INTERNATIONAL

Journal of Wilderness

In This Issue

- Managing Cave Wilderness
- Perceptions of Technology, Risk & Rescue
- Attitudes Toward Fire & Wind Disturbances
- India, Nepal

AUGUST 2011 VOLUME 17, NUMBER 2

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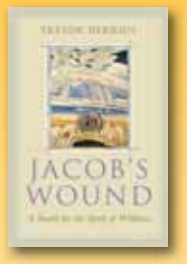

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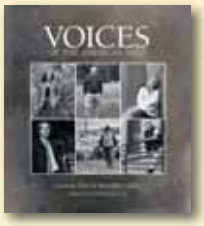

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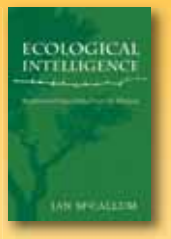

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On the Cover

Main image: Teddybear Chollas (*Opuntia bigelovii*) in the Sonoran Desert, Saguaro National Park, Tucson, Arizona, USA.

Inset: Gambel's Quail (*Callipepla gambelii*) on a saguaro skeleton. Sonoran Desert, Arizona, USA

Photos © courtesy of Jaime Rojo; jaime@wild.org

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—John C. Hendee, *IJW* Editor-in-Chief Emeritus

International Journal of Wilderness

The *International Journal of Wilderness* links wilderness professionals, scientists, educators, environmentalists, and interested citizens worldwide with a forum for reporting and discussing wilderness ideas and events; inspirational ideas; planning, management, and allocation strategies; education; and research and policy aspects of wilderness stewardship.

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EDITORIAL PERSPECTIVES

Balancing Risk and Public Safety in Wilderness

BY LISA EIDSON

Risk is a part of wilderness. It's a philosophy with roots in the language and intent of the Wilderness Act, and it has been espoused in the writings of many wilderness advocates. Yet as today's information age increases our reliance on technology, land managers are often left with the difficult task of balancing risk against public safety. Risk and safety share an inverse relationship; as one increases, the other decreases. One particular clash between risk and safety comes in the form of a little black box—your GPS unit. Charlie Callagan, wilderness coordinator at Death Valley, coined the phrase "Death by GPS" in a recent news article (Knudson 2011) to describe the following equation:

technology + desert – common sense = high risk of death

As Death Valley's search and rescue coordinator says, "GPS units are not only fallible but send people across the desert where no road exists" (Knudson 2011). Companies such as TomTom, Garmin, NavTech, and Google Earth maintain map data that GPS units and mobile devices (such as smart phones) use to navigate to particular destinations. In many cases, older U.S. Geological Service quad data serve as a starting point for these maps that can contain a variety of inaccuracies, including nonexistent, overgrown, or otherwise impassable roads. When these roads route visitors into wilderness areas, not only does risk increase and safety decrease, but illegal vehicle trespass and the associated resource damage can result, especially in places such as the Mesquite Mountains Wilderness, which contains a route shown on GPS maps that falls into the BLM Needles Field Office top-five locations for vehicle intrusion.

In the wake of bad publicity over the hazards and damage that map inaccuracies can cause when combined with user inexperience and bad judgment, GPS companies and the federal land management agencies are working together to remove or recategorize roads shown on GPS maps in and around wilderness areas such as Death Valley and Mesquite Mountains. Combined with visitor education on the unreliability of technology and the need for common sense when traveling in the backcountry, it is hoped that this strategy will prove to be an effective way of increasing public safety while maintaining acceptable levels of risk and reducing illegal vehicle trespass.

So this is one technology problem that may very well have a technology solution.

In this issue of *IJW*, there are two articles about wilderness and technology. Pope and Martin report on a study of wilderness visitors and their perceptions of risk and rescue in wilderness and the appropriate use of technology in wilderness. Eidson summarizes the development of one social media technology that helps connect wilderness professionals to understand common problems and develop a wider network to share information. Also in this issue, Cole proposes defining and designating a wider diversity in the types of wilderness, and McKinney describes managing caves as wilderness resources. Dvorak and Small report on a study about visitor attitudes toward fire and wind disturbances in the Boundary Waters Canoe Area Wilderness. Torri summarizes the opportunities and challenges of community-based conservation of snow leopards in the Himalayan foothills of northern India.

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SOUL OF THE WILDERNESS

A Role for Wilderness in Re-greening the National Parks

BY MICHAEL FROME

In his pioneering guidebook published in 1917, one year after Congress voted to establish the National Park Service (NPS), Enos Mills (1917) wrote, "Thus protected, these wildernesses will remain forever wild, forever mysterious and primeval, holding for the visitor the spell of the outdoors, exciting the spirit of exploration."

Such was the assumption of the time, and it seemed valid for many years. Following World War II, however, the wild places of our national parks (and other public lands as well) were clearly shrinking, no longer secure. Luckily, at the critical juncture, an epochal new law, the Wilderness Act of 1964, marked a turning point in American history: an acknowledgment that wild places are essential to our national life and culture, but they must be constantly defended from intrusion by our technological super-civilization.

National parks and wilderness have long been important in my life, not solely in the United States but elsewhere in the world as well. I cheered and supported passage of the Wilderness Act. For me, even now, the language of the act reads more like poetry than law and evokes an emotional response. In addition, it places wilderness at the core of a healthy society and a moral world. Until passage of the act the American system had reserved the terms *resource* or *natural resource* for hard-core economic matter such as lumber, oil, soil, minerals, and hydropower. In describing wilderness as a "resource," Congress heeded the singular input of Howard Zahniser, the executive director of The Wilderness Society, who wrote most of the act. In so doing, Congress enlarged the definition of that term to include space, beauty, solitude, silence, and biodiversity. It created a framework for understanding wilderness protection as being as legitimate a use of the public lands as the extractive industries.

But such attainments in preservation, as in any manifestation of ethics and idealism, do not come easily in a system dominated by materialism and manufacture. In the case of the Wilderness Act, fruition came after eight years of discussion and debate by the Senate and House of Representatives, and after 18 separate hearings conducted by congressional committees around the country. The bill was rewritten time and again, passed in the Senate, then bottled up in the House. The very idea of legitimizing wilderness was aggressively opposed by the timber industry and by the oil, grazing, and mining industries. The National Park Service and Forest Service opposed it, too: That is a matter of record. The public may own the land, but the administrators prefer to exercise their own prerogative without sharing decision-making authority, a view that prevailed long after passage of the act. But the people, all kinds of people, rallied to the wilderness cause. The very effort surrounding passage makes the Wilderness Act impressive as a statement of national purpose.

Michael Frome.

I was well acquainted with Zahniser (1961), the principal author of the Wilderness Act. He was studious, articulate, and compassionate. "We are not fighting progress," he said. "We are making it. We are not dealing with a vanishing wilderness. We are working for a wilderness forever." In 1956, Representative John P. Saylor of Pennsylvania introduced the Wilderness Bill in the House of Representatives. In many ways he was a conservative Republican. Nevertheless, for eight years Saylor led the uphill legislative battle and never gave up. In 1961, when the going was tough, he declared: "I cannot believe the American people have become so crass, so dollar-minded, so exploitation-conscious that they must develop every last little bit of wilderness that still exists."

That law made the United States the first nation anywhere in the world to recognize through government action

wilderness as part of its culture and heritage. Adoption of the Wilderness Act, providing for establishment of the National Wilderness Preservation System, reinforced a public feeling for nature and a desire to enjoy recreation with self-sufficiency and physical challenge. Other legislation followed in the 1960s, including the Wild and Scenic Rivers Act and the National Trails System Act.

Wilderness and the National Park Service

It grieves me that the National Park Service has never quite shared in "celebrating wilderness," either as a principle of law or as a resource it administers. In *Preserving Nature in the National Parks: A History* (1997, 2009), historian Richard West Sellars (who worked for many years in the national parks) writes:

> The 1964 Wilderness Act was the first statutory restraint of any consequence placed on Park Service management of backcountry since the 1916 Act establishing the National Park Service. Long accustomed to wide latitude in managing national parks, the Service was indifferent to the passage of the 1964 Wilderness Act, claiming that the Act was not necessary, and that national park backcountry was already adequately protected.
>
> This attitude remains strong today. In my opinion, it is the chief underlying factor for the indifference the Park Service has demonstrated since 1964 toward establishing a sound wilderness management program system-wide. When we do not—in policy and practice—clearly recognize the managerial differences between wilderness and backcountry, the National Park Service is, in effect, managing by the far more permissive National Park Service Act of 1916, and avoiding compliance with the highly restrictive 1964 Wilderness Act.

Figure 1—Great Smoky Mountains National Park. Photo courtesy of the National Park Service.

Sellars is not the only one to speak in these terms. Jim Walters, wilderness program coordinator of the NPS Intermountain Region, also complained that the agency was not meeting its responsibility. When he was ordered to transfer, he chose to retire and on January 22, 2004, dispatched this memorandum to the director:

> After 40 years, the National Park Service has done relatively little to demonstrate that it has taken its wilderness management responsibilities seriously nor has it implemented a management program which reasonably provides for the day-to-day and long-term preservation of this resource. The lack of evidence that the Service has met even its most basic responsibilities as required by the Wilderness Act, and its own policies, after this amount of time has generated a growing distrust of the agency by the public, and especially within the environmental community. This distrust is exacerbated by the growing number of incidents throughout the Service wherein NPS staff violate the letter and spirit of the Wilderness Act, and NPS wilderness management directives, with little or no consequences.

Consequently, the core areas of Yellowstone, Yosemite, the Grand Canyon, and other great parks are little more than tourist centers, with the commercialization that goes with them. In California, tight little Yosemite Valley, with 30,000 visitors daily, is more like a city than a park. These places are called "sacrifice areas," as though to legitimize the sacrifice.

Much the same is true at the Tetons in Wyoming. The lake that appears so natural is an artificial, fluctuating reservoir with artificially stocked fish. The visitor to the Tetons finds a river, the Snake, whose flow is artificially controlled, plus livestock grazing, luxury hotels, dude ranches, airport, high-speed highway, big-game hunting in fall, and mechanized snowmobiling in winter, all in the national park.

Artificiality has been widely implanted throughout the parks. It

dilutes the appeal to higher emotions. It is common fare, despite the best intentions of well-intentioned people. One director of the National Park Service after another has given a little here, or a little there. But history demonstrates that the first step is the worst step, leading to new illusions substituted for the old reality of natural ways in natural places.

Parks were established as scenic spectaculars. Now we know they are more. In the unending struggle to obtain and sustain a quality environment of life, national parks contribute by their existence as model ecosystems and reservoirs, or seedbeds, of biodiversity and environmental restoration. In a world where nothing remains static, they, logically, are the places to monitor and document change in the global ecosystems.

Nature Needs Half

That makes the concept, Nature Needs Half, which is advanced by world scientific and environmental organizations, timely and critical. By "half," they mean half of our planet. That may sound bold on the face of it, but in our day and age we are all in this together, for better or worse, sharing one world, one planet. The escalating global ecological crisis—characterized by loss of natural habitat, increasing extinction of species, rapid warming of the planet—has demonstrated that efforts to date have not been sufficient to sustain life on Earth.

While this has been happening, our ecological knowledge has increased dramatically, especially concerning how much land and water we must protect to support life on Earth. Assessments have typically determined that nature needs at least half of a given ecoregion to be protected, and needs to be interconnected with other such areas.

Viewing the world around us in the throes of change and upheaval, it's not hard to see the worst side of things on the planet. And yet there are people, sometimes only a few, trying to make things better through commitment to causes larger than themselves, and others, sometimes more than one would think, ready to receive the message and to act upon it.

Nature Needs Half to me is like a target—worth the challenge and the inspiration that comes with it—and we can find many case histories, in our own country and elsewhere. In the mid-1980s, for instance, Lily Venizelos, a socially prominent woman of Athens, Greece, became aware of the plight of sea turtle species, specifically loggerhead and green turtles in the Mediterranean, and determined to make their survival a very personal issue in her life. In due course she became recognized and renowned as "the turtle lady."

She learned, and then taught others, that sea turtles have lived on the planet for 100 million years, even before the age of dinosaurs, in the distant age when life in the oceans first began moving on to land. Little is still known of their great undersea travels, though clearly turtles migrate thousands of miles to nest, feed, and winter. Having lungs, not gills, they must surface at intervals to breathe; and to feed on sponges, small fish, mollusks, and squid; and to browse sea grass beds. Females come ashore at night to nest on sandy beaches, the very beaches where they were born, They dig holes in the sand and lay 80 to 100 small white eggs and then crawl back to the sea. After two months of incubation, hatches emerge from the nest and crawl to the sea, although only few make it past natural predation from crabs, foxes, and seabirds on the beach. Tourism, longline fishing, and pollution all have had serious effects on turtle habitat and numbers.

Since 1988, when she established Medassett, properly the Mediterranean Association to Save the Sea Turtles, Venizelos has made Europe conscious of the sea turtle as an endangered species in need of concern and protection. From headquarters in London and Athens, Medasset has informed and collaborated with governments, conservation organizations, and the tourism industry to advance turtle awareness and protection.

Thus people, and governments, are learning that sea turtles need an undisturbed, dark night beach to nest (without it, many females give up and abort their eggs in the sea); that thousands of turtles are accidentally caught in longline fishing nets, their fate unknown; and that survival of sea turtles can be secured only by international cooperation and effort, including awarding, or yielding, half to nature.

People such as the "turtle lady" shape public policy and government action. People who care have made national parks a powerful social ideal throughout the world. Virtually every country needs and wants them. Parks certainly make better calling cards than bombs do, and contribute more to peace.

International Movement Establishing National Parks

There was little such thought connected with establishment of Yellowstone in 1872. But the concept took hold and spread around the world. In 1885, when its railroads opened the West, Canada moved to protect land around Banff Hot Springs. It became the first of its 43 national parks spread across the country. In distant New Zealand, the first national park came into being

Figure 2—Colorado National Monument recommended wilderness. Photo courtesy of the National Park Service.

because the Maori, the native people, wanted a particular sacred area, Tongariro, protected.

Safeguarding such resources for future use, enlightenment and enjoyment makes more sense than exploiting and depleting them until little is left. Certainly the Amazon River in South America is worth more in its natural state to the eight countries sharing the river basin than if it was deforested and industrially developed. Here one encounters pink freshwater porpoises, many varieties of birds and fish, and lovely *Victoria regia*, the meter-wide water lilies that symbolize the lush Amazon forest—a rain forest with more types of plants, flowers, trees, birds, butterflies, reptiles, and mammals than any other forest on Earth.

Scientists warn that stripping the Amazon forest cover can drastically alter the world's climate. That is what national parks are all about. Protecting the setting, encouraging visitors to come but limiting their use to respect the carrying capacity—such measures help to appreciate the sense of place, the purpose of place, and the spirit of undefiled natural sanctuaries.

The first national park in South America was set aside in Argentina in 1903, from lands in Patagonia donated by Francisco "Perito" Moreno, who devoted his life to preserving Argentina's wild landscape. South America is a composite of wonderlands, extending 5,000 miles (8,047 km) from the tropics almost to Antarctica. The Andean Cordillera, the longest continuous mountain range in the world, embraces 45 peaks rising above 20,000 feet (6,096 m). One part or another of South America provides home and habitat to marmoset and monkey, giant armadillo and anteater, the world's tiniest deer, maned wolf, mountain tapir, mountain lion, jaguar, ocelot, llama, and vicuna—plus bird life that includes the black-necked swan, cacique, condor, quetzal, flamingo, parrot and parakeet, toucan, trogan, and hundreds of species of dazzling and bizarre butterflies. The survival of these species is no accident. Today these natural treasures of South America are located primarily within national parks, established through the initiative of individual citizens and the response of governments to their concern.

South Africa established national parks by the end of the 19th century and now is endowed with a superb system. Kruger National Park, the most renowned, embraces 4 million acres (1,618,743 ha) of bushveld and savanna, protecting the largest variety of mammals in Africa, plus hundreds of species of birds and more than 2,000 species of plants. On the same continent, President Julius Nyere of Tanzania set a positive and progressive course with a 1961 manifesto in which he declared: "In accepting the trusteeship of our wildlife, we solemnly declare that we will do everything in our power to make sure that our children's grandchildren will be able to enjoy this rich and precious heritage." His nation is among the poorest in Africa, yet Serengeti National Park, one of the world's legendary places, is nearly twice the size of Yellowstone. With nine other national parks and 16 game reserves, Tanzania has set aside almost 25% of its total area for wildlife and nature.

England and Wales show something different in national parks, distinctly their own, including large areas privately held—heathery hills and moors, valley farms, bridges, barns, medieval castles, Roman roads and walls, and Bronze Age stone circles. Britain somehow took its heritage for granted and established its national

parks only in the 1950s, responding at last to Wordsworth (1835), who through his poetry sang the praises of the countryside, urging recognition of "national property in which every man has a right and interest. Who has an eye to perceive and a heart to enjoy."

Lady Sayer (1970), a prime mover of the Dartmoor Preservation Association, in an address titled "Wild Country: National Asset or Barren Waste?" delivered at Harrogate in 1970 put it this way: "The hill farmer is a conserver of landscapes valued and precious." Then she pleaded for a halt to the tragic disintegration of the upland moors, declaring, "The rocks and heather…the gorse and the bogs. That is wild country, and in Britain it is all we have left of truly virgin land; and it is slowly vanishing, not only in Britain. But in every part of our man-polluted planet."

