for work in wilderness areas. Placing a moratorium on new installations, an arbitrary cap on the total number of installations, or imposing unreasonably short permit durations for long-term installations could also be viewed unfavorably by cooperators.



NPS photo

NPS photo

Figure 4a and 4b. This installation at Wickersham Dome, outside the Denali Wilderness in Denali National Preserve combines seismic monitoring, Plate Boundary Observatory geodesy, park radio, and wireless repeaters. Co-location usually means that a hut or huts can be shared for batteries and to protect electronics. In theory, a modest mast can support any number of small antennas, some of which can also be concealed within the hut. However, additional solar panel installations may be necessary depending on the total power requirements of the instruments involved. Seismometers are usually located a couple of hundred feet from the instrument huts to diminish interference, with a shallow buried cable running between them. Careful planning can minimize the number of helicopter trips required for installation and scheduled maintenance.

NPS photo

Figure 5. This Geographic Positioning System (GPS) site in Glacier Bay is designed to precisely and continuously measure bedrock movement caused by isostatic uplift. Visual impact was reduced by concealing minimal equipment within a patch of vegetation.

NPS photo

Figure 6. Park managers can sometimes reduce visual impacts by concealing instruments inside existing structures. Situating a radio repeater inside a deteriorating cabin may reduce overall visual impact and probability of disturbance. However, historic preservation is another important factor when considering adaptive reuse.

NPS photo

Figure 7. Cape Spencer Lighthouse is located within Glacier Bay's wilderness. The station was constructed prior to wilderness designation and is managed by the U.S. Coast Guard. At least seven installations are co-located there, including a Federal Aviation Administration web camera, a National Weather Service weather station, a University of Alaska GPS station, and UNAVCO geodesy equipment.

Steps for Reducing Cumulative Impacts from Installations

The Science in Wilderness Workgroup proposed a four-step process and several related questions for reducing cumulative impacts from installations.

1. Evaluate the Purpose and Need
   - Is the installation necessary for management of the area as wilderness? If so, how?
   - Is the installation expected to reduce future impacts to other qualities of wilderness character? If so, how?
2. Evaluate the Location and Design
   - Could the primary purposes be accomplished by an installation outside of wilderness (*Figures 3a and 3b*)?
   - Could potential impacts of installations be mitigated through alternative locations (or co-location with other installations) that would reduce frequency of encounters by visitors and wildlife or reduce transportation needs to service the installation (*Figures 4a and 4b*)?
   - Could the potential impacts be mitigated through design features to make it "substantially unnoticeable" or to reduce the frequency of maintenance (*Figures 5 and 6*)?
   - Are their opportunities for co-location or relocation of installations by NPS staff and cooperators (*Figure 7*)?
3. Bring Aging Installations "Up to Code"
   - Stipulations for existing installations should be re-evaluated during re-permitting (generally at least every five years), or possibly earlier if the permittee requests permit amendments for major upgrades or replacement of components. Re-permitting provides opportunities to better document existing installations and consider removal of obsolete installations, consolidation with other installations where practical, or modifications to reduce visual or other impacts.
4. Removing Abandoned and Inoperable Installations
   - Stipulations for all new permits for installations should require that they be indelibly marked or permanently tagged with contact and permit information, with map coordinates and photos of the actual installation to be provided to the permit office. Permit stipulations, correspondence, and documentation in the permanent project file should identify who is responsible for final removal and site restoration. Communications with permittees should include checking on the status of existing installations before the permits expire and before issuing additional permits.

Summary

It is important to remember that many exceptionally valuable studies are only possible today, because the current generation of scientists was able to precisely relocate benchmarks, monuments, plot markers, survey points, and exclosures that were installed by their predecessors, not always with thought for longer-term studies. Numerous new studies that rely on instrumentation provide valuable information about wilderness resources. However,

managers must be vigilant about preserving the undeveloped quality and wilderness character as a whole. Over time, any effort that succeeds in reducing the incremental effects of a new activity or installation will also reduce cumulative effects. Parks should establish an appropriate baseline and benchmarks to which the effects can be compared. While baselines can be established for any point at which data is available, the most relevant benchmarks relate to "desired conditions" identified in current management plans.

