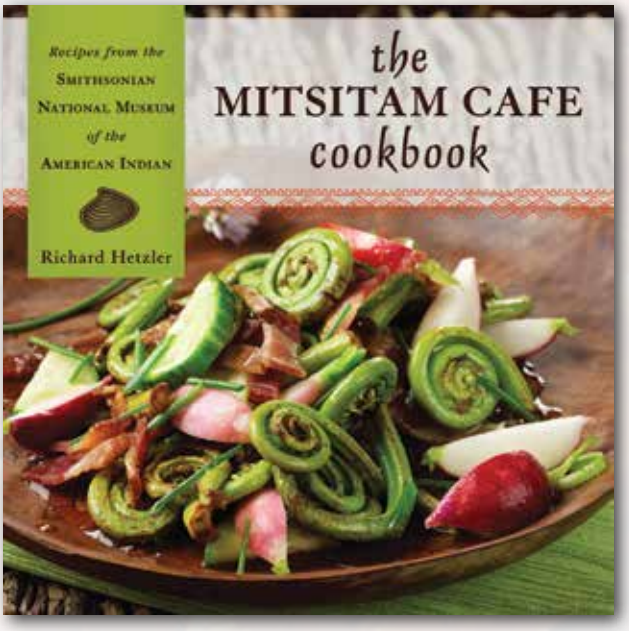
INTERNATIONAL

Journal of Wilderness

In This Issue

DECEMBER 2016 VOLUME 22, NUMBER 3



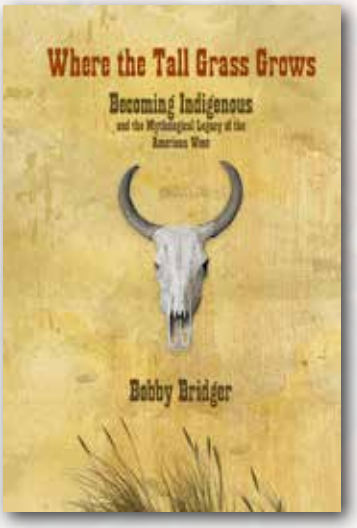
The Mitsitam Cafe Cookbook

Recipes from the Smithsonian National Museum of the American Indian

Richard Hetzler

Hardcover, 8 x 8, 192 pages, $26.95 US

Showcases the Americas' indigenous foods in 90 easy-to-follow, home-tested recipes. Author and Mitsitam Cafe chef Richard Hetzler spent years researching Native American dishes and food practices for this stunning cookbook. Includes full-color images of the dishes and of objects from the museum's collection.



Where the Tall Grass Grows

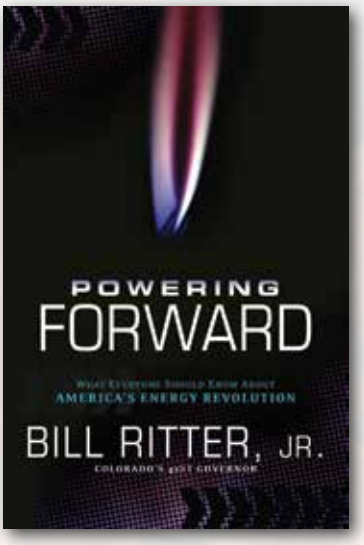
Becoming Indigenous and the Mythological Legacy of the American West

By Bobby Bridger

Paperback, 6 x 9, 464 pages, $29.95 us

Bridger's book is a gift to all who love the American West.
—Daniel Wildcat

The prophecies of the Lakota holy man Black Elk are woven into a chronicle of American Indians in the American culture psyche from the era of Buffalo Bill, Sitting Bull, and the Wild West through the creation of the Western, John Wayne, *Dances with Wolves*, *Avatar*, and modern myth making. In so doing, Bridger provides a highly original look at American history and culture from the mid-nineteenth century to the present day.



Powering Forward

What Every American Should Know About the Energy Revolution

Bill Ritter, Jr.

Paperback, 6 x 9, 350 pp, $17.95 us

A historic energy revolution is underway and wind, sunlight, and other sustainable resources are now the fastest growing sources of energy worldwide. American families are installing power plants on their roofs and entire communities are switching to 100 percent renewable energy. The urgent need to prevent climate change is causing people around the planet to question their reliance on carbon-intensive oil, coal, and natural gas. Author Bill Ritter Jr., discusses the forces behind the energy revolution, the new ways we must think about energy, and the future of fossil and renewable fuels. It is an essential read for any who want to understand one of history's biggest challenges to peace, prosperity, and security in the United States.

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Disclaimer

The *Soul of the Wilderness* column and all invited and featured articles in *IJW*, are a forum for controversial, inspiring, or especially informative articles to renew thinking and dialogue among our readers. The views expressed in these articles are those of the authors. *IJW* neither endorses nor rejects them, but invites comments from our readers.

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

On the Cover

Main image: There are many means of transportation in Mongolia, but none quite like the ships of the desert. With their ability to thrive in arid climates, camels have helped people navigate these harsh conditions for centuries.

Inset image: Breaking down barriers is never easy, especially when you are a 13-year-old girl. Ashol-pan was the first-ever female eagle hunter and changed the face of a 4,000-year-old culture.

Both photos were taken in Bayan-Ölgii, Mongolia by © Amy Vankanan.