But national parks and the world around them are closely linked. It is difficult to sustain a healthy park in an ailing society. In East Africa, the once great herds of elephants are deeply diminished. Rhinos, zebras, leopards, and cheetahs have declined drastically in numbers. Advanced nations have created an insatiable demand for products made from the wild animals, thus parks and reserves are plagued with problems of poaching for elephant ivory, rhino horns, and skins of the big cats. Serengeti, Amboseli, Tsave, Lake Manyari, and other East African national parks also face pressures by international aid programs. Kruger has been losing natural buffers as a result of government-sponsored irrigation, agriculture, and forestry projects, diverting the flow of water and seriously impacting vegetation and wildlife. Little wonder when billions of dollars are being poured into Africa and other undeveloped regions for highways, ports, river basin projects, and agricultural schemes based on forest conversion, drainage, pesticides, and fertilizers.

The very idea of wilderness enriches my body, mind, and spirit, but it also elevates me to look beyond my own wants and needs.

The rest of the world looks to the United States, where park systems are most advanced, and, it is hoped, the United States will not betray that trust. The time is long overdue to apply the principle of stewardship, real stewardship, to our entire planet, with public lands in the United States as the exemplars. Society should have its choices, but one choice should be wilderness, whether embodied in a single plant or a great virgin forest, whether a desert or a mountain, a California condor, grizzly bear, or spotted owl, but that image is possible because somewhere the image exists in fact.

An Appreciation of Wilderness

For myself, I believe that conservation responds to social needs. It treats ecology as the economics of nature, in a manner directly related to the economics of humankind. Keeping biotic diversity alive, for example, is the surest means of keeping humanity alive. But conservation transcends economics—it illuminates the human condition by refusing to put a price tag on the priceless. In my work I have tried to help define the human condition in subjective values essential to personal transformation as the starting point for transformation of global society.

I see wilderness as sanctuary of the spirit, the heart of a moral world governed by peace and love. Nuclear weapons will never force nations to join in recognizing the limitations of a fragile Earth. Stealth bombers and Trident submarines cannot bring people together as brothers and sisters caring for each other in our common destiny. We should give up the illusion of military solutions and redirect funding to constructive humanitarian purposes.

To say it another way: The very idea of wilderness enriches my body, mind, and spirit, but it also elevates me to look beyond my own wants and needs. The American tradition has sought the transformation of resources; materialism prevails as the dominant paradigm. But there is more to America and its people than manufacture, merchandise, and marketing. Nature, unspoiled, opens avenues of discovery, exploration, healing, spiritual enrichment, and growth to us all. The Wilderness Act stimulates a fundamental and older tradition of relationship with resources themselves. A river is accorded its right to exist because it is a river, rather than for any utilitarian service. Through appreciation of wilderness, I perceive the true role of the river, as a living symbol of all the life it sustains and nourishes, and my responsibility to it.

Thus, I ask whether each generation must know less of the real thing and accept less, settling for an increasingly degraded and crowded world, and whether it will all be taken for granted, as though nothing serious has been lost, without realizing that as the environment is altered, so too are we.

The challenge is to raise and then sustain the quality of the national parks themselves. Turning over the National Park System in better condition than we found it is

Continued on page 33

Planned Diversity

The Case for a System with Several Types of Wilderness

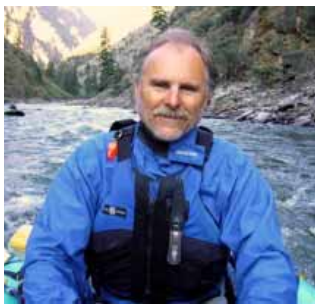
BY DAVID N. COLE

Although the U.S. Wilderness Act of 1964 legally designated only one type of wilderness, the full array of wilderness values might be better protected by setting aside several important and different types of wilderness. Wilderness serves many different needs, having multiple and varied values and purposes (Cordell et al. 2005). Although many assume that these values and purposes are congruent and that all can be provided in optimal measure in one type of wilderness, this is not the case. Wilderness values such as freedom and solitude are often in conflict (Seekamp and Cole 2009), as are values of wildness and naturalness (Cole 2001; Aplet and Cole 2010). Doing the "right" thing for one wilderness value is often the "wrong" thing for another. Therefore, a complex set of wilderness values is better optimized by maximizing different values in different places than by compromising among these values everywhere. Recognizing this, there has been a long history of interest in purposely planning for a diverse system of different types of wilderness areas. Although never successfully translated into legislation or policy, the case for planned diversity in wilderness is growing.

Aldo Leopold, Bob Marshall, and The Wilderness Society

As early as 1925, Aldo Leopold wrote that "wilderness is a relative condition," that we need *"all degrees"* of wilderness, "from the wild, roadless spot of a few acres left in the rougher parts of public forest devoted to timber-growing, to wild, roadless regions, approaching in size a whole national forest or a whole national park" (p. 399). Recognizing the need to purposely plan for a spectrum of wilderness "degrees," he noted that "by skillfully adjusting one use to another, the land planner builds a balanced whole without undue sacrifice of any function, and this attains a maximum net utility of land" (p. 400).

Bob Marshall further developed the concept of varied wilderness types and the need to carefully plan a diverse wilderness system. When asked to write the recreation section for a highly influential Forest Service report to Congress, *A National Plan for American Forestry,* he devoted much of the section to describing seven different types of recreation areas, four of which preserve values important in wilderness (Marshall 1933). "Superlative areas" would be localities (with no minimum or maximum size) of unique scenic, natural, or scientific value. Many of these areas are iconic, such as the Grand Canyon or the mountains of Glacier National Park. "Primeval areas," sometimes called natural areas, would be virgin tracts unmodified by human activities, representative of all major vegetation types. Devoted both to scientific study and contemplative recreation, these areas need not be large; neither should they be small (ideally at least 5,000 acres/2,023 ha). "Wilderness areas" would be large (at least 200,000 acres/80,937 ha), places where "it is possible to retire completely from the modes of transportation and the living conditions of the twentieth century" (p. 474). They would have no permanent inhabitants, no roads, settlements, or power transportation, and visitors would have to be self-sufficient for survival. The environment was to be primitive but not necessarily primeval. Finally, "outing areas" would be places, often close to population concentrations, where people could pursue nonmotorized outdoor activities in a natural environment, escaping for short periods from the demands of everyday life. Marshall (p. 479) used what is now Desolation Wilderness, near Lake Tahoe in California, as an example, noting that the place "has neither remarkable beauty nor remarkable timber" (so is not superlative or primeval) and "is much too small for any real wilderness journey, but is



David Cole rowing a raft through the Frank Church-River of No Return Wilderness in Idaho. Photo by Wendell Beardsley.

Figure 1—The type of wilderness most consistent with the language of the Wilderness Act emphasizes wildness over naturalness and biodiversity conservation, as well as low-density recreation use, even if limits are required; John Muir Wilderness. Photo by Garry Oye.

splendidly adapted for a day's walk or an overnight trip."

Marshall (1933, p. 471) argued that "due to the varied purposes of those who seek recreation…and the different forms that the realization of these purposes assumes…each of these types has its own standards of size, beauty, and administration and…a separate recreational program must be developed for each." That is, these areas need to be designated and managed separately, for different purposes, rather than managed for divergent purposes and protect divergent values in a single land classification called "wilderness."

In 1935, this need for multiple types of wilderness was reiterated in the four-page platform of the newly formed Wilderness Society (Sutter 2002), of which Aldo Leopold and Bob Marshall were founding members. The platform advocated for five types of wilderness, four of which are conceptually analogous to Marshall's types of recreation area: superlatively scenic areas, primeval areas, extensive wilderness areas, and restricted wild areas (areas free from the sights and sounds of mechanization and nearby population concentrations). The fifth conceptual type, "wilderness zones," would occur in corridors along mountains or rivers.

The Wilderness Act

As he developed the language that ultimately became the Wilderness Act of 1964, Howard Zahniser, executive director of The Wilderness Society, did not push for designation of the multiple types of wilderness that are needed. Rather, the Wilderness Act mandates only one of these types of wilderness, using language most similar to the description of "extensive wilderness areas"—the type most reflective of the values of The Wilderness Society. The act designated tracts of land characterized less by their preservation of primeval environments than by the extensive recreational opportunities they provide on lands that appear undisturbed and free from the sights and sounds of mechanization. This type of wilderness does less to preserve scientific and biodiversity values than designation of primeval and superlative areas would have and does little to meet the needs of an expanding population for outings in nature, as respite from everyday life, values that would have been provided by designating restricted wild areas.

Wilderness history since passage of the Wilderness Act can be interpreted, to a substantial degree, as an effort to make up for disregarding these other wilderness values. Subsequent acts designating wilderness have added areas that are small, representative of diverse ecosystem types, close to population centers, and that contain highly modified landscapes. Unfortunately, these lands are designated as if they were extensive wilderness areas, using the language of the Wilderness Act of 1964. Marshall's (1933) admonishment that given the unique and often conflicting purposes of these varied lands, separate management programs should be developed for each has largely been ignored. Instead all these lands are called the same thing, with no policy or guidance suggesting that they should be managed in different ways. The result, not surprisingly, is conflict between wilderness values, confusion about appropriate management, and, ultimately, the homogenization and compromising of wilderness values.

Recent Interest in Different Wilderness Types

Although original interest in different wilderness types revolved around questions of recreational values, more recent interest has reflected concern for scientific values and increasingly sophisticated ecological knowledge. In the latter half of the 20th century, ecologists came to realize that nature is characterized more by flux than by balance and to appreciate the ubiquity of human influence. Even the most remote wilderness has not escaped the far-reaching influence of human

activity. In the postscript of a popular accounting of this paradigm shift, Botkin (1990) devoted several pages to wilderness in the 21st century, arguing that we need three different types of natural areas: no-action wilderness, preagricultural wilderness, and conservation areas. No-action wilderness areas are to be "untouched by direct human actions, no matter what happens" (p. 194). The other two types are to be actively managed. For preagricultural wilderness, the idea is to maintain areas so they give the "feeling of being untouched by people," and "appear as they did when first viewed by the European explorers" (p. 195). Conservation areas are to be actively managed to conserve biological diversity, either particular species or ecological communities. Echoing Marshall, Botkin (1990) points out the inconvenient truth that "it is not going to be possible to manage the same area to be all three at once."

In an article on the dilemma posed by intentional manipulative intervention in wilderness, Cole (1996) elaborated further on the notion of having both wilderness where "no action" is taken, where wildness is maximized, and places where actions are taken to protect biological diversity and naturalness. Managing different wilderness areas or different places within wilderness for divergent purposes is also a way to deal with the dilemma of restricting access to insure low-density wilderness experiences (Cole 2001). Some wilderness lands in high demand from urban populations could be managed to support heavy recreation use, despite adverse effects on opportunities for outstanding solitude. Use could be restricted on other lands to ensure a wilderness experience closer to the ideal.

Most recently, recognition of the severity and implications of climate change has further spurred writers to advocate having multiple types of wilderness. Cole and colleagues (Cole et al., 2008; Cole and Yung 2010) argued that climate change, among other things, has made the concept of naturalness, central to the language of the Wilderness Act, an inadequate foundation for making wilderness stewardship decisions. Put simply, climate change has increased the lack of congruence among the multiple meanings of naturalness and the diverse values of wilderness. Conserving biological diversity will require more heroic efforts than imagined, more intrusive and widespread manipulation in wilderness. Alternatively, taking no action, protecting the autonomy of nature (Ridder 2007), will lead to conditions that are unprecedented, perhaps undesirable, and far from "natural." For example, some have suggested that, given climate change, biodiversity conservation—an important wilderness value—may require assisted migration, actively moving propagules or individuals to new habitats where they are better adapted (Hoegh-Guldberg et al. 2008). Which is a greater degradation of wilderness character, intentional manipulation of species distributions or loss of biodiversity? Given uncertainty about the future and the likely effectiveness of climate change adaptation strategies, future risk is reduced by doing different things in different places, not putting all one's eggs in the same basket.

In the context of wilderness stewardship, this means having different types of wilderness, managing for different purposes and values in different places. Cole and Yung (2010) suggest a number of different wilderness purposes that might be used as management objectives in different wilderness situations, including protecting nature's autonomy, preserving historical fidelity, building ecosystem resilience, and maintaining ecological integrity. In a popular book on global warming, Barnosky (2009) arrives at similar conclusions, arguing that we need two different kinds of wilderness—one to protect biological diversity and ecosystem services, another to protect the feeling of wilderness.

Figure 2—Where biodiversity conservation is an overriding goal, manipulation of wilderness ecosystems may be necessary, as in this landscape adapted to frequent fire; Sequoia-Kings Canyon Wilderness. Photo by Dave Parsons.

Figure 3—Where the goal is to provide the benefits of wilderness recreation to millions of people living in metropolitan areas, heavy use may have to be tolerated, as at this lake located within a one-hour drive and one-hour hike from downtown Seattle; Alpine Lakes Wilderness. Photo by Troy Hall.

The Case for Planned Diversity

Wilderness is not a singular concept. Rather it has multiple meanings, values, and purposes. Wilderness should protect biological diversity and ecosystem services and provide a scientific baseline. But it should be a place that is managed with restraint, symbolizing the fact that humans do not always know the right thing to do. It should provide opportunities for unique and increasingly rare human experiences, from solitude to connections to the past. But it should also be accessible, so wilderness benefits are available to the population. All of these meanings, values, and purposes cannot be protected in one place. Consequently, as the founders of the modern wilderness movement first articulated 80 years ago, several different types of wilderness, managed in different ways, are needed.

Only by designating different types of wilderness is it possible to meet the needs of diverse recreational tastes and situations. The original wilderness recreation ideal was a long trip in a remote area, where few other visitors are encountered. This reflects Marshall's (1933) definition of wilderness as a place "sufficiently spacious that a person may spend at least a week or two of travel in them without crossing his own tracks" (p. 473), and the Wilderness Act's definition of wilderness as a place that provides "outstanding opportunities for solitude." However, Congress has designated wilderness areas with boundaries that border suburban backyards. Today, most wilderness visits are day visits to areas close to the major metropolitan areas where most people live (Cole and Hall 2008). Although most visitors value solitude, most do not expect to find it everywhere in wilderness, nor do most consider it critical to having a high quality wilderness experience (Cole and Hall 2008). Clearly, there is value in having wildernesses close to and far from population centers, some that are large and others that need not be, some where it is easy to get away from people and others where this is less critical.

Diverse wilderness is also needed to protect the full range of values wilderness provides. Wilderness stewards increasingly will have to decide between protecting nature's autonomy, conserving biodiversity, or preserving primeval historical conditions. Since each has value and is central to what wilderness is and why it should be protected, different values will have to be given highest priority in different places. Moreover, in an age characterized by rapid change and an unpredictable future, diversification is a means of hedging bets and reducing risk. Society needs the different types of baseline that can only be provided by leaving some wilderness alone and managing others to mitigate human influence (Cole 1996). The uncertainty of climate change makes it critically important to thoughtfully plan diversity and redundancy into any management response (White et al. 2010).

Finally, it is important that diversity be planned and not occur by happenstance. It is common to hear that stewardship decisions need to be made on a case-by-case basis, based on ethical considerations, using a structured decision-making process to work through to decisions. Although structured decision making is better than being haphazard, this approach will not result in planned diversity. It is virtually impossible for hundreds of wilderness stewards to individually make local decisions that collectively complement each other such that the diverse values of wilderness are optimized. The small scale at which decision-making authority is distributed does not match the large scale at which the situation needs to be assessed and solutions need to be crafted. Optimal diversity will require either

top-down planning or some mechanism for individual stewards to come together to develop large-scale plans that will form the basis for individual decisions. Whether from the top down or the bottom up, individual decision makers must have their management discretion constrained by the needs of the larger wilderness system.

Conclusion

The need for multiple types of wilderness areas, managed in different ways and for different purposes, was advanced by the founders of the wilderness movement. The importance of a diverse wilderness system, established through careful planning at large spatial scales, has only increased with time. Following from the discussion above about different recreation situations and divergent wilderness values, the most important elements of diversity to build into the wilderness system appear to be size of area, accessibility to large populations, and the degree and type of ecological manipulation. The three primary wilderness types needed are:

1. Large wildernesses that are off-limits to ecological manipulation and managed to ensure low-density recreation use, even if this means limiting use.
2. Wilderness of varied size (or portions of larger wildernesses), where ecosystem manipulation to achieve ecological values is appropriate, where needed, and recreation use is not allowed to impair ecological values.
3. Wilderness of varied size (or portions of larger wildernesses), where ecosystems are managed to appear natural and recreation is managed to be as accessible as possible to recreationists.

Within these three primary types there is likely to be further variation, among ecological values (e.g., biodiversity conservation, ecosystem services, and historical fidelity) and recreational tastes (e.g., large groups and educational groups). It is also important to make clear that all wilderness types need to be consistent with the fundamental concept of wilderness, which excludes commercial enterprise, commodity extraction, mechanized transport, and permanent structures.

With the benefit of hindsight we can lament the fact that only one type of wilderness was legislatively codified or that Congress has aggravated this problem by designating lands with diverse purposes and values without apparent concern for lack of congruence between these values and purposes and those codified in the Wilderness Act. But it is more useful to focus on what we can do going forward to optimize wilderness values, given this situation. Although a thorough discussion of possible paths forward is beyond the scope of this article, several options are obvious.

The need for multiple types of wilderness areas, managed in different ways and for different purposes, was advanced by the founders of the wilderness movement.

The first choice is between providing these varied types of wilderness within the currently designated National Wilderness Preservation System (NWPS), or designating additional lands outside that system for purposes not entirely consistent with the language of the Wilderness Act. The International Union for Conservation of Nature (IUCN) protected areas management classification provides an example of managing the larger landscape for multiple protected area values, beyond those of strict wilderness. One problem with this approach is that many areas currently within the NWPS are better examples of other wilderness types than of extensive wilderness. Perhaps the ideal choice would be to both designate new lands and reorganize the existing NWPS to better match existing wilderness with the purposes and values they best serve.