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MOUNTAIN
HARD WEAR

Late Pleistocene Paleontology and Native Heritage in Northwest Alaska

By Jonathan Hardes

Northwest Alaska Eighteen Thousand Years Ago

The Pleistocene, or mammoth, steppe was characterized by a dry climate, with cool summers and a landscape rich with grasses spanning from Spain to Canada. These conditions were ideal for the large grazers of the day, with the most common being the steppe bison (*Bison priscus*), horse (*Equus sp.*) and the woolly mammoth (*Mammuthus primigenius*) (*Figure 2*). Though much lower in numbers, a suite of carnivores that preyed upon the grazers also inhabited the region, with the American lion (*Panthera atrox*), short-faced bear (*Arctodus simus*), and the grey or timber wolf (*Canis lupus*) being the best known (*Kurten and Anderson 1980*). The area supported a much greater variety of species than we see today.

The Bering Land Bridge describes an arid swath of land that connected Asia with North America during the Pleistocene epoch (2,580,000 to 11,700 years ago). This connection occurred when massive ice sheets held a larger percentage of the earth's water than today, causing sea levels to be lower, thereby exposing large tracts of land. At its greatest extent, approximately twenty-one thousand years ago, the land bridge measured some one thousand miles from north to south. The "bridge" served as a passageway for the movement of an array of species between the continents of Asia and North America.

NPS photo courtesy of Jeff Rasic

Figure 2. Woolly mammoth tooth discovered on the Seward Peninsula.

Figure 1. Louise Farquharson (UAF Geology Department) with a recently discovered mammoth humerus, Bering Land Bridge National Preserve.

NPS photo courtesy of Jonathan Hardes

What are fossils?

A paleontological find or "fossil" in the strictest sense of the term refers to remains or other evidence of a once-living organism that have been preserved, carbonized or mineralized (petrified) through long-term exposure to mineral-rich groundwater. Essentially, some portion of the organism or a trace of its existence (such as a track or imprint) turns to stone over time, a process known as diagenesis. However, scientists also frequently use the word fossil in a more ubiquitous way to describe specimens that are ten thousand years old or older. In other words, many bones found throughout Alaska, though described as fossils, have not actually petrified through the fossilization process. Fossils can include the remains of shells, plants, tracks, and feeding trails, and even the softer parts of animals such as feathers and skin.

Late Pleistocene fossils discovered in northwest Alaska consist primarily of remains of large mammals, whose more robust and denser teeth and bones lend themselves to better preservation and subsequent discovery than those of smaller species. Their greater size also makes them easier to spot on an open and vast landscape (*Figure 1*). The most common local finds are the remains of the grazers, or those animals that subsisted primarily on grasses and sedges and tended to live in herds or larger extended family groups. It is important to note that many extant (still with us today) species, such as caribou, muskox, and brown bear lived alongside these now extinct fauna.

How Fossils End Up Where We Find Them

In order for ancient remains to preserve or fossilize, the organism or at least a portion of it must be buried soon after its death. Timely burial protects the bones from

NPS photo courtesy of Jeff Rasic

Figure 3. Steppe bison skull on a northern Alaska gravel bar.

dispersal and destruction by scavengers as well as from the array of erosional forces constantly at work on the earth's surface. Ideal conditions for preservation would also have an element of consistency; for example, the ground in which the remains are contained would remain wet or frozen with minimal fluctuation throughout the period of interment.

Many prehistoric remains found in northwest Alaska have found their way to the surface through the erosional forces of moving water. Along coastal areas, storm surges expose ancient fossils, often depositing them on beaches. The breakup of ice on rivers in the spring and the rising of water levels regularly erode away large portions of river bank, exposing fossils contained within. More often than not, the freshly exposed fossils are then washed down stream where they can accumulate on gravel bars (*Figure 3*). For this reason, area fossils found in their original locations are rare.

The Importance of In Situ Documentation

Paleontological resources provide scientists with a rare glimpse into the prehistoric past. Ancient environments and their various forms of plant and animal life can be reconstructed by studying these remains and the unique place in the landscapes in which they were discovered. These resources are incredibly limited in numbers and once they are damaged, or removed from their original locations (in situ), much of their educational and scientific data is lost.

Documentation of a find is often the most important aspect of fossil-related research and collection. Appropriate recording of a paleontological specimen includes information about the specimen (taxonomic identification, measurements, taphonomy), its location on the landscape (latitude/longitude, stratigraphic position), and the geology of the immediate area. Without this baseline data, the specimen has lost the vast majority of its potential to inform us about the prehistoric past (*Figure 4*).

