Wilderness in a Changing Alaska

Managing for Resilience

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Forces Shaping Alaskan Wilderness

Wilderness is popularly viewed as a pristine land without people, a land that changes only by "natural" processes, unaffected by human actions. Wilderness, however, is a dynamic system in which physical, ecological, and cultural processes interact in ways that retain their natural essence and are resilient to perturbations. Alaska is widely recognized as a region that has retained its wilderness character. In this article, we briefly probe the history, dynamics, and possible future of Alaskan wilderness, with an emphasis on the role of people as an integral component of the system.

The topographic diversity of Alaska is a product of its geologic history. Terranes of multiple origin rafted across the Pacific Ocean and collided with the North American Plate, producing mountain ranges that include the highest peaks in North America (Thorson 1986). These mountains also contribute to Alaska's climatic diversity by intercepting the rainfall that generates temperate rain forests in southeastern Alaska. blocking moisture from the continental areas of interior Alaska, and focusing the frontal boundary between the cold air mass of the arctic slope and more moderate climates to the south (Gallant et al. 1995).

These climatic patterns result in a large-scale mosaic of forests, tundra, glaciers, and wetlands that are home to both permanent residents and migratory animals such as tropical songbirds, salmon, and whales. During glacial periods, Alaska was functionally part of the Asian continent and isolated from the rest of North America by glaciers. In warmer periods, Alaska's biological links have been with North America. This biogeographic ambivalence, combined with topographic and climatic diversity, has contributed to unusually high biological diversity for a region of such high latitude (Walker 1995).

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People have been an integral component of Alaskan ecosystems for at least 11,000 years (Aigner 1986). However, due to its low productivity and harsh environmental conditions, interior Alaska has always had a relatively low density of human inhabitants. During much of its human history, Alaska has been occupied by multiple cultures, each of which interacted with its environment in substantially different ways. For example, depending on the region, the primary subsistence base has been fish, marine mammals, or terrestrial mammals (Langdon 1986; Burch 1998). During its period of human habitation, Alaska has experienced both gradual and abrupt change. Climate warmed rapidly at the end of the Pleistocene to its thermal maximum about 9,000 years ago. Subsequently, there has been a gradual cooling and climate moistening, a rising sea level that inundated the land bridge to Asia, and melting continental glaciers that had isolated Alaska from the rest of North America.

These trends led to large-scale changes in vegetation. For example, in interior Alaska, which was never glaciated, there were gradual changes from steppe tundra typical of glacial times to poplar forests to white spruce forests to black spruce forests. This last change occurred abruptly 6,000 years ago, when black

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spruce became widespread in response to the moistening climate. Its high flammability caused a sudden increase in fire frequency, instituting a new disturbance regime that has persisted to the present (Lynch et al. 2003). In northern Alaska, vegetation changed from steppe tundra to poplar forests to the current mosaic of arctic tundra vegetation types. The well-developed megafauna of mammoths, bison, and horses that had been in Alaska for hundreds of thousands of years disappeared during the last several thousand years. Other components of the Pleistocene megafauna such as caribou and moose have persisted. The relative importance of changes in climate, vegetation, and human hunting in triggering the change in megafauna is still actively debated (Zimov et al. 1995; Guthrie 2003). Alaskan ecosystems have continued to change over the last 6,000 years in response to climatic variation, but these changes have been smaller in magnitude and more reversible than those that occurred earlier, indicating substantial resilience to small-scale environmental change.

In summary, prior to white contact, Alaska ecosystems underwent repeated changes in climate, biota, and culture. None of Alaska's current ecosystems or cultures was present 10,000 years ago, and substantial changes have continued even during the past 5,000 years. Nonetheless, Alaska ecosystems have retained the basic nature of ecosystem processes, including the flow of energy; recycling of nutrients; diversity of plants; animals, and cultures; and the relationships between local people and their environments. These systems have continued to support a diversity of human and nonhuman life, despite large climatic and cultural changes. People have been part of these ecosystems for most of their history and have both responded to and contributed to the changes that have occurred.

Recent Changes in Alaska

If people are an integral component of regional systems, cultural changes in political and economic systems will likely affect regional ecology. Russian and European colonization of Alaska initiated a relationship between people and the land that was qualitatively different from that of its original inhabitants, who were an integral part of the ecosystems that they occupied (Watson et al. 2003). For example, Russian fur traders on the coast of Alaska and Canadian fur traders in interior Alaska used ecosystems as a source of materials to be extracted and exported for profit. Similar motivation launched a fishing industry in coastal Alaska and a gold rush in interior Alaska in the early 20th century (Naske and Slotnick 1987). European diseases reduced the Native population of Alaska substantially and introduced new technologies such as rifles, fishnets, and motorized transport.