There are also several approaches to working with the existing NWPS. One option is legislative change, a legislated system of different wilderness types, as Marshall envisioned. This might involve revising the Wilderness Act, undesignating some wilderness and/or reclassifying areas into different wilderness types. In theory, legislative change might seem the optimal approach in that it would extend the protection of congressional designation to all wilderness types, ensuring a high degree of permanency to lands designated for each wilderness purpose. It could include language that would codify the objectives and appropriate management regime of each wilderness type in law. Practically, however, there is likely to be little enthusiasm for revising the Wilderness Act; the potential for all sorts of harmful amendments is too great.

The remaining, perhaps most practical, option is to build diversity though administrative action, allocating different wildernesses or portions thereof to different wilderness types. This would require developing a typology of wilderness types, each with different objectives and appropriate management guidelines. To be successful, it would be necessary to establish procedures that make it very difficult to reassign lands

to a different wilderness type and to hold managers accountable for meeting appropriate objectives and following requisite guidelines. Two arguments against this approach have surfaced. Many argue that allowing substantial ecological manipulation and heavy recreation use are inconsistent with a strict interpretation of the Wilderness Act. Others simply do not trust the land management agencies and note that the intent of the Wilderness Act was to ensure that wilderness decisions were made by Congress rather than the land management agencies.

Each option has its pros and cons and will have its supporters and detractors. No option is obviously the correct course to take and none of the options will be easy. The least attractive option, however, is to continue on our current path, pretending that these multiple purposes and values do not exist or that they do not conflict, making decisions on a case-by-case basis. This is a recipe for a homogenized wilderness system in which all values are compromised and none are optimized. It is time to develop the institutional capacity to plan for and implement a diverse system of wilderness types, founded on an articulation and celebration of the diverse purposes and values of wilderness. This will require recognizing that these purposes and values often conflict, that trade-offs must be made, and that the right thing to do for wilderness can only be identified by situating stewardship decisions in the context of a large-scale wilderness strategy.

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Challenges and Applications of Managing Cave Wilderness

BY CAMI PULHAM McKINNEY

The concept of cave wilderness is not a new one, but it is also not entirely familiar to many people, even to those knowledgeable of the Wilderness Act. Caves remain one of the world's most remote and fragile wildernesses. They provide irreplaceable habitat for rare species. Visitors to a cave wilderness can find solitude that cannot even be found in a forest wilderness. Cave wilderness can enable visitors to encounter a naturalness that is unique to the subterranean environment where humans are and can only be visitors (Halliday 1996). Researchers are continually finding new grounds of untouched study areas and humans can still find the last frontier in cave wilderness.

Cave wilderness does more than provide a recreational experience. Cave wilderness can provide a valuable baseline for managers in a natural laboratory. Just as wilderness areas can provide baselines for evaluating the effects of management decisions, research areas that have reduced human influences, and the effects of human development on the natural environment—so can cave wilderness (Halliday 1996). The National Park Service uses cave wilderness in Mammoth Cave to compare the effects of human impacts in visitor areas of the cave. Cave wilderness in the Guadalupe Escarpment provides standards for Carlsbad Caverns National Park. Additionally, cave wilderness allows land managers to evaluate pollutants that may enter the watershed and subsurface (Weisbrod 1974).

Although most caves provide solitude and a unique experience, just like many forests, not all caves qualify for cave wilderness. The United States has hundreds of tour caves that allow visitors to enter caves that are equipped with electric lights, trails, and stairs. Hundreds of thousands of "wild" caves are visited across the country and show impacts of human influence resulting from heavy-use impacted floors, enlarged passages, leaching surface pollutants, vandalism, and/or broken formations. There are fewer caves that are visited by individuals with specialized training, using ropes and bolting kits, ladders, and artificially enlarged passages from digging and even blasting. However, even fewer still are caves throughout the country that are an underground wilderness "area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain" (U.S Public Law 88-577).

Cami Pulham McKinney

Cave Legislation and Policy

Although lengthy discussion of including caves in the Wilderness Act occurred prior to its passing, ultimately caves were not included in the act. Struggles to protect caves and cave wilderness continued until the passage of the Federal Cave Resource Protection Act of 1988 (FCRPA). This law stated that caves were an "invaluable and irreplaceable part of the Nation's heritage." Through the enactment of FCRPA, agencies created lists of "significant" caves located on federal lands for protection and management by the respective agency.

The Federal Cave Resource Protection Act did much to protect cave resources, and required federal agencies to make efforts to protect caves; it did not establish or require agencies to protect cave wilderness qualities. Many of the listed significant caves contain rare speleothems (mineral formations such as stalactites), biological life, or unusual speleogenesis (geological features resulting from the development of the cave system, such as scallops and passages). Many of these, however, also show impacts from human use; therefore, not all significant caves qualify as cave wilderness.

Regardless of the lack of cave wilderness legislation, caves are currently managed by many agencies to preserve cave wilderness qualities. Caves currently located within wilderness area boundaries are generally managed in accordance with the Wilderness Act. The National Park Service

Figure 1—Delicate speleothem formations and cave floor in Lechuguilla Cave. Photo by Andy Armstrong.

has taken this a step further to state that a cave with an entrance located in wilderness but with passages that extend beyond wilderness boundaries, should manage the entire cave as wilderness. For caves with multiple entrances, both within and outside wilderness boundaries, surface boundaries will dictate the subsurface wilderness delineation (Kerbo 2002).

Federal land and wilderness managers can utilize wilderness goals and principles to manage caves. Several examples of this throughout the United States are Mammoth Cave National Park, Jewel Cave National Monument, Lechuguilla Cave at Carlsbad Caverns National Park, and many caves at Sequoia National Park. These caves have managers that have defined and managed national park caves for the wilderness values contained within.

Mammoth Cave National Park and Jewel Cave National Monument manage as wilderness the extents of the caves beyond the tour routes. Additionally, the Jewel Cave Management Plan states that any new caves found on the Monument will be managed as ad hoc wilderness (National Park Service 2007). Carlsbad Caverns began by managing Lechuguilla Cave as wilderness. In 1993, the Lechuguilla Protection Act was signed to protect the extent of the cave that passed outside National Park Service boundaries (Lechuguilla Cave Protection Act of 1993, H.R.698.ENR). Although the law increased protection to the cave, it did not designate Lechuguilla as wilderness. The park therefore continues to manage the cave as wilderness requiring "traditional tool" caving equipment and minimal impacts. Sequoia National Park manages Hurricane Crawl, Soldiers Cave, and Lilburn Cave as cave wilderness, but has allowed some impacts utilizing the Minimum Tool Analysis in permitting the placement of cave gates on some, and bolting practices in others (National Park Service 1998). Managers can elect to manage wilderness values to protect subterranean wilderness using these areas as templates in their own respective management areas.

Cave Wilderness Challenges

Federal land managers have the responsibility to manage and protect caves under the FCRPA. Managers can take this responsibility a step further to protect subterranean wilderness to preserve wilderness qualities until cave wilderness can be recognized through congressional acts. All components of a cave, including biological life, geologic features, hydrological processes, and even loose materials are significant—both to the cave processes and for visitor enjoyment and interpretation (National Speleological Society 1990). Although some may parallel surface wilderness issues, managing cave wilderness includes many challenges that are unique to the cave environment, and the need is great for managerial consideration. These challenges can include protecting an ultrasensitive ecosystem, managing human impacts and public access, managing subsurface wilderness that may extend beyond wilderness boundaries, and/or monitoring where known boundaries change with continued survey.

Sensitive Ecosystem. The biological life that exists deep in a cave environment is adapted to living in an unchanging habitat. Most cave environments do not experience changes in temperature, air pressure, or humidity. The biological life in a cave learns to live its lifespan in total darkness (known as troglobytes), and as opportunistic consumers that take meals when they come. These lifeforms are extremely sensitive to changes to the stable environmental factors. Digging or excavating in a cave can result in alterations in airflow, careless cavers may leave debris that disrupts food sources, and surface pollutants can wash into the cave where troglobytes cannot escape.

Human Impacts. Human impacts to a cave can be challenging as they are often very long lasting. The loss of a tree can be repaired in a few decades with new growth, whereas the loss of a stalagmite may take centuries to millennia, if it happens at all, to repair. A

few disregarded crumbs from a snack can grow into mold that kills or disrupts a cave ecosystem. A misplaced footprint in a forest wilderness could be washed away in the next storm; however, Salt's Cave in Kentucky contains footprints that are dated more than 3,000 years old. Therefore, a misplaced footprint in cave wilderness may potentially last forever (Weisbrod 1974).

Managing human impacts in cave wilderness may require managers to designate travel paths in caves. Lechuguilla Cave at Carlsbad Caverns National Park is managed as cave wilderness. To reduce human impacts, managers have elected to mark subsurface trails with temporary flagging tape. This visual impact can detract from the wilderness experience but supports the integrity of the delicate speleothems found in that cave.

Mitigating human impacts to cave wilderness may extend to permitting, limiting access, or establishing a carrying capacity that will reduce the potential unnatural changes. A carrying capacity can set limits to the amount of use a cave may receive before the impacts reach unacceptable levels. Due to the delicate nature of cave speleothems and ecosystems, the appropriate carrying capacity for a surface lake or campsite will not be the same for similar square footage in cave wilderness. To minimize human impacts to Hurricane Crawl Cave at Sequoia National Park, managers have placed a strict limitation of four people to visit the cave per year (National Park Service 1998).

Another serious human impact to cave wilderness ecosystems is the damage resulting from human waste. Cave ethics call for "pack it in, pack it out" to include human waste, thus cavers should carry an appropriate container for removing this damaging impact to cave ecosystems. Although this is extremely rare in cave wilderness management, the Lechuguilla Cave Management Plan does designate four urine dump locations for individuals to use once on a five-day or longer trip to the 130-plus mile (210 km) cave (NPS 2006).

Regardless of the challenges, it is possible to incorporate wilderness philosophies and practices that protect cave wilderness qualities.

Public Access. Managing cave wilderness and maintaining the primitive environment may exclude many members of the public from enjoying and experiencing some cave wilderness areas. The Wilderness Act states that wilderness areas are to be "administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness." This mandate is already challenging for forest wilderness managers, but it is increasingly so for cave wilderness managers. Some cave wilderness areas may exclude visitors simply by the nature and complexity of the cave and its passages (Miller 1990). Vertical, exposed, or tight passages can exclude many members of the American public, including individuals with disabilities, children—even those that are simply not physically fit or adequately trained for the terrain. Entry to Lechuguilla Cave wilderness requires descending a 90-foot (27 m) pit using ropes, harnesses, and other equipment. The passage continues to drop another 150 vertical feet (45.7 m) down an area known as Boulder Falls and many vertical drops beyond. Similarly, access to Jewel Cave wilderness requires traveling 1,500-plus feet (457 m) through an 8-inch (20 cm) high passage known as "The Miseries." Once past this location, explorers can experience another 100 miles (160 km) of known cave and continued exploration.

Many cave wilderness areas contain similar challenges and hazards. To alter these to enable access would remove the wilderness qualities that the caves hold. Managers must determine the appropriate action to protect cave wilderness and possibly limit access to those persons who have the necessary skills to navigate these hazards.

Wilderness Subsurface, Not Surface. Ideally, the best method for protecting cave wilderness is to designate surface wilderness that encompasses the underlying cave passages; however, managers are not always so fortunate. Although solitude can be found in almost any cave, other cave wilderness qualities can be greatly affected by actions occurring on the surface.

Mammoth Cave has 360 known miles (580 km) and many passages extending beyond national park boundaries. Managers must work with

Figure 2—Hershey's Kiss that developed E. coli in Timpanogos Cave. Photo by Jon Jasper.

Figure 3—Crawling through The Miseries of Jewel Cave. Photo by Andy Armstrong.

other agencies and private individuals to protect the subsurface wilderness. Cave wilderness managers must consider surface actions—especially in cave areas—that may result in impacts to the subsurface wilderness. Without appropriate consideration, a manager could allow surface activities that would compromise the integrity of subsurface wilderness.

Defining Wilderness Boundaries. Managing wilderness is challenging enough when the boundaries are known, but many areas of cave wilderness that are still yet to be defined as cave passages continue to be explored and mapped. Surveying and mapping allow managers to understand the cave and determine where the cave passages extend beneath the surface. This can be challenging when a cave is not fully explored. Due to the challenges of mapping and exploring caves, it can take decades to completely map a cave (Miller 1990).

The challenges of managing and defining cave wilderness boundaries of an extensive cave are represented in the Lechuguilla Cave Protection Act of 1993. The law designated the National Park Service and adjacent land agencies to limit surface activities that would protect Lechuguilla Cave. The law also resulted in the withdrawal of mineral development in the area, and designated federal lands overlying the cave as a cave protection zone consisting of approximately 6,200 acres (2,510 ha). At the time of this act, there were approximately 80 miles (129 km) of known cave passage. In 2010, there were approximately 128 miles (206 km) of known passage, with several miles to be added each year as survey continues. As the known cave length continues to grow, managing surface lands in a manner that is compatible with the unknown extent of the passages will challenge land managers, cave specialists, and lawmakers.

Conclusion

Regardless of the challenges, it is possible to incorporate wilderness philosophies and practices that protect cave wilderness qualities. Managers can utilize the minimum tool requirement for determining the use of cave management actions, including gating, bolting, excavating, or other. Careful management and regulation of cave resources can allow for a natural environment that retains its primeval character and dominates the subterranean landscape, where visitors can find solitude and a unique experience traveling through an environment that is free from "human controls and manipulations."

Federal land managers have the responsibility to protect cave resources through federal legislation. Many land managers are adept at managing surface wilderness. These skills and responsibilities can extend to protecting and preserving cave wilderness environments. Managers can become better at managing cave wilderness through understanding cave environments and ecosystems, recognizing challenges unique to caves, and utilizing minimum tool applications to establish a more primitive subsurface environment.

Managing cave wilderness can help protect those caves that are exemplary for their pristine state, unique resources, and unusual ecosystem components. Careful management of cave wilderness can allow for a natural environment that retains its primeval character within a subterranean landscape, a place where visitors can find solitude and the experience of traveling in a unique "area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain," until caves can be officially designated as wilderness.

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Visitor Perceptions of Technology, Risk, and Rescue in Wilderness

BY KRISTEN POPE and STEVEN R. MARTIN

Abstract: As devices like personal locator beacons become readily available, more visitors may bring them into wilderness and use them to request rescues, and may develop unrealistic expectations of rescue. In 2009, 235 overnight visitors to the King Range Wilderness in California completed a written survey. "Pro-technology" respondents (55% of the sample) felt that technology increased one's safety in wilderness, and would be more likely to use technology to request a wilderness rescue. "Anti-technology" respondents (45%) felt very strongly that technology cannot substitute for skill, experience, and knowledge; were very unlikely to take chances that could increase risk just because they had technology with them; and did not agree that technology reduced dangers and made them feel safer in the wilderness. Those with personal experience of a serious wilderness accident were more likely to believe that technology creates a false sense of safety for wilderness users than were people who have not been involved in a serious wilderness accident.

Introduction

The National Park Service (2008) described the Grand Canyon's Royal Arch Loop as a route "for canyon experts only" that offers "a million ways to get into serious trouble." In September 2009, two men and their teenage sons ventured out on this 35-mile (56 km) loop with, among other items, a personal locator beacon (PLB). During their brief trip, they activated this beacon three separate times. PLBs are equipped to send rescuers only the location of the party requiring rescue. The group activated their beacon for the first time at night when they ran out of water; by the time rescuers arrived in the morning (via a dangerous canyon helicopter ride) the group had already found water and refused help. The same evening, the group signaled another emergency. Rescuers used a night-vision enabled helicopter to make a risky night journey into the canyon arriving to find the same group telling them that the water they found tasted salty. Again, the group refused evacuation, but they accepted water from the rescuers. In the morning, the group activated the beacon for a third time; rescuers required the group to leave with them and cited one man for "creating a hazardous condition" (Cone 2009).

Kristen Pope. Photo by Emily Scholler.

Steven R. Martin. Photo by Peter Keller.

As technological devices such as cellular phones, satellite phones, and personal locator beacons become more readily available, greater numbers of recreation visitors may bring these devices into the wilderness and use them to request res-

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Figure 1—The tranquil scenery of the King Range Wilderness masks many dangers. Photo by Bob Wick.

cues. Although these devices have sometimes alerted rescuers to emergencies early enough to save lives, it remains to be seen whether visitors, particularly those with limited wilderness experience and skills, may develop unrealistic expectations of rescue based on their possession of and reliance on these devices. Visitors may come to rely on these devices in the wilderness instead of developing appropriate knowledge, abilities, experience, and skills. The Royal Arches foursome is an example of an inexperienced group that used their beacon in place of appropriate knowledge, abilities, experience, and skills. When rescuers asked the men what they would have done had they not possessed the device, they said: "We would have never attempted this hike." As a result of this type of incident, some rescuers refer to personal locator beacons as "Yuppie 911" (Cone 2009).

Personal locator beacons were legalized for public use in 2003, and by February 2010, the SPOT brand of personal locator beacon sold for $99.95 plus a $99.99 annual service fee (SPOT 2010). The basic SPOT model offers three signaling options: "OK," which provides preselected friends or family members with the device's location and notifies them everything is "OK"; "help," which notifies friends or family of the device's location and the user's request for assistance (but no other details); and "911," which alerts emergency responders of the user's location and request for assistance. Though people may rely on them, personal locator beacons are by no means foolproof.