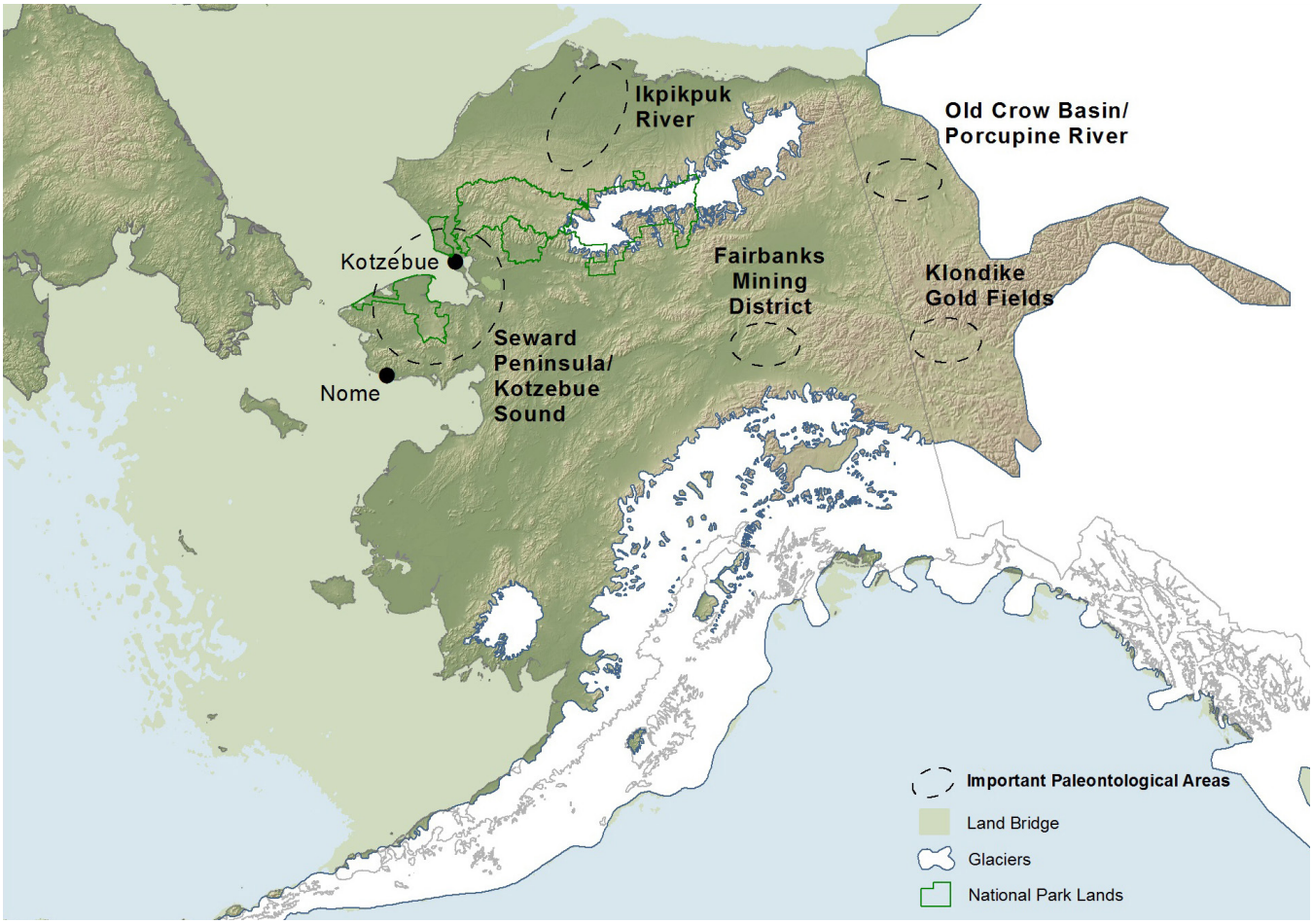
A Heritage of Collecting and Current Management

Native inhabitants of Alaska have long used animal remains discovered on the landscape as sources of raw material for a variety of household items, hunting implements, and pieces of art. It is not unheard of for the remains of a five-hundred-year-old pit house in northwest Alaska to contain sections of a ten-thousand-year-old mammoth tusk. The ivory is likely collected from a nearby beach,

NPS photo courtesy of Jonathan Hardes

Figure 4. National Park Service archeologist Jonathan Hardes examines a portion of a mammoth rib recovered from a small thermokarst lake, Bering Land Bridge National Preserve.