When Alaska became a state in 1959, many land ownership issues were unresolved. In 1971, the federal government ostensibly settled the land claims of Alaska's Native people through the Alaska Native Claims Settlement Act (ANCSA), through which Native corporations were established. The Alaska Federation of Natives, as a representative of Native Alaskans, negotiated with the federal government, with the result that the new corporations received title to 45 million acres (18.2 million ha) of land and payment for the remaining approximately 300 million acres (121.5 million ha) of land, which were transferred to state and federal ownership. Through ANCSA, Native Alaskans gave up management of natural resources on government land, including traditional hunting and gathering practices (Ross 2000).

The passage of the Alaska National Interest Lands Conservation Act (ANILCA) in 1980 designated 225 million acres (91.1 million ha) of Alaska land for federal ownership, establishing the status of key areas recognized for their scenic and/or ecological value (Ross 2000). ANICLA also opened the door for designation of federal wilderness areas while concurrently restoring some of the rights of Native Alaskans to practice traditional hunting and gathering on government lands. However, the state of Alaska and the federal government have never agreed on how to manage the subsistence practices on public lands, resulting in different management policies for different types of public lands. In federal wilderness, Native subsistence rights to hunting and gathering remain and are defined as "customary and traditional uses by rural residents of wild, recoverable resources for direct personal or family consumption." (ANILCA 1980 in Watson et al. 2003).

Native Alaskans were not displaced from their original homes to reservations, as in the Lower 48. Thus, in the Lower 48, land unoccupied by white people had almost no inhabitants, but in Alaska, many of the lands remote from the road network continued to be inhabited by both Native and white people, who maintained close cultural and subsistence ties to the land. Thus the Eurocentric concept of wilderness as an area where "man himself is a visitor who does not remain" (The Wilderness Act 1964) has never char-

Figure 1—The centralization of families into permanent communities such as Fort Yukon changes the relationship with traditional lands. Photo by F. Stuart Chapin.

acterized the remote regions of Alaska (Huntington 2002; Watson et al. 2003).

Yet in the continually changing wilderness of Alaska, Native Alaskans' lives differ significantly from those of their ancestors. Whereas most Native groups of Alaska were once seasonally and annually mobile, moving throughout the year to access different types of resources, they are now settled in permanent villages (see Figure 1) that are tied to schools, stores, churches, airports, and opportunities for permanent or seasonal wage jobs, usually with tribal or governmental agencies (Langdon 1986). This reduction in mobility associated with establishment of permanent villages has been compensated to some extent by more efficient transport such as snowmobiles and outboard motors, which are now an integral part of subsistence hunting and allow people to access a larger area. This technology, however, ties people to a wage economy, and the regional ecological effects of these more sedentary subsistence patterns are not yet known (Gerlach et al. in press). In addition, after Native populations were reduced by disease and centralized in permanent villages, children were often raised or taught by missionaries who did not allow them to speak their language or practice their own religion. The resulting loss of native language, legends, and depth of understanding of the relationship to land and animals contributed to the shift toward western energy and food sources. Although Native lifestyles are still changing, there remains a strong cultural and economic dependence on the land—a dependence that today is supported by modern means of transport. The role of such technology in designated wilderness areas is a multifaceted issue that has no simple answer and continues to be debated.

In summary, remote portions of Alaska have been remarkably resilient to the massive changes of the last century. The population density in most of rural Alaska has increased during the last 50 years (Anonymous 1997), although local patterns of distribution are quite different. Most people who live off the road network still maintain strong cultural and subsistence ties to the land, despite radical changes in land tenure, community structure, and technology (see Figure 2). In these areas people still consider themselves part of the same land that visitors view as wilderness (Huntington 2002; Watson et al. 2003). Other impacts or recent change have left a more indelible mark. These include seismic trails and gravel roads associated with oil development, which have thawed the permafrost and altered hydrology. These geomorphic changes will remain imprinted on the land for thousands of years until the natural processes of erosion and deposition gradually reshape the landscape. This relationship between industrial activities and the land is qualitatively different from the cultural and subsistence uses by rural residents (Klein 2002).

Figure 2—The use of motorized boats to access portions of the river distant from communities allows maintaining traditional access of Native Alaskans to the land. Photo by F. Stuart Chapin.