The two federal agencies primarily responsible for conducting search and rescue missions in the United States are the National Park Service (NPS) and U.S. Coast Guard (USCG). Counties are typically responsible for search and rescue missions on other public land, including Bureau of Land Management (BLM) and U.S. Forest Service land; interagency efforts are very common. Between 1992 and 2007, the NPS responded to 65,439 search and rescue incidents that involved a total of 78,488 individuals in the NPS system (Heggie and Heggie 2009). During the same period, there were a total of 4.4 million recreational visits to the national parks and a total of 2.2 million nonrecreational visits (National Park Service Public Use Statistics Office 1992–2007). The most common causes for these search and rescue incidents were judgment errors (22.3%); lack of physical preparation/fatigue (16.8%); insufficient equipment, clothing, or experience (15.6%); falls (8.9%); and weather (7.4%). One out of five people rescued (20%) would have died without search and rescue intervention. However, 65.7% of those rescued were not ill or injured (Heggie and Amundson 2009; Heggie and Heggie 2009).

From 2003 to 2006, people used cellular and satellite phones to report 18% of the 12,337 search and rescue incidents in the U.S. national parks. More recent figures are not yet available, but it is likely the percentage has climbed considerably with the proliferation of new technology in recent years. During the same years, 1% of incidents were reported via personal locator beacon devices. However SPOT, the first widely available and reasonably affordable personal locator beacon, was not released until 2007 and is not included in those figures (Heggie and Heggie 2009). It is likely that this number has increased substantially.

One of the major differences between devices (such as SPOT) and equipment (such as a topographical map and compass) is that equipment requires skill and practice as well as incorporating environmental knowledge. Devices may provide instantaneous results, but they fail to involve or engage us with the surrounding environment (Pohl 2006). This lack of engagement with one's environment can contribute to a lack of visitor autonomy, self-sufficiency, and sense of self-responsibility. In turn, these factors may contribute to changes in visitor behavior and use patterns, including increased risk-taking behavior, not understanding the dangers involved

with particular behaviors, and overestimating the availability of rescue assistance. Technology may serve to insulate visitors from the consequences of their actions to the point where they fail to recognize the severity of a situation (Borrie 2000).

Many land managers feel that the average level of experience and skill among users is decreasing as more people venture into the wilderness with technology. This technology allows people with less skill to access areas that were once available only to the highly skilled (Hollenhorst 1995). The subsequent diminishing capacity for self-rescue can lead to a "society of rescuers and rescuees" where rescue (including self-rescue) is a specialized niche instead of an essential skill. Lack of visitor self-reliance has distressed wilderness proponents for decades. This is especially problematic when individuals are "no longer willing to extricate themselves" from trouble (Setnicka 1980). Robert Marshall once wrote, "In a true wilderness if a person is not qualified to satisfy all requirements of existence, then he is bound to perish" (Marshall 1930). Now that many wilderness visitors bring technology on trips and rely on this technology in the event of an emergency situation, they are no longer prepared to "satisfy all requirements of existence" and may rely on professional rescuers to fill in the gaps. San Bernardino County Emergency Coordinator John Amrhein deals with the repercussions of this on a daily basis. "In the past, people who got in trouble self-rescued; they got on their hands and knees and crawled out," Amrhein said. "We saw the increase in non-emergencies with cell phones: people called saying 'I'm cold and damp. Come get me out.' These [devices] take it to another level" (Cone 2009).

This increasing reliance on others also includes reliance on the financial resources of others (particularly public agencies) in order to fund search and rescue missions. From 1992 to 2007, the NPS spent more than $58 million on search and rescue missions, often reallocating resources to fund rescues. Rescues at Alaska's Wrangell-St. Elias and Denali National Parks were the most expensive (averaging $29,310 and $18,345 per search and rescue respectively) due to the need for extensive aerial searches (Heggie and Amundson 2009). Despite the high costs of rescue, the NPS provides search and rescue services "without subsequent cost recovery from the person(s) assisted" as a member of the United States Search and Rescue Plan. There are also concerns that charging for rescue would open the NPS up to legal liability and create a legal mandate for rescue (Heggie and Amundson 2009).

The purpose of this study was to examine wilderness visitors' beliefs and perceptions about safety, risk, and rescue in wilderness, and the extent to which technological devices may influence those beliefs.

Methods

The Lost Coast Trail follows 25 miles (40 km) of remote northern California coastline, nestled between the Pacific Ocean and the mountains of the King Range National Conservation Area. Managed by the BLM, 42,585 out of the 68,000 acres (17,234 out of the 27,519 ha) in the King Range National Conservation Area are designated as wilderness. Visitation is steadily increasing, from 3,302 self-registered visitors in 2007 to 4,646 in 2009, with an estimated registration compliance rate of 80 to 90% (Carr, pers. comm. 2009; Pritchard-Peterson, pers. comm. 2010). The topography is so rugged that engineers had to locate coastal roads farther inland. This rugged isolation makes the area an excellent place to study technology and rescue.

Lost Coast Wilderness dangers include high tides that leave miles of trail underwater, unexpectedly large "sneaker" waves, high winds, precarious cliffs, river crossings, slippery rocks, environmental hazards, and wildlife. Rescues often involve multiple agencies, including the Humboldt County Sheriff's Office, Bureau of Land Management, Cal Fire, U.S. Coast Guard, local volunteer fire

Figure 2—Strong surf is just one on a long list of hazards. Photo by Kristen Pope.

Table 1—Visitor perceptions of factors contributing to the need for rescue in wilderness, King Range Wilderness, California, 2009.

Factor	Visitor perception mean rating[a]
Inexperience	6.0
Poor judgment	5.9
Lack of preparation	5.9
Bad weather	5.0
Equipment failure or wrong equipment	4.0
Bad luck	3.6

[a]Measured on a 7-point scale, where 1 = "not at all" and 7 = "a lot."

Table 2—Self-reported level of experience/training, and perceived importance of same, King Range Wilderness, California, 2009.

Skill	Median self-reported level of experience/ training[a]	Median perceived importance of same[b]	Related samples Wilcoxen Signed Ranks test results
First aid	4	6	$p < .001$
Survival skills	4	6	$p < .001$
Navigation	4	6	$p < .001$
Search and rescue	3	4	$p < .001$
General backcountry skills	6	6	$p < .001$

[a]Measured on a 7-point scale, 1 = no experience/training, 7 = a lot of experience/training.
[b]Measured on a 7-point scale, 1 = not important, 7 = very important.

departments, Southern Humboldt Technical Rescue, and other volunteers. However, no one agency keeps comprehensive records of Lost Coast Trail rescues.

From May through September 2009, 235 overnight visitors to the King Range Wilderness completed a survey along the Lost Coast Trail. Sampling occurred on a stratified sample of weekdays, weekends, and holidays at three points along the trail: the northern trailhead (Mattole Beach), southern trailhead (Black Sands Beach), and a popular resting spot 3 miles (4.8 km) south of the northern trailhead (Punta Gorda Lighthouse). All adult visitors on an overnight backcountry trip were asked to complete the survey.

Respondents answered questions about their wilderness skills, experiences, and beliefs regarding risk, rescue, and technology in the wilderness. Questions consisted of logical items as suggested by the literature and personal experience, and were further refined by way of a focus group of experts. Respondents answered some questions on a 7-point scale (e.g., "not at all" to "a lot" or "not important" to "very important"). Other questions were answered by checking "yes" or "no" or one of several provided responses.

Results

The response rate was 92%. Respondents ranged in age from 18 to 80 (median age was 28). Sixty-five percent of respondents were male. Subjects reported a median of 10 years of experience making overnight wilderness trips, with a median of 2.5 trips (6 nights total) in the previous 12 months. Median group size was 4. Additionally, 32 visitors (13.6%) reported serving in a leadership or guide role on a wilderness trip in the previous 12 months.

King Range Wilderness visitors believed that factors they felt they could personally control (such as inexperience) were greater contributing factors in the need for visitor rescue in the wilderness than factors they could not control (such as "bad luck") (see table 1). Respondents reported that they believed the following factors were responsible for people making unsafe decisions in wilderness (on a 7-point scale where 1 = not at all, 4 = somewhat, and 7 = a lot): overestimating one's abilities (mean=5.3), not realizing the consequences (mean=5.2), proving themselves (mean=4.8), adrenaline or endorphin surge (mean=4.4), fear of looking weak (mean=4.4), and feeling they can call for help (mean=3.8).

Visitors self-reported their own level of experience or training in first aid, navigation, survival skills, general backcountry skills, and search and rescue, then assessed how important they believed it was to possess those same skills. All medians for "perceived importance" were significantly higher than the medians for "self-assessment," indicating that people believe it is important to possess a higher level of wilderness skills than they actually have (see table 2).

Out of 235 respondents, 135 (57.4%) reported having cellular phones with them, six (2.6%) had satellite phones, four (1.7%) had emergency position indicating radio beacons or personal locator beacons, 56 (23.8%) had GPS devices, 62 (26.4%) had no technological devices, and 42 (17.8%) had more than one device. A minority of visitors (17.8%) reported

having previously used a technological device in a self-defined "emergency situation in the wilderness."

Most respondents reported that technology was not a very successful substitute for skills, experience, and knowledge in the wilderness, nor would they be likely to take chances that could increase risks if they had technology with them, nor did they believe that technology reduces many of the dangers people associate with being in the wilderness (see table 3). Respondents were fairly evenly split on whether technology creates a genuine increase in safety or a false sense of safety for wilderness users, whether they would feel safer by having technology with them, and whether or not having technology makes people feel their safety is not their personal responsibility. However, using the scores from the items in table 3, we did a K-means cluster analysis to classify respondents (see table 4). A "pro-technology" group (55% of the sample) felt that technology increased one's safety in wilderness, and were more likely than the "anti-technology" group to use technology to request a rescue, take chances that could increase risk if they had technology with them, and believe that technology can successfully substitute for skill, experience, and knowledge. The "anti-technology" group (45%) felt quite strongly that technology cannot substitute for skill, experience, and knowledge, were very unlikely to take chances that could increase risk just because they had technology with them, and did not agree that technology reduced dangers and made them feel safer in the wilderness. Those respondents in the "pro-technology" cluster also identified themselves (in a different question) as significantly greater risk takers than did the respondents in the "anti-technology" cluster (Mann-Whitney U test, $p < .05$).

An overwhelming majority of King Range Wilderness visitors (80.9%) would choose a traditional map and compass over GPS (14%) if forced to choose only one navigation method. Notably, all 31 respondents (100%) who reported having served in a leadership or guide role in the previous year opted for the map and compass. However, those visitors who would choose technological navigation (GPS) were more likely to say they felt safer by having that technology with them (Mann-Whitney U test, $p < .05$), and would be more likely to take chances that could increase risk if they had that technology with them (Mann-Whitney U test, $p < .01$) than visitors who preferred the traditional map and compass. Not surprisingly, people who actually brought a GPS device to the King Range Wilderness were also more likely to believe that "technology creates a genuine increase in safety for wilderness users" (Mann-Whitney U test, $p < .01$), were more likely to believe that "technology reduces many of the dangers people associate with being in the wilderness" (Mann-Whitney U test, $p < .01$), were more likely to feel safer (Mann-Whitney U test, $p < .01$), and would be more likely to take chances that could increase risk (Mann-Whitney U test, $p < .01$) than those without GPS.

If forced to choose a single method of emergency communication, 61% of respondents preferred technological methods such as a cell/satellite phone or EPIRB device (e.g. SPOT beacon) over

Table 3—Perceptions of technology use in the King Range Wilderness, California, 2009.

To what extent...	Percentage of respondents rating 1–3 on 7-point scale	Percentage of respondents rating 5–7 on 7-point scale
Do you think technology in the wilderness can successfully substitute for skill/experience / knowledge?	82.0	6.8
Would you be more likely to take chances that could increase risk if you had technology with you in the wilderness?	68.9	16.3
Do you feel technology reduces many of the dangers people associate with being in the wilderness?	56.2	17.1
Would you be more likely to use technology to request rescue when you could make it out on your own but the process of self-rescue would be long and uncomfortable?	42.6	37.2
Do you think technology in the wilderness makes people feel that their safety is not their personal responsibility?	39.0	38.6
Do you/would you feel safer by having technology with you on a wilderness trip?	34.3	36.2
Do you think technology creates a genuine increase in safety for wilderness users?	18.7	50.9
Do you think technology creates a false sense of safety for wilderness users?	13.8	56.3

[a]Measured on a 7-point scale, where 1 = "not at all" and 7 = "a lot"; *n* ranges from 218 to 224

a traditional signal mirror and whistle. Visitors who preferred such technological emergency communication were more likely to believe that technology can successfully substitute for skills/experience/knowledge (Mann-Whitney U test, $p < .05$), that technology reduces many of the dangers people associate with being in the wilderness (Mann-Whitney U test, $p < .01$), and reported being more likely to take chances that could increase risk if they had the technology with them (Mann-Whitney U test, $p < .01$) than visitors who preferred traditional methods of emergency communication.

When asked, "Do you see yourself as a risk taker?" the mean response was "somewhat" (mean = 4.1) on a 7-point scale (1 = not at all, 4 = somewhat, 7 = a lot). Not surprisingly, the more likely someone was to self-identify as a risk taker, the more likely they were to report that they would take chances that could increase risk if they had technology with them in the wilderness (Spearman's *rho* = .337, $p < .01$). A majority of visitors (63.1%) reported having done something in the wilderness that they felt at the time was unsafe; 68.2% reported having done something that in retrospect they felt was unsafe. People who have done something in the wilderness that they felt at the time was unsafe were more likely (than those who had not) to believe that technology creates a genuine increase in safety (Mann-Whitney U test, $p < .05$). People who have done something in the wilderness that they felt in retrospect was unsafe were more likely to believe that technology reduces many of the dangers people associate with being in the wilderness (Mann-Whitney U test, $p < .01$), but somewhat paradoxically were also more likely to believe that technology creates a false sense of safety for wilderness users (Mann-Whitney U test, $p < .05$).

Gender was a significant factor in risk taking, with males more likely to see themselves as risk takers (Mann-Whitney U test, $p < .01$). Males were more likely to report having done something in the wilderness that they felt at the time was unsafe (Chi-Square, sig. < .05), and were more likely to report having done something in the wilderness that they felt in retrospect was unsafe (Chi-Square, sig. < .01). This is consistent with Slovic (2000), who reported dozens of studies documenting that men judge risks as smaller than do women. Age is negatively correlated with self-identifying as a risk taker (Spearman's *rho* = -0.186, $p < .01$).

About 11% of King Range Wilderness visitors reported having been personally involved in a serious

Table 4—Contrasting perceptions of technology use in the King Range Wilderness, California, 2009.

To what extent...	Mean score[a] "pro-tech" cluster *N* = 118	Mean score "anti-tech" cluster *N* = 97	Mann-Whitney test results
Do you think technology in the wilderness can successfully substitute for skill/experience / knowledge?	2.8	1.5	*p* < .01
Would you be more likely to take chances that could increase risk if you had technology with you in the wilderness?	3.4	1.9	*p* < .01
Do you feel technology reduces many of the dangers people associate with being in the wilderness?	3.7	2.6	*p* < .01
Would you be more likely to use technology to request rescue when you could make it out on your own but the process of self-rescue would be long and uncomfortable?	4.7	2.6	*p* < .01
Do you think technology in the wilderness makes people feel that their safety is not their personal responsibility?	3.9	3.8	*p* < .05
Do you/would you feel safer by having technology with you on a wilderness trip?	4.9	2.9	*p* < .01
Do you think technology creates a genuine increase in safety for wilderness users?	5.2	3.9	*p* < .01
Do you think technology creates a false sense of safety for wilderness users?	4.8	5.0	*p* < .05

[a]Measured on a 7-point scale, where 1 = "not at all" and 7 = "a lot."

wilderness accident, and 41% knew someone involved in a serious wilderness accident. Half (52%) of the respondents who reported personal involvement in a wilderness accident said they had used a technological device in a wilderness emergency. Tellingly, those with personal experience of a serious wilderness accident are more likely to believe that technology creates a false sense of safety for wilderness users than those who have not been involved in a serious wilderness accident (Mann-Whitney U test, $p < .05$), as do those who know someone who was involved in a serious wilderness accident (Mann-Whitney U test, $p < .05$). This second ("know someone") group is also more likely to believe that technology makes people feel that their safety is not their personal responsibility (Mann-Whitney U test, $p < .05$).

The possible financial repercussions of rescue appear to play a small role in certain types of decisions. Visitors reported that they would be "somewhat likely" (mean=3.2, on a 7-point scale, with 1 = not likely and 7 = very likely) to delay or reconsider requesting a rescue for "yourself or someone in your party" if they thought they would be held financially responsible for the rescue.

Discussion

Visitors who enter the wilderness without adequate knowledge, skill, abilities, and equipment to return from their trip safely endanger themselves and rescuers. Respondents believed they should possess a greater level of wilderness skills and experience than they actually did. Many admitted to venturing into the wilderness with less preparation than they believed was necessary. Professional and volunteer rescuers and others are often left to fill in these gaps in skill and ability. This reliance on technology and rescue may create a false "safety net" when people's expectations of technology and rescue do not correspond with the actual capabilities of technology and rescuers. It may also lead to people taking more risks than they otherwise would take, relying on technology to "take up the slack." Borrie (2000) posits that as reliance on GPS rises, people's confidence in their ability to go anywhere may increase, and their willingness to turn back may decline. Our empirical findings suggest this as well, as our "pro-technology" respondents identified themselves as significantly greater risk takers who would be more likely to take chances that increase risk if they have technology with them, and are more likely to use technology to request a rescue. This represents a combination that many managers have expressed concern over—visitors who believe that their technology makes the wilderness a safer place, who are therefore willing to take more risks and then use the technology to bail themselves out of trouble.