Figure 5. Major ice age fossil localities in Alaska include gold mining districts near Fairbanks and Dawson, rivers on the Arctic Slope, and the Seward Peninsula/Kotzebue Sound region. Each area provides a different view of Beringia's ancient environments and animal communities. Map courtesy of Adam Freeburg. Sources: Glaciers adapted from Manley and Kaufman (2002) [LGM, approx 20kya] and Dyke (2004) [18k 14Cya]. Land Bridge adapted from Manley (2002).



taken to the home with portions put to use in myriad ways. This tradition of fossil collecting by Alaska Natives continues to the present with bones and ivory collected from Native- and privately-owned lands and put up for sale, either in their original form or after having been fashioned into objects of art. This common activity plays a critical role in the local subsistence, cash-based economy.

The National Park Service (NPS), charged with the stewardship of paleontological remains, seeks an ethical balance between the preservation of all prehistoric finds and the rights of long-term, Native inhabitants, whose very livelihoods (often for many generations) have involved the collection of these very remains.

Federal regulations are clear about not disturbing or damaging paleontological finds on federal lands. Appropriate management involves federal land-managing agencies conducting condition assessments leading to management actions that preserve paleontological resources where possible, or it permanently captures and documents the information these resources contain where preservation is not possible.

Paleontology and Northwest Alaska

Fossil remains are bountiful in northwest Alaska, with the Baldwin Peninsula, Kotzebue Sound, and Seward Peninsula being particularly fossil-rich areas (*Figure 5*). Recorded paleontological discoveries were made in the immediate area as early as 1816. However, the region has lacked the level of attention and scientific study of other northern areas such as the Klondike and the Yukon, and is therefore lesser known (*Kurten 1980*).

In order for these resources to receive adequate protection and study, local avocational and scientific communities must become more aware of them and come together to share information. Scientists working in areas such as Kotzebue rely heavily on local knowledge to learn more about and protect paleontological resources. The author has found public workshops and blogging as well as a simple open-door policy for those who are already in possession of fossil remains, to be quite effective means of sharing this knowledge (*Figure 6*).

NPS photo courtesy of Jonathan Hardes

Figure 6. National Park Service archeologist Jonathan Hardes documents ice age bones from the collections of LaVonne's Fish Camp, Kotzebue.

The Value of Fossils and Why We Study Them

Each fossil, no matter how fragmentary, is singular in its ability to illuminate the life of a particular creature and the age in which it lived. Fossils provide us with direct, tangible links to the prehistoric past, including long-extinct animal populations, changes in climate, and ecology. The study of past life forms even plays a role in modern conservation biology and wildlife management. Through the lens of paleontology and its vast spans of time, researchers are afforded an exceptional opportunity to look at long-term biological trends and apply their findings to prevailing conservation concerns.

Of course in order to study the prehistoric past, we must protect and conserve the remnants of it. For federal managers, the Paleontological Resources Preservation Act (PRPA) provides the authority for the preservation and management of ancient remains. The act also reminds us that collecting these resources from federal lands without the appropriate permits is not permitted. In fact, damage or removal of paleontological resources can lead to conviction and a felony charge. State, federal, and Alaska Native Corporation land managers each have their own set of rules designed to protect these resources.

Suggestions for the Discovery of a New Find

1. Please *do not* touch, move, collect, or otherwise disturb artifacts, cultural features, or paleontological resources.
2. Record the site location with a GPS unit or by marking it on a topographic map with compass bearings to prominent landmarks.
3. Provide a detailed description of approximate size, numbers, and position of materials.
4. If you have a camera, please take photographs of the site area and surrounding landscape. If possible, include a scale in photos of individual items or specimens.
5. Report information to an archeologist or paleontologist. (If you are in the greater-Kotzebue area please contact National Park Service Archeologist Jon Hardes at 907-442-8342 or jonathan_hardes@nps.gov)

For More Information

Society of Vertebrate Paleontology
http://vertpaleo.org/

The Paleontological Society Code of Fossil Collecting
http://www.paleosoc.org/pscode.htm

Paleontology in the National Parks
http://www.nature.nps.gov/GEOLOGY/paleontology/index.cfm

Ice Age Mammal Bones of Northwest Alaska blog series
(see Running Herd blog)
http://www.nps.gov/kova/blogs/runningherd.htm

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Artists Spotlight Alaskan Wilderness

By Tim Lydon

Throughout 2014, Alaskans can celebrate the fiftieth anniversary of the Wilderness Act with artistic flair. The *Voices of the Wilderness Traveling Art Exhibit* is a collection of paintings, photographs, sculptures, poetry, and other works created by professional artists and inspired by Alaska's expansive 56 million acres of federal wilderness. The exhibit will tour seven Alaska communities during 2014, including Juneau, Fairbanks, Anchorage, Sitka, Homer, Kenai, and Ketchikan.