Although we cannot predict the precise future of Alaska wilderness, we know that it will be different from what characterizes it today. The climate of Alaska is now warming as rapidly as any place on Earth (Serreze et al. 2000; Krupnik and Jolly 2002). This region, whose climate has long resisted invasions of exotic species, is now being colonized by new plants and animals. Salmon populations are changing in response to climate, commercial fishing, and potentially the introduction of escaped farm salmon. The culture of rural Alaska and the institutions that manage Alaskan lands are undergoing change. There is growing pressure from tourism, as an expanding world population increasingly values and seeks to experience Alaskan wilderness. Although we cannot predict the precise nature of the future Alaskan wilderness, we can be absolutely certain that it will differ in important respects from the landscape of today.

Conceptual Framework for Wilderness Stewardship

The challenge of wilderness stewardship is to manage the inevitable changes that will occur in ways that maintain the key cultural and ecological qualities of Alaska wilderness. This goal requires that we manage not for a set of uniform physical attributes but for protection of a wilderness character that is difficult to define but which acknowledges the integral nature of the dynamic relationship between people and the land. There is a growing literature on managing social-ecological systems (i.e., systems in which people are an integral component) for resilience in the face of uncertain but inevitable change rather than managing to prevent change (Folke et al. 2002; Gunderson and Holling 2002; Berkes et

al. 2003). In this context, resilience is the capacity of a system to absorb shocks and still maintain its essential characteristics. This framework seems particularly appropriate for Alaska wilderness, where there are still strong cultural ties of local residents to the land and where there is a growing interest among nonresidents in nonconsumptive use of Alaskan wilderness. Managing for resilience would have the following attributes:

1. Sustaining diversity, including:
   a. Maintaining large management units with a wide range of ecological and topographic diversity so organisms can migrate in response to future climate changes rather than being trapped in a local preserve that becomes gradually less suitable as habitat (Elmqvist et al. 2003).
   b. Facilitating institutional diversity, including multiple types of co-management arrangements with local residents who have extensive experience in managing local resources (Berkes and Folke 1998). By treating management as an experiment rather than a single monolithic entity, it is more likely that novel effective solutions will emerge that mesh well with local conditions. However, institutional changes can either strengthen or degrade wilderness character and must be approached cautiously.
   c. Allowing for cultural diversity in which people with different cultural ties to the land (e.g., subsistence users and backpackers) may interact with the land in different, but equally appropriate, ways.
   d. Recognizing that diversity increases the range of surprises with which a system can cope without danger of radical change in essential properties.
2. Recognizing change as a natural feature of social-ecological systems, thus
   a, Creating conditions that allow modest change rather than seeking to prevent change, which may create conditions that make catastrophic change more likely (Holling 1986). For example, fire suppression, which reduces the probability of wildfire in the short term, increases the probability of future larger fires. However, carefully designed prescribed fires near communities can enhance wildlife habitat and reduce the probability of large fires that destroy property; these fires might otherwise become more likely in a warming climate.
   b. Treating crises as an opportunity for change (Gunderson and Holling 2002). When institutional, economic, and other crises occur, it becomes easier to initiate change, because it is clear that the current system no longer functions effectively. Such crises should be used as opportunities to think outside the box for novel solutions that address future needs.
   c. Treating changes that do occur as opportunities to learn. Many of the changes that occur outside a wilderness context (e.g., industrial development, predator control, commercial salmon harvest) provide opportunities to learn about the vulnerability of social-ecological systems to radical change.
3. Focusing on the variables that regulate long-term change (Carpenter and Turner 2000). Crisis management that focuses on issues of most immediate public concern (e.g., a road, fire, or particular regulation) is often less effective over the long term than stewardship focused on the important underlying controls, such as the economic viability of rural communities, patterns of fuel buildup, or the development of effective institutions for co-management of resources. Wilderness planning will fail if it focuses only on immediate crises without studying ways in which appropriate relationships between people and the land can be protected or restored.
4. Anticipating variability and change, including:
   a. Anticipating predictable change. These include warming effects on permafrost and infrastructure, increased visitor impact on Alaskan wilderness, and an ice-free Arctic Ocean that increases the economic feasibility of arctic oil development (Chapin et al. Submitted). Planning in the context of these anticipated changes provides a context exploring long-term solutions that are more likely to be viable.
   b. Expecting surprises. We can never predict everything that will happen, so planning that fosters diversity, learning, and flexibility provides an environment that is more likely to cope effectively with unanticipated changes.

Conclusions

Alaskan wilderness has a different character than small reserves, which remain in more populated regions of the world. In Alaska, wilderness is the matrix that surrounds relatively small areas of more intense human activity. Planning for the long-term integrity of this wilderness in the face of certain changes in climate, culture, and economy is a serious challenge, but it represents an opportunity to think creatively about the deepest values that underlie the human need to be a part of wilderness in an enduring fashion.

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