Kruger and Dunning (1999) found that individuals who lacked experience reached inaccurate conclusions, made bad choices, and were unable to realize that their conclusions and choices were poor, falsely believing they were doing everything right. Novices have poorer metacognitive skills than experts, and are less likely to accurately judge the difficulty of the problem at hand (Kruger and Dunning 1999). Media coverage and the recency of an event distort risk perception (Slovic 2000). "Optimism bias" also affects the perception of risk, leading people to believe they are at less risk than others would be in a similar situation. This is particularly prevalent when people believe they can control the risk, that it is unlikely to happen, or if they lack experience with the risk (Powell 2007). Optimism bias can "harness us to a wishful, thereby inaccurate, and therefore dangerous image of the world," with misperceptions leading to accidents (Udall 1987).

Lack of knowledge about device capabilities can create dangerous situations. The Rocky Mountain Rescue Group spent two months searching for the source of a personal locator beacon that was triggered in Colorado nine times between December 2009 and

Figure 3—Ocean rescues are sometimes required along the King Range Wilderness coastline. Photo by Shelter Cove Fire Department, CA.

February 2010. They finally solved the mystery, learning that a backcountry skier thought it was an avalanche beacon, activating it every time he went skiing. He had received it as a gift and never read the instructions (Willoughby 2010).

In recent years, the media has frequently presented stories about people in need of wilderness rescue as well as technology's role in these rescues (from calling on a cellular or satellite phone, activating a personal locator beacon, or even possessing a cell phone on which rescuers could triangulate the approximate location). Although this technology can and does save lives, such media portrayals may lead people to believe that they can expect an easy and technologically aided wilderness rescue should they get into trouble. This can be dangerous and inaccurate. In 2006, three climbers were stranded on Oregon's Mount Hood during a blizzard in 100-mph (161 kmph) winds. They built a snow cave and contacted relatives via cellular phone, but rescuers were unable to locate or reach them. They had enough knowledge to build a snow cave, but their skills, supplies, abilities, and technology were, tragically, not enough to save their lives (Frazier 2006).

As the use of technology expands into wilderness areas, it is important to address people's expectations of technology in a backcountry environment and the dangerous blending of expectations between frontcountry road-accessible areas and backcountry settings (Pohl 2006). Unrealistic expectations can occur when individuals bring technology into the wilderness, falsely believing they can rapidly summon help if needed. Cellular and satellite phone coverage is often unreliable in wilderness areas, and technology is not always reliable and functional in a wilderness environment (Attarian 2002). Bringing technology into the wilderness can create a false sense of security that may compromise a group's self-reliance (Borrie 2000; Holden 2002). Even when used perfectly in ideal conditions, it can still take a considerable amount of time for rescue crews to respond. Without appropriate self-rescue abilities, even the most technologically equipped wilderness visitor can be in considerable danger waiting for help to arrive.

Visitors who enter the wilderness without adequate knowledge, skill, abilities, and equipment to return from their trip safely endanger themselves and rescuers.

Technology will improve with time, but it remains to be seen if these improvements will create even higher expectations of safety and more unrealistic views of rescue. This topic will require further attention as technology advances and becomes more prevalent among wilderness visitors. Heggie and Heggie (2009) noted a "general feeling among many search and rescue unit managers in the United States that cell phones are being used to request search and rescue assistance in what turns out to be minor situations," or as Lomas notes: "We've confused emergency with convenience" (Lomax 2006, p. 21).

This is an especially serious concern as rescuers often place themselves in danger. Although technology has undeniably been used to save lives in wilderness emergencies, nonemergency use can negatively influence the wilderness environment.

The first Leave No Trace (2010) principle is to plan ahead and prepare. We recommend an educational campaign that would include public service announcements promoting responsible use of technology devices in wilderness, including their limitations, as well as encouraging personal locator beacon owners to register their devices with the National Oceanic and Atmospheric Administration to provide rescuers with information to help facilitate rescue (www.beaconregistration.noaa.gov).

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Continued on page 48

Visitor Attitudes Toward Fire and Wind Disturbances in Wilderness

BY ROBERT G. DVORAK and ERIN D. SMALL

Abstract: This study examines visitor attitudes across the Boundary Waters Canoe Area Wilderness regarding the effects of natural disturbances on visitor planning and wilderness conditions. Visitors were intercepted at entry points and permit distribution locations during 2007. Results suggest that respondents were aware of recent wind and fire disturbances. Few respondents reported that these events had affected trip plans. Evidence of natural disturbances was evaluated as desirable or indifferent conditions in wilderness. Further investigation of these events related to travel patterns and perceptions may help understand their impacts on visitor use and behavior.

Introduction

The Wilderness Act of 1964 (P.L. 88-577) directs that wilderness be managed to preserve natural conditions and processes while providing outstanding opportunities for solitude or primitive and unconfined types of recreation. The act also indicates that wilderness be administered in a manner that will leave areas unimpaired for future use and enjoyment as wilderness. However, a potential conflict of these goals exists with the management or nonmanagement of natural disturbances in wilderness. Although fire and windstorms are natural processes, suppression of naturally ignited fires, the existence of human-caused fires, and windfall management practices have changed the forests and the role of disturbance on the landscape. These practices further complicate wilderness management with potential impacts on visitor use, enjoyment, and the relationships individuals have with a wilderness area. Several visitor studies have examined these impacts, such as fire effects on visitation and visitor attitudes (Borrie, McCool, and Whitmore 2006; Knotek et al. 2008), decreased visitor expenditures during and following wildfires (Butry et al. 2001), impacts to recreational demand (Loomis et al. 2001), and changes in how visitors value land once it has burned (Hesseln et al. 2004).

Robert G. Dvorak. Photo by Rob Truax.

Erin D. Small. Photo by Mandy Farrar.

Thus, to meet wilderness mandates, managers must understand their natural disturbance policies and management relative to the potential impacts on visitors. This article examines visitor attitudes toward recent wildfires, fire suppression activities, and the 1999 blowdown windstorm at the Boundary Waters Canoe Area Wilderness (BWCAW) in Minnesota. It addresses how these natural disturbances and events may have influenced visitor perceptions of wilderness character and if trip planning and visitation were affected.

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Figure 1—BWCAW area visited shortly after 2007 Ham Lake Fire. Photo by Erin Small.

Context

The Boundary Waters Canoe Area Wilderness is a 1,098,057-acre (444,557 ha) wilderness located in the Superior National Forest of northern Minnesota. With the passage of the Wilderness Act in 1964, the BWCAW was officially designated as part of the National Wilderness Preservation System and is the largest designated wilderness area east of the Mississippi River. On July 4, 1999, a massive storm hit northern Minnesota. Winds in excess of 90 mph (144 kmph) caused extensive blowdown on nearly a half million acres of the BWCAW, downing an estimated 25 million trees (Lime 2000). Portages were blocked by downed trees, campsites were destroyed, and access became limited. Forest conditions also changed to create a challenging situation where previously used minimal management intervention tactics and tools could no longer adequately deal with potential fire risk. Therefore, management priorities shifted to downed fuel wood reduction, fire prevention education, and staff preparation for wildfire suppression and emergency response.

Because wilderness policy dictates that natural processes rule in these areas, managers of the Superior National Forest have implemented a wildland fire use policy to allow lightning-ignited fires to burn in a manner that duplicates natural conditions as much as possible (U.S. Forest Service 2006). Managers have also prescribed management-ignited fires in certain areas to restore natural conditions and reduce hazardous fuel wood situations. Within the blowdown area, active suppression and prescribed fire have been used as tools. In 2006, the lightning-ignited Cavity Lake Fire affected more than 32,000 acres (12,955 ha) in the blowdown area and was actively suppressed. In 2007, at the beginning of the data collection of this study, the visitor-ignited 75,000 acre (30,364 ha) Ham Lake Fire burned 20,000 acres (8,097 ha) within the BWCAW despite suppression activities (see figure 1). The fire burned across the Gunflint Trail, a major wilderness access point, and included areas with private homes and outfitters' structures (see figure 2). Closures of roadways, campsites, and entry points were necessary for public safety. Although public safety remains the highest priority in any disturbance, it is important to understand that disturbance management policies affect the landscape and may alter visitor attitudes, experiences, and relationships with the wilderness.

Methods

This study's sampling design was informed by previous BWCAW studies

Figure 2—Areas of regrowth along the Gunflint Trail, BWCAW. Photo by Robert Dvorak.

conducted in 1969 and 1991 (Stankey 1973; Cole et al. 1995; Watson 1995), as well as by current knowledge about recreation use and input from Superior National Forest wilderness staff. This study was a precursor to a qualitative study conducted by Schroeder and Schneider (2010). Data were collected using mail surveys from May 1 to September 30 in 2007. During this peak season, an entry point visitor quota system is in place. Permits issued by group are required for all overnight visitors and day use motor boaters. These permits are specifically allocated to the 74 designated entry points to the BWCAW. To most accurately represent this population, data from 2006 allocated permits were examined, and a total of 76 sampling days were selected and stratified simultaneously across both entry points and months during the peak season, according to the proportion of use.

Sampling occurred at both wilderness entry points and permit distribution locations. Because sampling at all 74 entry points was logistically and practically impossible, on-site locations represented the 17 most used points. These points account for more than 70% of the total use during the peak season. Low use entry points were sampled through the permit distribution locations. This contact method may have been less ideal than on-site contacts, but was deemed more efficient for reaching visitors utilizing low use entry points.

A total of 884 groups were contacted at various entry points and distribution centers. Of these groups, 13 groups refused to provide contact information to receive mail-back questionnaires, resulting in a sample population of 871 total groups (98.5% contact rate). Intercepted groups were asked to complete an interview for the on-site survey portion of the study. This interview could be conducted either before or after the trip and included questions of basic trip and demographic information (e.g., group size, type, length of stay) and contact information for each group member over 15 years of age. Approximately two weeks after the interview, individuals were mailed a survey packet. Packets included a cover letter describing the study, a questionnaire, and a prepaid envelope to return the questionnaire. A reminder/thank you postcard was sent one week after the first mailing and a replacement questionnaire sent two weeks after the postcard. A total of 613 questionnaires were returned for a 69.2% response rate.

Visitors were asked in the mail survey if they were aware of recent fire and wind disturbances and if these events had an effect on their trip planning. If visitors responded "yes" to the planning question, open-ended questions were asked to understand how their planning was affected. Visitors were also asked the importance of several factors in choosing an area to visit and the desirability of different conditions in a wilderness context. These factors and conditions were evaluated using 3-point and 5-point Likert-type scales, respectively.

Results

Tests for nonresponse bias suggested no significant or practical differences between respondents and nonrespondents. Additionally, to examine the representativeness of the sample, the proportion of returned overnight surveys by month and entry point was calculated and compared to the actual number of visitors by month and entry point from 2007 permit data. Results suggest no mean differences in proportions between the overnight sample and 2007 permit data ($t = .000$, $p = 1.00$). These proportions were further compared based on the top 17 "high use" sites ($t = .439$, $p = .661$) and again, no significant mean differences were found.

Awareness and Planning

The majority of respondents were aware of the recent fire and wind disturbances in the BWCAW (see table 1). More than 90% of respondents reported they were aware of the 1999 blowdown storm. This level of awareness was less for both recent prescribed burning activities and recent lightning-ignited fires. Despite these high levels of awareness, only a minority of respondents reported that these events had affected their trip plans in either

Table 1—Awareness of recent BWCAW events and effects on visitor planning.[a]

Recent events in the BWCAW	"Yes"
Aware of 1999 storm blowdown	91.9%
Blowdown affected plans to visit BWCAW in past years	21.8%
Blowdown affected plans to visit BWCAW this year	9.2%
Aware of prescribed burning (management-ignited fires) occurring in BWCAW	82.2%
Prescribed burning affected plans to visit BWCAW in past years	4.1%
Prescribed burning affected plans to visit BWCAW this year	2.4%
Aware of lightning-ignited fires that occurred in BWCAW	69.3%
Lightning-ignited fires affected plans to visit BWCAW last year (2006)	8.0%
Lightning-ignited fires affected plans to visit BWCAW this year (2007)	11.1%

[a]Sample size (n = 427–601) was limited by visitor awareness.

Visitors were generally accepting of the fire and wind disturbances present in the BWCAW.

previous years or on the current trip. The blowdown storm had the greatest impact, affecting more than 20% of respondents on trips in previous years. Relative to fire activity, lightning-ignited fires had the largest effect, 11%, on respondents' current trip. However, it is important to note that the 2007 Ham Lake Fire event, the largest fire event of the season, was human caused and may confound visitor responses. Respondents may not have differentiated this human-caused event from lightning-ignited fires.

For those respondents indicating that the blowdown storm and fires had affected their trip plans, open-ended responses were examined to further understand the effects of these disturbances. Common responses included that the blowdown areas and burn areas were directly avoided. Trips were also rerouted around affected areas, and visitors tended to avoid locations where a campfire ban issued by the Superior National Forest was in effect. Very few individuals who went to the BWCAW in 2007 described altogether cancelling or postponing their trips due to these disturbances. However, it is worth noting that a complete understanding of cancelled or postponed trips is not possible. The study design precluded contacting those individuals who chose not to visit the BWCAW in 2007, and their attitudes are therefore not reflected in the sample.

Factors in Site Choice

Respondents were specifically asked how important the 1999 blowdown storm, the occurrence of prescribed burning, and the occurrence of lightning-ignited fires were in choosing a specific area to visit on this trip (see table 2). For each of the disturbances, more than 70% of respondents reported that these events were not important factors in choosing an area to visit on their current trip. Only one in 20 respondents felt the events were important factors.

Although these fire and wind disturbances were apparently not important in choosing the area to visit for the visitor's current trip to the BWCAW, it is important to note that many respondents either did not travel or were unsure whether they had traveled through a blowdown or burn area. Only 27% of respondents were sure they had traveled through an area affected by the 1999 blowdown storm. Similarly, only 8% of respondents reported they had traveled through a prescribed burn area, and 10% reported they had traveled through a burn area affected by 2006 lightning-ignited fires.

Wilderness Conditions

Respondents were asked if the occurrence of fire suppression and the use of prescribed burning were something they considered personally desirable in a wilderness setting (see table 3). They were also asked how personally desirable encountering evidence of natural disturbance was in a wilderness setting. The majority of respondents reported that evidence of natural disturbance (e.g., blowdown, flooding), use of prescribed burning, and fire suppression were neutral or desirable occurrences in a general wilderness context. However, approximately 25% of visitors reported that suppression of lightning-ignited fires was an undesirable or very undesirable action in a wilderness setting. Conversely, the use of prescribed burning to reduce risk of uncontrolled or catastrophic wildfires or to restore the natural role of fire to the wilderness landscape was a very desirable action within a wilderness context.

Application

Several important insights into managing fire and wind disturbance impacts can be communicated to wilderness managers from this study. At face value, fire and wind disturbances were not a factor in trip planning for those who went to the BWCAW, despite respondents being very aware of their presence in the BWCAW. This may be the case for several reasons. Previous studies have suggested that directly after a fire, visitors may be more apt to visit burned areas (Englin et al. 2001). Use may actually increase in these areas because individuals are curious about the conditions. Another possible reason for responses is that areas affected by

Table 2—Important factors in choosing area to visit.[a]

Factor	Not important	Somewhat important	Very important
1999 Blowdown	76.0%	19.2%	4.9%
Occurrence of prescribed burning	75.0%	19.6%	5.4%
Occurrence of lightning-ignited fires	71.2%	22.9%	5.9%
Natural place, lack of human evidence	9.2%	41.9%	48.9%
Remoteness, solitude	7.0%	36.7%	56.3%
Scenic beauty	3.3%	22.8%	73.9%

[a]n = 588–603.

Table 3—Desirability of wilderness conditions.[a]

Condition	Very undesirable	Undesirable	Neutral	Desirable	Very desirable
Suppress fires that are started by lightning	3.5%	21.8%	42.7%	26.2%	5.8%
Evidence of natural disturbance (e.g., fire, blowdown, flooding)	0.2%	4.0%	55.0%	34.2%	6.6%
Use of prescribed burning to reduce risk of escaped wildfires	0.5%	2.0%	29.7%	55.2%	12.6%
Use of prescribed burning to restore the natural role of fire	0.5%	2.0%	33.3%	51.2%	13.0%

[a]n = 601–603.

fires and the blowdown storm are not predominantly in high destination areas. Visitors may only pass through these areas to other destinations, and the most desirable campsites/entry points were not severely affected.

Despite these possible explanations, some conflicting information does exist in the study. Although these disturbances were not particularly important to respondents during the planning of their trip, respondents acknowledge that they did not visit or were unsure if they had visited these areas. Additionally, open-ended responses by visitors who reported their plans were affected describe actions that changed their travel patterns. Respondents described avoiding blowdown and burn areas, rerouting trips around affected areas, and avoiding locations covered by campfire bans. These types of actions may not have been considered by respondents when reflecting upon the effects of disturbances on their trip planning. Therefore, it is possible that these disturbance events are having an additional effect on visitor travel patterns in the BWCAW. It is also worth noting again that the sample only reflects those respondents who visited the BWCAW in 2007. The attitudes of individuals who chose not to visit the BWCAW because of these disturbances and impacts were precluded from the sample.

Since the Superior National Forest utilizes travel models to determine quotas for managing wilderness experiences and opportunities for solitude, any new factors influencing these models are important to understand. If, for example, campsites are hard to find or encounters with other groups are higher during times of fire, such information could be applied to travel models and changed during and directly after wildfires. Further examination is necessary to understand these changes in travel patterns related to fire and wind disturbances and whether they are applicable to a larger proportion of visitors. A more in-depth understanding of these factors could assist managers in factoring fire and wind disturbance issues into their travel management plans.

Responses in this study also suggest that visitors were generally accepting of the fire and wind disturbances present in the BWCAW. More specifically, respondents perceived management actions such as fire suppression and prescribed burning as desirable actions in wilderness settings if the reasons were to reduce risk or restore the natural role of fire to the landscape. These actions along with the evidence of natural disturbance on the landscape were considered desirable occurrences in a wilderness context. In an effort to increase public understanding of fire and wood fuels management, managers may need to continue to provide information regarding the role these disturbances play in management and how they offer humans insight into natural forest processes.