In all, twenty of Alaska's thirty-nine federal wilderness areas are represented, spanning the state. The works include a wood-carved paddle by Tlingit artist Donald Frank, whose home village of Angoon lies adjacent to Admiralty Island National Monument on the Tongass National Forest. Other highlights come from Gates of the Arctic National Park, Glacier Bay National Park, Arctic National Wildlife Refuge, Alaska Maritime National Wildlife Refuge, and the Chugach National Forest wilderness study area in Prince William Sound.

Much of the work was produced through artist residencies hosted by the U.S. Forest Service, National Park Service, and U.S. Fish and Wildlife Service during the last five years. Each work is accompanied by an artist's statement about their experiences in Alaskan wilderness, along with a placard and map highlighting the area's features.

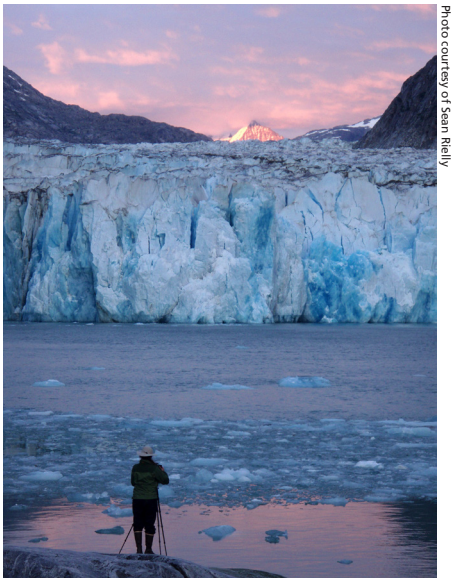

Photo courtesy of Sean Rielly

Figure 2. As a 2011 artist-in-residence, Julie Denesha of Merriam, Kansas, photographs Dawes Glacier. Tracy Arm-Fords Terror Wilderness, Tongass National Forest.

Figure 1. As a 2012 artist-in-residence, Susan Watkins of Eagle River, Alaska, paints at Pakenham Point, College Fjord. Nellie Juan-College Fiord Wilderness Study Area, Chugach National Forest.

Photo courtesy of Barbara Lydon

"For generations, artists have connected Americans to their public lands," says Barbara Lydon, U.S. Forest Service wilderness ranger and the exhibit's coordinator. "Think of George Catlin, Albert Bierstadt, and Thomas Moran. Their work in the nineteenth century inspired early pride in America's wild landscapes and even influenced Congress to create our first parks."

Lydon says Alaska's wilderness artist residencies keep that tradition alive today.

Managers of parks, forests, and wildlife refuges know the inspirational value of art and have long hosted artist residencies at spectacular places across the country. But according to Lydon, recent Alaskan residencies have offered a twist.

Rather than hosting artists at cabins or lodges, where scenery is often the focus, recent artists have participated in wilderness stewardship projects as part of their residencies. Many of those in the exhibit joined agency specialists for a week or more in the field. They gathered marine debris, pulled invasive weeds, or assisted with research of wildlife, air quality, and climate change.

Often in very Alaskan weather, they hiked, paddled, and camped in some of America's wildest places. According to Lydon, they also learned that how we care for the land is often just as inspiring as the land itself, especially in an era facing climate change and other big challenges.

Additional Information and application materials for the Voices of the Wilderness—Artist-in-Residency Program: http://www.fs.usda.gov/detail/chugach/home/?cid=STELPRDB5347393

Photo courtesy of Barbara Lydon

Figure 3. Kathy Hodge of Providence, Rhode Island, paints in front of Surprise Glacier in Harriman Fiord as a 2011 artist-in-residence. Nellie Juan-College Fiord Wilderness Study Area, Chugach National Forest.

Photo courtesy of Kathy Hodge

Figure 4. Oil painting entitled "Surprise" by Kathy Hodge of Providence, Rhode Island. Inspired by Surprise Glacier, Harriman Fiord. Nellie Juan-College Fiord Wilderness Study Area, Chugach National Forest.

NPS photo courtesy of Linda Jeschke

Figure 5. "Wolf at the Door" was painted by Elaine Phillips, who was the 2013 artist-in-residence at Kobuk Valley National Park. Listen to an interview with the artist: http://kdlg.org/post/original-tapestry-debuts-dillingham

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Savage Canyon view, Denali National Park and Preserve. NPS photo