As further insight is gained into visitor attitudes and opinions regarding the management of forest resources in wilderness, it will remain important to posit management strategies and actions within the public attitudes and relationships associated with the wilderness. Thus, management actions that target fire and wind disturbances in these areas (e.g., fire bans, road closures) might require further explanation to prevent visitors from avoiding these areas or dramatically changing their behavior beyond the desired intent of these management actions. Although managers may default to fully describing all conditions and actions to visitors, they must balance this desire with allowing visitors to seek the unknown in wilderness. This may be achieved by encouraging visitors to gain an appreciation and interest in the unique experiences these disturbance areas can offer them during their visit. Otherwise, there is potential for these areas to be perceived as ongoing detractions to visitation.

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Continued on page 36

PERSPECTIVES FROM THE
ALDO LEOPOLD WILDERNESS RESEARCH INSTITUTE

Ecosystem Services

Just Another Catch Phrase?

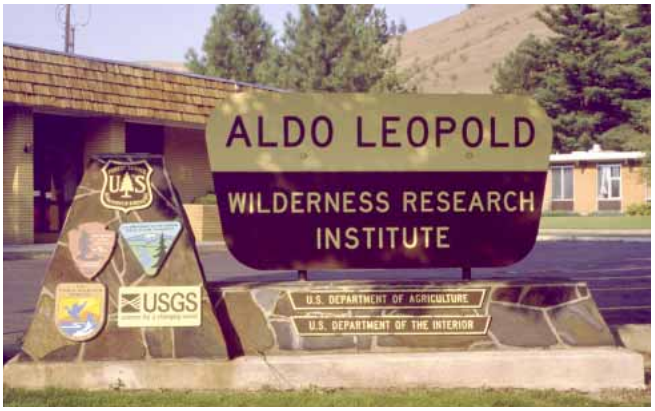
BY EMILY WEIDNER

The "ecosystem services" concept has emerged as a popular area of discussion among policy makers and conservation advocates. Ecosystem services are the benefits people derive from nature and include the provision of water, food, wood, and fiber; regulation of climate, flood, drought, and disease; maintenance of biodiversity; and recreational, aesthetic, spiritual, and cultural values. Ecosystem services brings together traditionally disparate fields of ecology, economics, and geography to address how the services are generated, how they flow across the landscape, who benefits from them, and by how much.

Because wilderness agencies have been providing ecosystem services to the public for decades, they have focused much of their research agendas in this arena, though they rarely labeled it as ecosystem services research. Indeed the Leopold Institute's body of work has included considerable research on benefits and values of wilderness, and trade-offs of wilderness values under various management scenarios (e.g., active restoration, fire suppression)—all components of ecosystem services research. But apart from a new catch phrase, what can the ecosystem services perspective provide for wilderness?

First, it raises awareness of the value of wilderness. Wilderness values can be described in ways that matter to people and help inform the public of the breadth of wilderness benefits. Imagine being able to describe areas in terms of human benefits such as gallons of potable water, or tons of carbon sequestered, in addition to existing measures such as number of recreational visitors, or number of acres. This would certainly provide additional rationale for a steady or increasing wilderness management budget, and engender additional support for wilderness designation.

The ecosystem services perspective also helps in understanding how people value wilderness. Understanding how



different stakeholder groups value wilderness can bring more transparency to intended beneficiaries of management actions, and can help ensure a just planning approach. Additionally, with public participation a key step of any forest planning or major management action, having a better idea of how people value wilderness areas and other public lands can help build trust amongst stakeholder groups.

Finally, it better informs decisions that include trade-offs between services. Considering the suite of ecosystem services provides a more complete picture of the impacts of various management scenarios on ecosystem services. And understanding how and where services are generated across the landscape and the ecological or social pathways the services take to reach the beneficiaries provides the groundwork for understanding how decisions affect different stakeholders and their values of wilderness. This will be essential as managers are increasingly faced with complex management decisions related to fire, climate change, and insects and disease.

In order to use ecosystem services to raise awareness of the value of wilderness, better understand how people value wilderness, and better inform decisions that include trade-offs between services, we need to develop the methods, create

user-friendly tools, and conduct case studies to serve as a proof of concept. Ecologists, economists, modelers, and geographers will have to work together to help build spatial tools that allow for ecosystem services assessments, assessment of measurable and immeasurable economic values of services, and scenario building that show the effects of management and natural disturbances such as fire, climate change, and insects and disease.

The Leopold Institute has begun a new research stream on ecosystem services beginning with a multiphase project called "The Role of Wilderness in Sustaining Ecosystem Services across Landscapes and Society." Focusing in on the Frank Church-River of No Return Wilderness in Idaho as a case study, this project seeks to identify the ecosystem services, their beneficiaries, and stakeholder perception of relative importance of the services; assess nonmarket values of the services; and develop a decision-support framework to inform managers about wilderness ecosystem services and how wilderness management and natural disturbance (fire, climate change, insects and disease) affect these services. Results of the phase-one analysis are planned for publication in 2011.

Ecosystem services are the benefits people derive from nature and include the provision of water, food, wood, and fiber; regulation of climate, flood, drought, and disease; maintenance of biodiversity; and recreational, aesthetic, spiritual, and cultural values.

Additionally, with growing momentum behind the ecosystem services concept among wilderness professionals, the North American Intergovernmental Committee on Cooperation for Wilderness Conservation (an outcome of an MOU on Cooperation for Wilderness Conservation signed by federal agencies of the United States, Canada, and Mexico) formed a working group called Valuing Ecosystem Services from Wilderness and Payment Mechanisms. Led by the U.S. Forest Service, this group has a mission to exchange information and best practices on innovative approaches to governance of wilderness areas, and to promote consideration of mechanisms of payment for ecosystem services related to nonfederal wilderness conservation.

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Continued from RE-GREENING NATIONAL PARKS, page 8

an important bequest of this generation to the future.

Perhaps the most important role of the public lands is to safeguard wilderness, nature untamed. Wilderness is at the core of a healthy society. Wilderness, above all its definitions, purposes, and uses, is sacred space, with sacred power, the heart of a moral world. Wilderness preservation is not so much a system or a tactic, but a way of understanding the sacred connection with all of life, with people, plants, animals, water, sunlight, and clouds. It's an attitude and way of life with a spiritual ecological dimension.

But the longer I work to protect and preserve wilderness, the more I believe there is more to it.

Crusades for social issues, whether for peace, racial equality, gender rights, or the environment, show how people—at times a very few—can and do bring needed change. Moreover, the effort itself is rewarding, the change in oneself matters most, more than whatever success the effort may bring. In protecting these wildernesses to remain forever mysterious and primeval, we discover ourselves, and our inner spirits called souls.

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Connecting Wilderness Professionals Using Social Media Technology

BY LISA EIDSON

In December 2009, connect.wilderness.net, nicknamed Connect, was launched and became the first and only online social network exclusively for wilderness professionals. For many years now, electronic communication has been found to support organizational knowledge exchanges across hierarchical levels, sectors, and geography (Constant et al. 1996). Connect has demonstrated that professional social networking can successfully unite a diverse, dispersed workforce through centralized, accessible, easy-to-use technologies that mirror real-life social interactions. This article is intended to offer perspectives on Connect's evolution and success after its first year.

Member Makeup

Connect is intended to be inclusive of the variety of different organizations and people who perform wilderness-related work, and its members include federal, state, and local government land managers; wilderness researchers; academics; environmental educators; and wilderness-focused nonprofit employees. Since its creation, the Connect community has increased to just over 650 members, 75% of whom, however, are federal government employees (see figure 1). Not surprisingly, the Forest Service and National Park Service—the agencies managing the most wilderness areas and the most wilderness acreage, respectively—claim the largest percentages of overall membership.

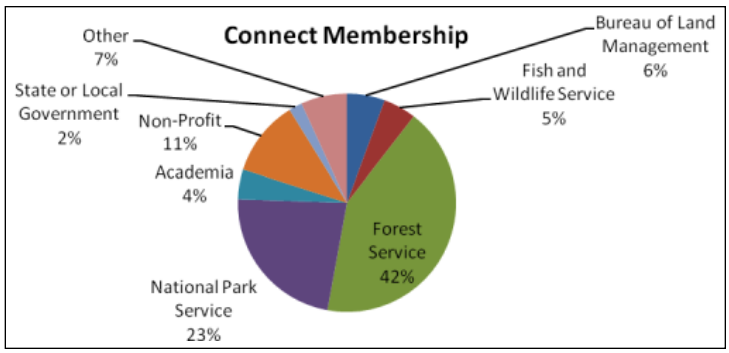

Figure 1—Connect membership by employer.

Lisa Eidson on the banks of Sheep Lake in Hells Canyon Wilderness, Idaho.

Problem-Solving Connections

More important than sheer membership numbers, however, is member connection and engagement. Social networks are grounded in theory suggesting that weak ties, relationships with strangers or acquaintances, can sometimes offer an advantage over strong ties, relationship with friends or colleagues, in obtaining useful information and solving problems (Granovetter 1973). The value of weak ties is due to their bridging capacity among cliques of strong ties—groups of often-similar or localized people who are more likely to know the same things but are less likely to know dissimilar things. Through these bridges, people can obtain access to resources and answers that are not found in their strong-tie relationships. Although it might seem counterintuitive to think that someone would take time to offer advice, knowledge, or aid to a stranger or acquaintance online, information exchanges of this nature occur when people perceive that doing so enhances their professional relationships and when they have relevant expertise and experiences to share (Wasko and Faraj 2005).

Bridging Distance

Weak ties have formed on Connect through informal groups focused on broad issues, such as invasive species or climbing,

and narrower issues, such as outfitter/guide needs assessments. Regardless of the scope of the group, interest and expertise draw previously unacquainted people, often from different parts of the country, together to facilitate information exchanges on the subject or problem they have in common.

One such exchange, a discussion centering on the legality and existence of fixed anchors for wilderness climbing, exemplifies the exchange of advice and solutions across distances. Started in January 2010, this discussion included 11 posts over six months from seven participants. These seven people represented five different states (Arizona, Colorado, Kentucky, Vermont, Washington) from five different regions (Southwest, Intermountain, South, Northeast, Northwest) and exhibited varying levels of wilderness stewardship experience from two to 36 years.

Vertical and Lateral Information Flows

Not only is information on Connect flowing geographically, it is also flowing vertically within the wilderness management agencies and laterally between different sectors within the larger wilderness professional community. One popular discussion on improvements to field uniforms was started by the Forest Service Chief's Wilderness Advisory Group (WAG), the agency entity charged with serving as a conduit between field-going employees and those in the Washington office. Ideas from this discussion, including eliminating cotton, adding broad-brimmed hats and zip-off pants, improving rain and cold-weather jackets, reducing overall clothing weight, and exploring existing military outdoor clothing company lines, were aggregated and prioritized at WAG's annual November meeting for forwarding to agencywide uniform coordinators (T. Carlson, pers. comm. 2010).

Whereas WAG's use of Connect in this example serves to move information up from the field level to the Washington office level, the Bureau of Land Management's (BLM's) Wilderness Character Monitoring Team (WCMT) is moving information both up and down hierarchically within the agency. Following the release of the BLM Implementation Guide Version 1.3 for measuring attributes of wilderness character, the WCMT created a group on Connect specifically to answer questions and discuss problems with those implementing the different measures described in the guide. Not only does this group provide implementers with access to the expertise contained within the WCMT, it also provides the WCMT with insight from implementers necessary for further revisions of the guide (C. Barns, person. comm. 2010).

Connect is also facilitating the flow of information laterally within the larger professional wilderness community. Although Connect's membership is primarily federal government employees, researchers and academics fill a small but important, niche, allowing the sharing of relevant scientific findings with managers. For example, discussions on topics such as trail stabilization techniques for boggy areas, food storage options to minimize human/wildlife conflicts, campsite marking, fixed anchors, monitoring social trails, horse-mounted weed sprayers, and camping setbacks have included either the exchange of research article citations or participation by people who identify themselves as researchers or scientists employed either by the agencies or by academia.

As with researchers and academics, the inclusion of nonprofit employees provides valuable opportunities to connect the nonprofit sector with managers, but also to further unite various groups within the nonprofit sector. One early use of Connect was to facilitate formation of the National Wilderness Stewardship Alliance, an allied constituency of wilderness friends organizations. Although it has subsequently created its own website and online communication network, the group initially used Connect to facilitate communication between prospective members, typically employees or directors of various friends groups; organize its first meeting held in Colorado in March 2010; and begin the process of implementing meeting outcomes.

Formal Learning Opportunities

Whereas Connect's main successes lie in facilitating informal information exchanges among workers with common problems, the University of Montana's Wilderness Management Distance Education Program (WMDEP) and the Arthur Carhart National Wilderness Training Center (ACNWTC) are integrating Connect into undergraduate and graduate college coursework and job training. In the fall of 2010, WMDEP began conducting all of its online discussions for Recreation Management/Forestry 405: Management of the Wilderness Resource, and Recreation Management/Forestry 561: Managing Wilderness Ecosystems in a closed group on Connect. Similarly, in January 2011, ACNWTC began using Connect for discussions and course management for its new instructor-led minimum requirements analysis e-course, MRA Live. Incorporation of formal learning opportunities such as these in to Connect means that both traditional and nontraditional students are using social networking in an educational context as part of course or training requirements. This use serves as the foundation for promoting the effective integration and use of technology into ongoing wilderness-related professional

development by fostering an understanding of how Connect can be used for future job-related problem solving once the course or training has concluded.

Continued Evolution

Although this article has focused on the early positive outcomes Connect is having, the network is still in a tenuous evolutionary phase according to group/member development theories. One frequently cited theory of group development suggests that groups go through four stages—forming (hesitant participation, acclimatization), storming (conflict, role definition), norming (rule definition, cooperation), performing (progress, stabilization) (Tuckman 1965). Similarly, members themselves go through four somewhat similar stages—being online, doing online, acting online, thinking online (DiMauro 2010)—that characterize increasing member engagement in a community. In both of these models, the rate of group or community failure and member attrition are greatest during the first two stages.

Connect's main successes lie in facilitating informal information exchanges among workers with common problems.

Connect has not progressed beyond the forming stage, with most members either being or doing online only, but with few acting or thinking online. So although membership numbers are high and sign-ups continue at a steady pace, participating members represent a significantly smaller portion of overall members, and the initial results of an online survey of Connect members reveals that almost 75% of respondents log on to Connect no more often than once a month. As such, increasing the number of members who participate frequently and meaningfully to ensure quality content and continued relevance remains an elusive goal. Additionally, one of the objectives of the recent online Connect member survey is to understand what type of oversight or involvement in community evolution members want to have, a step that will perhaps move the community into the storming stage where clearer member roles and responsibilities can be explored.

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Continued from VISITOR ATTITUDES, page 31

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Community-Based Conservation of the Snow Leopard in the Trans-Himalayan Foothills of Northern India

New Opportunities and Challenges

BY MARIA COSTANZA TORRI

Introduction

In the last years there have been numerous reports of population decline in most parts of the snow leopards' range (Koshkarev and Vyrypaev 2000). This decline is a concern to conservation: as long ago as 1975, the snow leopard was included in Appendix I of CITES, recognition that it was "threatened with extinction." The species is also classified as endangered in the 2002 International Union for Conservation of Nature (IUCN) Red List of Threatened Species (Nowell 2000) and has been so classified in IUCN Red Lists since 1988. Major threats to the snow leopard include prey base depletion, illegal trade, conflict with local people, and lack of conservation capacity, policy, and awareness.

Examination of biodiversity patterns indicates that most of the world's biodiversity exists in cultural landscapes (i.e., forests, grasslands, woodlands, etc.) that have been actively occupied, managed, and respected by indigenous communities for millennia. This finding raises the fundamental questions of how and for whom biodiversity is being promoted and conserved. Clearly, community-based conservation (CBC) perspectives need to be incorporated to maintain biodiversity, while at the same time respecting the local cultures that sustained that biodiversity. Community development and biodiversity goals are reached through the empowerment and active participation of local people in the conservation process. This is necessary in order to achieve at the same time wildlife conservation and the sustainable development of rural societies.

This article analyzes the issue of community-based snow leopard conservation in the Himalayan region in northern India (Hemis Reserve). With regard to the Hemis Reserve, although the biological and ecological research is quite prolific, few studies are available on the efforts of community-based conservation in these regions. India and Nepal have been chosen for this analysis as they have pioneered a number of innovative participatory approaches to sustainable rural development. These wildlife management approaches have integrated the ecological dimensions of the conservation of the snow leopard with the socioeconomic development of rural communities. Against this background, the purpose here is to analyze the impact of community participation for effective

Maria Costanza Torri

conservation of this endangered species and explore the ways through which the objective of wildlife and ecosystem conservation can be associated with the enhancement of local livelihoods.

Biology and Habitat, Distribution of the Population and Current Dangers

Snow leopards are closely associated with the alpine and subalpine ecological zones, favoring steep terrain well broken by cliffs, ridges, gullies, and rocky outcrops (McCarthy and Chapron 2003). However, in Mongolia and Tibet they may occupy relatively flat or rolling terrain as long as there is sufficient cover. In the Sayan Mountains of Russia and parts of the Tien Shan range of China, they are found in open coniferous forest, but usually avoid dense forest. They generally occur at elevations of 3,000 to 4,500 meters (9,840 to 14,760 ft.), except for at their northern range limit where they are found at lower elevations (900 to 2,500 m/2,950 to 8,200 ft.) (McCarthy et al. 2005). Low temperatures and high aridity makes its habitat among the least productive rangeland systems in terms of graminoid biomass, with prey populations consequently occurring at relatively low densities (Sanderson et al. 2002).

The leopard's principal natural prey species are bharal or blue sheep (*Pseudois nayaur*) and ibex (*Capra sibirica*), whose distribution coincides closely with snow leopard range. Snow leopards also prey on marmot (*Marmota* spp.), pika (*Ochotona* spp.), hares (*Lepus* spp.), small rodents, and game birds. Considerable predation is reported on domestic livestock. Annual prey requirements are estimated at 20 to 30 adult blue sheep, with radio-tracking data indicating such a kill every 10 to 15 days. A solitary leopard may remain on a kill for up to a week (Sanderson et al. 2002).

Snow leopard home ranges overlap widely between the sexes, and are reported to vary from 10 to 40 kilometers^2 (26 to 104 sq. miles) in relatively productive habitat in Nepal (Jackson and Ahlborn 1989).

By comparison, home ranges are considerably larger (140 km^2 or greater; 363 sq. miles) in Mongolia, where terrain is relatively open and ungulate prey densities lower (McCarthy et al. 2005). Densities range from 0.1 to 10 or more individuals per 100 kilometers^2 (259 sq. miles).

The snow leopard is restricted to the high mountains of central Asia, with core areas including the Altai, Tian Shan, Kun Lun, Pamir, Hindu Kush, Karakorum, and Himalayan ranges (McCarthy et al. 2005). Ecological regions were defined in a workshop as Altai-Sayan, Trans-Altai—Alashan Gobi, Tian Shan, Pamir, Hindu-Kush, Karakorum, Himalayas, Hengduan Mountains, and Tibetan Plateau.

Based on elevational analysis, Bajimaya (2000) estimated potential range at more than 3 million kilometers^2 (7.7 million sq. miles), with much of this in Mongolia and the Tibetan Plateau of China, although it is unclear to what extent snow leopards use much of the flatter parts of the plateau (R. Jackson, pers. comm. 2008). There was evidence of snow leopard occupation in 1.83 million kilometers^2 (4.7 million sq. miles), and only about 550,000 kilometers^2 (1.4 million sq. miles) was considered to be good habitat (McCarthy et al. 2005). Dinerstein et al. (2007) used historical data to improve mapping of potential range, but there remains a significant lack of information about current snow leopard status across much of its known and potential distribution.

In India, the snow leopard is known to dwell above 3,200 meters (10,500 ft.) across the Himalayan regions. Its range extends from Jammu and Kashmir, to Himachal Pradesh and Uttaranchal in the central Himalayas, to the eastern states of Sikkim and Arunachal Pradesh (Fox and Chundawat 1991). In the late 1980s, the total population of snow leopards in India was estimated at 200 to 600 animals, with the largest number inhabiting central Ladakh, in Jammu and Kashmir (Chundawat 1990). Fox and Chundawat (1991) estimated a nationwide population of some 500 animals, based on mean density figures of one animal/110 kilometers^2 (285 sq. miles) for good habitat and one animal/190 kilometers^2 (492 sq. miles) for lower quality habitat.

Current Dangers for Snow Leopard Conservation

Major threats to the snow leopard include prey base depletion, illegal trade, conflict with local people, and lack of conservation capacity, policy, and awareness (see figure 1). The Snow Leopard Survival Strategy assessed primary threats by region as follows (Wingard and Zahler 2006).

Some of the threats to snow leopoards in the Himalayan region (Tibetan Plateau and other southern areas of China, India, Nepal and Bhutan) include: the reduction of natural prey due to competition with livestock, killing of snow leopards in retribution for livestock depredation, lack of transboundary cooperation, military activity, and human population growth or poverty. Snow leopard habitat undergoes extensive agropastoral land use, both within and outside protected areas. Conflict with local

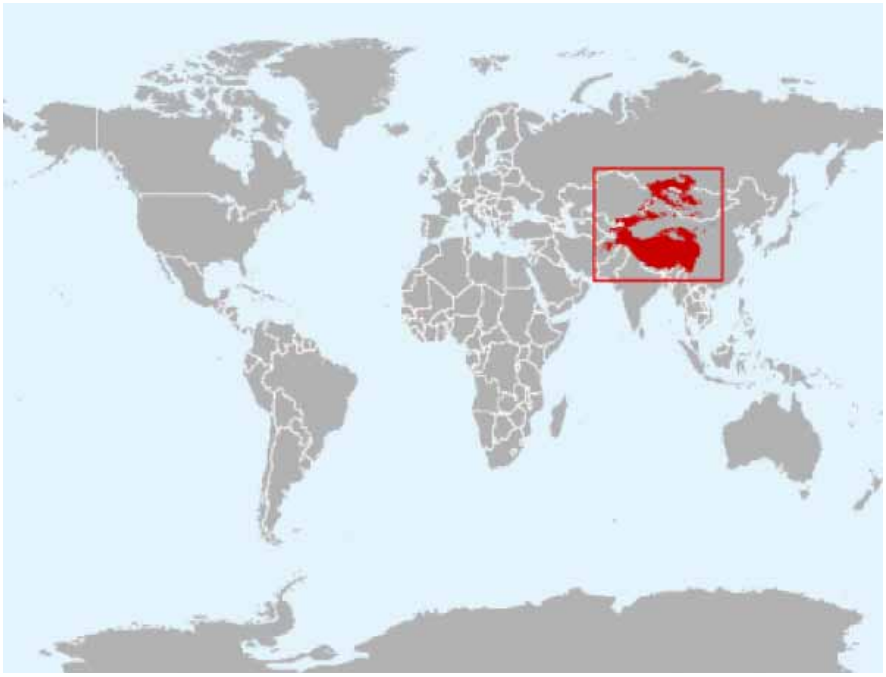

Figure 1—Snow leopard current distribution (IUCN 2009).

communities over livestock depredation is among the most important threats to the species and its range.

The inherently low wild ungulate density in the snow leopard's range, owing to relatively low primary productivity, is further exacerbated by prey declines due to hunting for meat and competition with livestock. A declining prey base reduces habitat quality for snow leopards and escalates livestock depredation. Competition with livestock for forage is one of the most widespread causes of prey base decline; reduction of the wild prey base because of hunting by people is also significant in parts of snow leopard range (Wingard and Zahler 2006; Dinerstein et al. 2007).

Snow leopards are capable of killing all domestic animals except perhaps for fully grown male yak. Although herders take steps to reduce the risk of depredation (Sanderson et al. 2002), livestock populations are a locally abundant food source for snow leopards and make up to 58% of their diet in some areas. The relative abundance of livestock versus wild prey is a reasonable predictor of the level of livestock depredation by snow leopards (Jackson et al. 2006; McCarthy et al. 2005).

Snow leopards are killed in retribution for livestock depredation, but also for commercial purposes, and poaching for illegal trade represents a significant threat. Pelts appear to be the main snow leopard product in demand, but there is also evidence of demand for live animals for zoos and circuses. Other body parts found in trade include bones (used especially in Chinese medicine as a substitute for tiger bone), as well as claws, meat, and sexual organs of male cats (Henschel and Ray 2003). Illegal trade increased in the 1990s in the economically depressed, newly independent central Asian states that emerged from dissolution of the Soviet Union (Kreuzberg-Mukhina et al. 2002; Koshkarev and Vyrypaev 2000). Illegal trade appears to be increasing rapidly with China's growing economic power, for example, in neighboring Mongolia (Wingard and Zahler 2006). In Afghanistan, a new market has emerged that is difficult to police due to ongoing military conflict (Henschel and Ray 2003; Nowell 2000).

The general lack of awareness at both local and national levels for the need to conserve wildlife, and especially predators, further hinders conservation efforts. Up to a third of the snow leopard's range falls along politically sensitive international borders, complicating transboundary conservation initiatives (O'Brien et al. 2003). Military conflict is taking place across much of the snow leopard's range, causing immense damage to wildlife through direct loss of species and destruction of habitat, losses to land mines, the demands of displaced peoples for food and fuel, and the encouragement of trade in wildlife (McCarthy and Chapron 2003; Karanth et al. 2003).

Community-Based Wildlife Conservation

The Himalayan Mountains arc covers more than 2,414 kilometers (6,252 sq. miles) through the center of the Eurasian continent. Within the heart of this mountain range lie some of the world's tallest mountain peaks. These are Sagarmatha (Everest), Kangchenjunga, and Jumolhari. They are regarded as sacred under the culture of the local communities.

The transboundary nature of the landscape, adjacent to Nepal, is embodied in intergovernmental conservation policy in the region for effective conservation. This also meets their regional governmental obligations under multilateral environmental agreements (MEAs) such as the Convention on Biological Diversity. This ecosystem is one of the richest landscapes of the Indo-Burman biodiversity hotspots (Myers et al. 2000)

and an important transboundary mountain ecosystem shared by India and Nepal (Sandwith et al. 2001). It is rich in biological diversity mainly due to the complex physiography, bioclimatic zones, and its location at the convergence of the Palaearctic and Oriental zoogeographical realms. It can be referred to as a "biological laboratory" endowed with a rich variety of genetic species and ecosystem diversity and endemism of global importance.

As these important ecosystems and services are sensitive to environmental changes, conservation is an imperative. Glacial lake outburst flood (GLOF) events have been frequent in recent years, highlighting the vulnerability of the region to threats ranging from climate change to habitat degradation from unsustainable resource extraction. In Nepal alone, 16 of the 20 potential GLOFs identified to date occur in this landscape (ICIMOD, UNEP 2001). The region was identified as a priority area for conservation in the Himalayas during a regional analysis by experts in Himalayan biodiversity (WWF and ICIMOD 2001).

Community-Based Conservation and the Snow Leopard in India

In India, there has been a shift since the 1990s toward more inclusive approaches to conservation that accommodate indigenous livelihood concerns. This has been manifested in a large-scale ecodevelopment program funded by the World Bank and the Global Environment Facility, which has been integrated within the National Wildlife Action Plan. Viewed as a major conservation initiative, the program was initially tested on two sites: the Great Himalayan Park in the north and the Kalakad Mundanthurai Tiger Reserve in the South during the mid-1990s. It has since expanded to cover seven other national parks and tiger reserves. Its stated objectives, as described by its architect, the World Bank, are to garner local people's participation in conservation initiatives through participatory microplanning processes in protected areas, to develop alternative livelihoods and resource use practices, and to promote "voluntary" relocation.

However, given that ecodevelopment remains located within the current legal and policy framework, which prioritizes biodiversity values over human resource needs, it is unclear how local resource users can be meaningfully involved in its planning processes. Other critical issues of ecodevelopment projects in India have been its tendency to simplify and homogenize local populations, resulting sometimes in a difficulty to develop long-term income generation activities linked to conservation objectives and to address the livelihood needs of the poorest groups within communities.

Hemis National Park

Established in 1981, Hemis National Park covers approximately 3,350 kilometers² (1,293 sq. miles) of the Trans-Himalayan Range of Ladakh in the state of Jammu and Kashmir (Fox and Nurbu 1990). The park offers prime snow leopard habitat, harboring four species of wild sheep and goats, giving it international biodiversity importance (see figure 2). About 1,600 people live in 16 small settlements scattered across three valleys. They grow barley and vegetables, and own more than 4,000 head of livestock, of which 81% are sheep and goats and 11% are yaks, cattle, and crossbreeds. Tourism provides an important source of supplementary income. Ladakh was opened to tourism in 1974, and the Markha Valley circuit through Hemis National Park remains the most popular trekking route, with approximately 5,000 annual visitors.

Tourism, both within and outside the park, provides an important source of income to supplement

Figure 2—A landscape view in Hemis Park, India. Photo by Maria Costanza Torri.

Ladkah's mainly pastoral livelihoods (see figure 3).

In 2001, the nongovernmental organization Snow-Leopard Conservancy (SLC), in partnership with The Mountain Institute and UNESCO, initiated in Hemis National Park the Traditional Village Homestay program as a pilot project. The goal of this ecotourism program is to empower local communities to benefit directly from an ecosystem that includes snow leopards, through income-generating schemes. Training and support was provided to cooperatives of village women in Ladakh to offer traditional accommodation to foreign tourists in providing "homestays" and in running a small restaurant that serves trekkers during the tourist season. Emphasis is placed on environmentally friendly practices, including good waste management, the use of natural gas and kerosene for cooking instead of scarce firewood or yak dung, and the sale of pressure-boiled, filtered water to minimize use of plastic mineral water bottles. Solar cookers and solar water heaters were provided by a subsidy, contributing to the hygienic and ecologically friendly operation of these facilities. In 2003, the program was expanded to other areas in Ladakh, as well as to Lahul-Spiti, and training was provided for local people to act as wildlife and cultural guides for tourists. Guide handbooks and reference materials are provided for the villagers, including a "Homestay Manual" and educational materials for local schools.

In 2002, SLC initiated a pilot strategy to reduce conflict between the local communities and the snow leopard, which is a major problem for the success of conservation in this area.

In fact, in Hemis National Park, a survey carried out by local authorities shows that between January 1998 and February 1999, half of the households had lost up to 10% of their livestock to predators. The average household lost six animals, valued at almost $US300, and the total loss in the park was estimated to be some $US23,500. Snow leopards were said to be responsible for 55% of these kills. The snow leopard territories are adjacent rangelands, which support their natural prey, the blue sheep.

Figure 3—A roadway in Hemis Park, India. Photo by Maria Costanza Torri.

The Snow Leopard Conservancy's program is responsible for implementing project activities, working in cooperation with other villagers to make nighttime livestock enclosures more "predator-proof," monitor depredation hotspots, undertake outreach education programs at local schools, and educate herders on the importance of protecting wildlife.

The SLC engaged communities by using a participatory process known as Appreciative Participatory Planning and Action (APPA), which builds on a community's strengths to reinforce best practices and to make it better using low-cost, locally appropriate interventions. APPA employs basic Participatory Rural Appraisal tools to lead villagers and other stakeholders through a sequential four-step reiterative process that ensures that the program evolves from the traditional knowledge of local communities relating to animal husbandry, predator occurrence, and behavior.

In collaboration with the inhabitants of Markha, a village that has the highest predation rate in the Hemis National Park, predator-proof corrals were built in 2000, using wire mesh, poles, secure doors, and concrete, together with locally available stones, mud, and labor contributed by the villagers. The corral reinforcement project followed in the wake of an earlier scheme, set up in 1994 to provide financial support to herders following livestock predation. The findings of this project showed that by proofing corrals against predators, five or more snow leopards per site were removed from the risk of retributive killing.

Since these barriers to predators can eliminate multiple killings of livestock by snow leopards, they are especially important and effective from a conservation action standpoint.

All initiatives have been implemented under an "action plan" specifying the activities and inputs for each action. Reconstructed corrals must benefit all livestock-owning households, who must also cease filing claims for compensation and report any instance of poaching to the authorities. A reciprocal contribution in the form of labor and collection of locally available materials is required from each participating community. An important long-term goal is to improve forage conditions for native prey species to help reduce depredation pressures on domestic stock. Clearly, this will require concerted actions such as rest-and-rotation grazing schemes, establishing special pastures reserved for wildlife, and other measures for enhancing forage plant seedling establishment and productivity.

Some Final Considerations

This case study demonstrates the importance of adopting an integrated perspective on social and ecological systems or society and nature. As the field example Hemis National Park shows, the coexistence between local communities and wildlife should not only be considered a problematic issue. Identifying, understanding, and sustaining the initiatives of community-based conservation could be a way forward to reconcile the dual goals of biodiversity conservation and improved livelihoods for local communities.

Yet the crucial task of defining objectives and monitoring progress toward these goals is often complicated by the long-term nature of conservation measures, the competing agendas among different stakeholders, and the subjective and context-specific notion of "improvement." The issue of how benefit sharing and customary rights issues are integrated into planning and implementation should be explored.

It is also important that governments promote official policies, guidelines, and principles that recognize diverse local (formal or informal) arrangements developed by communities on their own or in collaboration with other stakeholders, for the management of community-conserved areas.

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Announcements

COMPILED BY GREG KROLL

Quebec Pledges to Protect 50% of Its Northern Lands

Canada's province of Quebec has pledged to protect 50% of its northern lands from all industrial activity. This means an area of 123 million acres (50 million ha) will be set aside for the benefit of nature and traditional aboriginal activities, such as subsistence hunting. "This is a globally significant announcement," said Harvey Locke, vice president for Conservation Strategy at The WILD Foundation in Boulder, Colorado. "The government of Quebec is now moving formally to join the global leaders who are responding to the scientific imperative to greatly increase the level of nature protection all over the world."

In 2007, 1,500 scientists wrote a letter through the Canadian Boreal Initiative to Canada's federal and provincial governments identifying the need to protect approximately half of Canada's vast boreal forest in an interconnected manner. The WILD Foundation facilitates the global Nature Needs Half movement, which calls for the protection of at least half the world, land, and sea. According to Locke, "We are in the middle of a species extinction crisis, we are emptying the ocean of large fish and we are radically changing our climate. We must do better than this and Quebec is showing the way." (Source: natureneedshalf.org)

New Journal Addresses Protected Areas in the Alps

The Austrian Academy of Sciences, in conjunction with the Innsbruck University Press, has launched *EcoMont*, an online journal emphasizing research and management of protected areas in the Alps, with relevance for mountain area managers worldwide. Published twice a year, *EcoMont* offers peer-reviewed articles in English, and is targeted toward scientists, protected area managers, and the general public. Article abstracts are available for free; full-text articles cost €5 (approximately $US6.75) each at www.oeaw.ac.at/ecomont.

U.S. Homeland Security Cancels "Virtual Fence"

After spending $1 billion on a project to build a technology-based "virtual fence" along the U.S. border with Mexico, the Department of Homeland Security canceled the undertaking, saying it was ineffective and too costly. Homeland Security Secretary Janet Napolitano said she decided to end the five-year project, which, in a pilot program in Arizona, cost about $1 billion to build 53 miles (85 km) of "virtual fence" along the state's border. Originally estimated to cost more than $7 billion to cover 2,000 miles (3,200 km), the plan was the subject of more than a dozen scathing reports by the Government Accountability Office. The project was carried out by the Boeing Corporation under a contract first signed in 2005 by President George W. Bush.

Napolitano said the original concept of the project, to develop a single technology that could be used across the entire border, was not viable. Boeing had built a complex system of sensors, radars, and cameras mounted on towers, often adjacent to designated wilderness, that was supposed to lead border agents to the exact location of illegal crossers. But the system functioned inconsistently in the rough terrain. Napolitano said border agents would instead use less expensive technology that is already part of their surveillance equipment, tailoring it to the specific terrain where agents attempt to interdict illegal border crossers and drug traffickers. (Source: *The New York Times*, January 14, 2011)

Entire Namibian Coastline Preserved as Park

The driest country in southern Africa has designated its whole coastline as the National Skeleton Coast Park. Stretching for 976 miles (1,570 km) from the Kunene River, at its border with Angola, to the Orange River, on the border with South Africa, Namibia's new preserve encompasses 26.6 million acres (10.8 million ha), making it larger than Portugal. And the park does not stop at the national borders,

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since it abuts South Africa's Richetersveld National Park in the south, and Angola's Iona National Park in the north.

Excluding the Henties Bay, Swakopmund, and Walvis Bay municipal areas, the park consolidates three existing national parks (Skeleton Coast, Namib-Naukluft, and Sperrgebiet) and the newly inaugurated Dorob National Park. Minister of Environment and Tourism Netumbo Nandi-Ndaitwah called Dorob "Namibia's greatest and most significant conservation achievement since Independence." Nandi-Ndaitwah added that "there have been many allegations that the park will no longer be accessible to people. This is not true. These allegations come from those who do not care for our environment." She stated, however, that off-road operations will be "watched closely" and will face the "strongest fist of the law" if they do not adhere to the regulations.

The Skeleton Coast, which is composed of desert and savannah, shelters hyenas, Cape fur seals, and abundant birdlife, including African penguins. Black rhino and desert elephants follow the coast's watercourses, and small prides of lions have recently returned. (Sources: *The Telegraph* [U.K.], February 11, 2011; *The Namibian*, April 19, 2011)

California's Latinos and Asians Are More Concerned about the Environment Than Whites

A recent *Los Angeles Times*/USC poll has revealed that California's Latino and Asian voters are significantly more concerned about global warming, air pollution, and soil and water contamination than white voters. In a telephone survey of 1,689 adults, with a margin of error of plus or minus 2.4 percentage points, 50% of Latinos and 46% of Asians said they personally worry a great deal about global warming, compared with 27% of whites. Whereas 31% of whites said they are seriously worried about air pollution, two-thirds of Latinos and 51% of Asians expressed similar concern.

Peyton Craighill, who supervised the poll, said Latinos and Asians are far more likely to be registered as Democrats than whites, and Democrats tend to hold these views. According to Jane Junn, a professor of political science at USC and research director of the poll, "Environmental hazards are a part of the everyday lives of Asian American and Latino voters who are disproportionately represented in locations with high levels of pollution and contaminants."

Environmental organizations that have historically relied mostly on white constituencies for donations and influence in crafting legislation, including The Wilderness Society, the Sierra Club, and the Audubon Society, are now aggressively reaching out to ethnically diverse communities. "We spend the vast majority of our resources in districts that are dominated by, or have substantial, Latino and Asian populations," said David Smallwood, Southern California director of the California League of Conservation Voters. "Their concerns will help us build broader support for aggressively dealing with global warming." Jason Padilla, 26, of Riverside, California, said there is no doubt that minorities will become increasingly engaged in environmental issues. "We're stepping up and saying, 'Hey, we live, hike, camp, fish and play here too.' We're getting involved to help make changes that are morally and ethically right and benefit everybody." (Source: *Los Angeles Times*, November 20, 2010)

Online Forum Shares Climate Change Information and Tools

The not-for-profit Island Press and EcoAdapt have established an online forum called the Climate Adaptation Knowledge Exchange (CAKE). Located at www.cakex.org, CAKE offers practitioners case studies, a virtual library, a community section, a directory of people and organizations, and tools for climate change adaptation planning and implementation. By gathering resources and fostering communication among experts, CAKE facilitates the development and use of adaptation solutions that can contribute to battling climate change now and in the future. "Despite the attention now focused on mitigating global warming, the reality is that some level of it is inevitable," said Island Press president Charles Savitt. "Unfortunately, the field of climate adaptation is still in its infancy. That's where CAKE plays a critical role."

Vias Ferratas Contemplated for Canadian Parks

In an attempt to reverse declining visitor numbers and provide people with more reasons to visit Canada's national parks, the federal government has decided to allow a number of new recreational options, including hang gliding, kite surfing, community gardens, zip lines, and mountain biking. Banff and Yoho National Parks are considering installing *vias ferratas*, mountain paths with fixed cables, stemples (wooden steps set between notches in rock walls), ladders, and bridges in order to make previously rugged and isolated ascents accessible to a wide range of harnessed climbers. Pam Veinotte, superintendent of Lake Louise, Yoho, and Kootenay, said that although no

one has yet made a decision, "we will develop, support and promote new recreational activities where they meet certain criteria. [They will have to] align with the park's character." Veinotte noted that her parks have a history steeped in mountaineering. "So, actually, *via ferrata* seemed an appropriate first one for us to look at," she added.

However, according to an internal letter obtained through Access To Information, there was virtually no public support for such thrill-seeking activities during Banff's management plan review. In a letter directed to high-ranking officials, Banff superintendent Kevin Van Tighem stated, "Mostly we are hearing concerns about crowding and commercialization, plus predictions that these sorts of initiatives risk pushing some of our ecological integrity accomplishments backwards. It does seem that people are looking at this place as being defined by its wildlife and nature, its alpine beauty, its mountain culture and its wilderness adventure—and worrying that we could be drifting from those defining elements." (Sources: *The Vancouver Sun*, October 29, 2010; *The Rocky Mountain Outlook*, April 14, 2011)

Great Sand Dunes Offers Ambassadors for Wilderness Program

Since 2008, Great Sand Dunes National Park and Preserve, Colorado, has run a highly successful Ambassadors for Wilderness youth program—a wilderness-based education experience for local students from Colorado's San Luis Valley. Immersed in wilderness after extensive preparation, the students learn Leave No Trace and backcountry skills, experience a full range of wilderness values, work with National Park Service (NPS) staff from all divisions, and have an opportunity to practice leadership and personal and civic responsibility.

The majority of sessions take place in remote areas of the park and preserve, including high alpine zones, forests, and remote stretches of the dune field. Upon returning to school, students complete a project of their own design to educate others about their wilderness experience and about the resources of the Great Sand Dunes. The Ambassadors for Wilderness program charges no fees; food, gear, and entrance fees are paid for by the program. The participant is responsible only for his or her own personal clothing and transportation to the park. Local students currently in grades six through eight are eligible for the middle school sessions, and those in grades nine through eleven may apply for the high school sessions. Students who complete all summer sessions and the Ambassador project receive a $100 scholarship and their choice of either volunteer service hours or elective credit.

In recognition of this outstanding program, NPS Intermountain regional director John Wessels presented the region's 2010 Wilderness Stewardship Award to the Great Sand Dunes interpretation and education staff. Program information, a brochure, and a video may be accessed at www.nps.gov/grsa/ambassadors-for-wilderness.htm.

Joshua Tree National Park is No. 1 for Ozone Pollution

Joshua Tree National Park, California, recorded the greatest single-day ozone concentration of all U.S. national parks in 2010. That same year, the park experienced 53 days of ozone that exceeded federal health standards. A sign near the park entrances informs visitors of that day's air quality: green for good, and red for unhealthful. Ozone is an unstable, reactive gas that aggravates lung tissue, can cause headaches and nausea, and can trigger asthma attacks. It has been linked to early deaths. In sunlight, volatile organic compounds such as gasoline fumes react with nitrogen oxides emitted from vehicles and smoke stacks to form ozone.

Along with Sequoia National Park, air pollution at Joshua Tree is a significant challenge. Both parks lie adjacent to two of the nation's most polluted regions: California's South Coast and San Joaquin Valley air basins. Although the pollution does not originate in the parks, managers have little control over smog that drifts in from elsewhere. They monitor the problem, deal with the consequences, and worry about what the future holds. Not only does ozone at Joshua Tree ruin daytime views and sully the night sky, it fertilizes invasive grasses. The dry grasses increase the fire hazard by spreading flames among the native vegetation.

A new concern at Joshua Tree is fine-particle pollution, a mix of soot, dust, and chemical compounds, which is also unhealthful and creates gray or brown haze. As Colorado River water is diverted from farm fields in the Imperial Valley, south of the park, to farms and businesses in the San Diego area, less irrigation water runs off into the Salton Sea. As the sea recedes, the ground dries and dust clouds form. Joshua Tree National Park contains 600,000 acres (243,000 ha) of federally designated wilderness. (Sources: *The Press-Enterprise*, February 13, 2011; www.wilderness.net)

Canada Proclaims World's Largest Dark Sky Preserve

Canada's federal environment minister, Peter Kent, has proclaimed Alberta's Jasper National Park the world's largest dark sky preserve. At 2.8 million acres (1.1 million ha), the park will eclipse

the rest of the world's dark sky preserves, which together compose only one-fifth of the Jasper total. The preserves, which are officially recognized by the Royal Astronomical Society of Canada, are areas where no artificial light is visible and measures are in place to educate the public and promote the reduction of light pollution.

Canada has established 11 dark sky preserves—eight of which are in national parks or national historic sites—but unlike the more remote preserves, Jasper National Park is also highly accessible to the public. Kent said the designation won't force any changes on the town of Jasper, which already enjoys strict dark-sky regulations. "It is very seldom when I say we should celebrate the fact that we're in the dark," he commented, "but I think in this case there is reason to pop a cork or two." (Source: *Edmonton Journal*, March 14, 2011)

Protected Areas Increase Economic Gains in West Africa

A 2010 International Union for the Conservation of Nature (IUCN) study that analyzed how protected areas affect jobs and revenues in west Africa determined that local populations living close to those areas earn an additional 40% of their income from the preserves. According to Geoffroy Mauvais, IUCN regional coordinator for Protected Areas in central and west Africa, "We've found out that sustainable gathering of natural products made possible by the protected area[s] are the major source of increased income, with tourism and fishing following far behind."

The results come from some of the poorest areas in countries that are among the least well off in west Africa. The annual per capita income of the almost 8,000 people living in the local villages that surround the Nazinga forest in Burkina Faso, for example, is estimated at €304 (approximately $US450) in 2010. Sustainable gathering of shea nuts and other fruits, wild honey, grasses for brooms, straw, and wood, made possible by the protected area, account for the increased income. Mauvais added, "This 40% income growth can be considered as a minimum amount that could easily be increased with investment in ecotourism, for example… We now have a better understanding of the potential that protected areas have for both sustainable development and nature conservation, keeping in mind of course that conservation must be the priority and that local development must contribute to its reinforcement." (Source: www.iucn.org/knowledge/news/?7104/Protected-Areas-Increase-Economic-Gains-in-West-Africa)

Virunga National Park Requests U.N. Peacekeepers

Less than a week after three wildlife rangers and five soldiers were murdered in Virunga National Park by the rebel group Democratic Forces for the Liberation of Rwanda (FDLR), another ranger was killed and a driver was hospitalized in critical condition. The dire situation has caused park authorities to request the presence of United Nations peacekeepers.

Located in the Democratic Republic of Congo, Virunga is home to a quarter of the world's mountain gorillas, as well as chimpanzees, hippos, lions, forest elephants, and rare birds. It is one of Africa's most biodiverse parks and is a World Heritage Site. In the past 15 years, the park has lost more than 130 wildlife rangers to clashes with rebels and government soldiers using the park as a staging ground. (Source: news.mongabay.com/2011/0201-hance_virunga.html)

Book Reviews

A New Conservation Politics: Power, Organization Building and Effectiveness

By David Johns. 2009. Wiley-Blackwell. 408 pages. $59.95 (paperback).

A New Conservation Politics is an empowering, engaging book that seeks to educate conservationists on effective strategies of mobilization, communication, political action, and organization. The book identifies three factors to help conservationists better achieve their goals: clear vision, political influence (termed "the hammer," p. 94), and persistence.

Johns maintains that the political effectiveness of conservationists is often compromised by their tendency to use facts, rather than values or emotions, to gain public support. Conservationists are too focused on rationality and education, and by "not framing their arguments in terms of the audience's deepest understandings and values or by not invoking an emotional basis for action, they trigger the defence mechanisms associated with challenges to deeply held views" (p. 151). They expect the public to think critically when "critical thinking is rare" (p. 7). Johns suggests conservationists are repeatedly defeated because they are reluctant to resort to manipulative forms of political action, and are surprised when their opponents have no objections to using such strategies. This reluctance, coupled with being unprepared for successes, makes conservationists politically ineffective.

Johns also emphasizes the importance of a strong conservation community, as "good does not triumph over evil because it is good but because it is strong" (p. 11). Other weaknesses are identified: "Dependence on foundation largess limits organizations in many ways: many foundations are conservative and action-averse or seek to set recipients' agendas; being a tax exempt entity limits political action; and foundation support in total is inadequate" (p. 11).

The book also details the strengths of businesses in politics, and the assets that they typically have: the ability to give and withdraw economic benefits, and to decide types or degrees of environmental degradation. These strengths give them voting power, whereas conservationists typically try and influence public opinion, which doesn't necessarily translate into changed political behavior.

Johns warns that conservation will always remain an afterthought unless it is integral to people's lives, communities, and relationships. Johns criticizes "check-writing" NGO membership and notes an overall lack of grassroots mobilization. Along with detailed recommendations on mobilizing techniques, organizations with well-established networks such as city zoos are identified as potential allies in environmental action.

This book is highly recommended to any conservation activist, particularly those who are looking for specific tools and strategies to improve their effectiveness. Conservationists interested in activism but unsure of effective ways of doing so will find guidance and empowerment in *A New Conservation Politics*, from those looking to begin their activism journey to those organizing countrywide mobilization. At a time where climate change and conservation issues in general face strong, well-organized opposition, especially from industry-funded special interest groups, Johns presents some potentially useful analysis and solutions. "Playing nice" may provide the moral high ground, but may not be the optimal approach to environmental activism.

Reviewed by KATHERINE STACK, a graduate of the Outdoor Recreation and Tourism Management Program at the University of Northern British Columbia.

Connectivity Conservation Management: A Global Guide

Edited by Graeme L. Worboys, Wendy L. Francis, and Michael Lockwood. 2010. Earthscan. 382 pages. $79.95 (paperback).

The book was written under the auspices of the World Commission on Protected Areas (WCPA) of the International Union for Conservation of Nature (IUCN) to address the regional and continental need for planning and managing the connections between protected areas. The realization that protected areas were increasingly becoming isolated fragments across the landscape under

global environmental change brought some leading conservation and protected area authors together to address the need for more connectivity to conserve biodiversity.

The idea for this book began at a 2004 international workshop called "*Protecting the World's Mountain Corridors and Peace Parks"* in Banff, Canada, and was followed by IUCN WCPA workshops called "*Mountains Connectivity Conservation"* in Ecuador in 2006 and in Nepal in 2008. These workshops provided the dialogue, case studies, feedback on the book concept, and practical insights necessary to write this comprehensive and well-documented overview of the management of connectivity conservation around the world.

The book is divided into three parts. The first part sets the stage for the book with the theory, science, planning, and management of connectivity conservation, with particular emphasis on mountain connectivity conservation. The second part includes 25 case studies of the practice of connectivity conservation from six of the eight biogeographic regions on Earth: Africotropical, Australian, Indomalayan, Nearctic, Neotropical, and Palaearctic. The third part includes an overview of the main themes that emerged from the case studies and workshops and forms the practical and empirical basis for a connectivity conservation management framework that is proposed and discussed with implications for several different spatial scales. Additionally, the planning and management tasks required for successful connectivity conservation are outlined along with the challenges and opportunities.

The book concludes with a poignant warning and a suggestion for the place of connectivity conservation in a better future: "Without intervention, the reality of past and forecast human behaviour identifies the inevitable fragmentation and loss of natural lands and their ecosystem services. The end result would be an unhealthy and less diverse world. For many areas of the earth, however, we still have a choice: a worldwide network of large-scale natural connectivity conservation lands with their associated interconnected and embedded protected areas would constitute an investment in the survival of many species and a better future for the planet and the people who live on it" (p. 346).

This book is a valuable and practical resource for anyone interested in connectivity conservation, from policy makers to planners to managers, and would serve as a text for teachers and students studying the large-scale issues in conservation, biodiversity, protected area management, and landscape level connectivity.

Reviewed by CHAD DAWSON, *IJW* editor in chief and managing editor; email: cpdawson@esf.edu.

Continued from TECHNOLOGY, RISK, AND RESCUE, page 26

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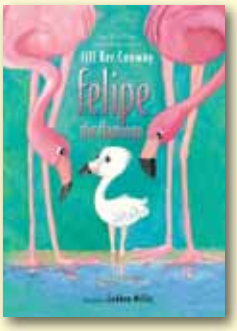

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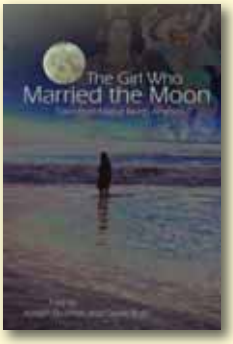

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