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.

International Journal of Wilderness (IJW) publishes three issues per year (April, August, and December). *IJW* is a not-for-profit publication.

Manuscripts to: Robert Dvorak, Dept. of Recreation, Parks and Leisure Services, Central Michigan University, Room 108 Finch Hall, Mount Pleasant, MI 48859; Telephone: (989) 774-7269. E-mail: dvora1rg@cmich.edu.

Business Management and Subscriptions: The WILD Foundation, 717 Poplar Ave., Boulder, CO 80304, USA. Telephone: (303) 442-8811. Fax: (303) 442-8877. E-mail: info@wild.org.

Subscription rates (per volume calendar year): Subscription costs are in U.S. dollars only—Online access $35; online access and printed journal $50; online access and printed journal (Canada and Mexico) $62; online access and printed journal (international) $74. We do not offer an agency discount price. No refunds.

Submissions: Contributions pertinent to wilderness worldwide are solicited, including articles on wilderness planning, management, and allocation strategies; wilderness education, including descriptions of key programs using wilderness for personal growth, therapy, and environmental education; wilderness-related science and research from all disciplines addressing physical, biological, and social aspects of wilderness; and international perspectives describing wilderness worldwide. Articles, commentaries, letters to the editor, photos, book reviews, announcements, and information for the wilderness digest are encouraged. A complete list of manuscript submission guidelines is available from the website: www.ijw.org.

Artwork: Submission of artwork and photographs with captions are encouraged. Photo credits will appear in a byline; artwork may be signed by the author.

Website: www.ijw.org.

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EDITORIAL PERSPECTIVES

Does Wilderness Need a Celebrity ... or Just More Defenders?

BY ROBERT DVORAK

One of my favorite quotes by Edward Abbey is "wilderness needs no defense. Only more defenders." This quote has resurfaced for me in the context of our recent losses of some great wilderness defenders in Ian Player, Bob Lucas, and John Hendee. These individuals, and many others, have created, grown, and contributed to global wildland conservation in ways that many of us can only hope to replicate in some small amount.

As a professional dedicated to protected area management and conservation, I have come to know many of the "defenders" of the wild through their writings. These include Abbey, Rachel Carson, Aldo Leopold, Sigurd Olson, Bob Marshall, Dave Foreman, and others. For many of our colleagues, the writings and reflections of these defenders are the foundation or the voice of their own personal values and passion for wild places and protected areas. Personally, I have had a few instances to listen to individuals like this speak in person, and far fewer opportunities to interact with them on any kind of personal level. I had the privilege of seeing and hearing Dr. Jane Goodall speak at the 9th World Wilderness Congress in Merida, Mexico, and then again at my university's campus speaker series. Her passionate words, as I'm sure many can attest to, did not disappoint. Instead, they reaffirmed my values and drive to contribute to our profession and the conservation of wild places.

I cannot help but wonder, as I consider the future of protected areas and wild places, "Who are the next iconic, possibly transcendent defenders for wild places? Who can reach that level of respect not only in the professional community but also in the global population?" I ask this question of the college students in my courses. Instead of an answer, they often point to the challenges such a defender would face today. Our world is now one of interconnectedness, a 24-hour news cycle with social media that provides instantaneous information. It is also a world where everyone can provide their critique and feedback, whether through blogs, websites, and yes … editorials! Given this context, how difficult is it for an individual to emerge as a global representative for wild places and conservation?

This has led me to ask the question "Does wilderness need a celebrity?" Let us examine several celebrities who are known to a global audience. Some individuals, such as Jack Hannah and Steve Irwin (i.e.., the "Crocodile Hunter") have had limited success in energizing conservation education and awareness of the natural world. Others, such as Leonardo DiCaprio and his speech on climate change at the United Nations, were met with criticism and skepticism because of perceived incongruences in his statements and his own individual carbon footprint. The challenge with any "celebrity" is that in social media today we are quick to praise someone's accomplishments, and ready to criticize his/her missteps. We admire their prominence and social-political influence while wishing we could individually influence the public to the same extent.

But what "celebrity" does not have a goal that rallies "defenders" to the cause? So maybe wilderness could benefit from a celebrity, but one individual cannot lift up wilderness as a single goal to the vast diversity of our global population. Let us heed Edward Abbey's words a bit more closely and continue to recruit "defender*s*." It

Continued on page 34

SOUL OF THE WILDERNESS

A Tribute to John C. Hendee

A Pioneer of the Global Wilderness Movement in Science, Research, Education, and Communications

BY CHAD P. DAWSON and VANCE G. MARTIN

Wilderness Leader

Dr. John C. Hendee, cofounder of the *International Journal of Wilderness* (*IJW*) in 1995 and longtime *IJW* editor and wilderness champion, died on June 16, 2016, in San Rafael, California, after a brief illness. John Hendee was a nationally known researcher, author, educator, and administrator related to forestry, human dimensions of natural resources, wilderness stewardship, visitor experiences in wilderness, and wildlife management in wilderness. Dr. Hendee was internationally known for the integration of science-based information with wilderness management and decision making, his books and articles on wilderness management and stewardship, and his efforts to establish *IJW* as a journal and forum to keep wilderness professionals informed, sharing best-practices and strengthening the importance of them worldwide.

The following brief narrative about John's life cannot begin to illustrate the complexity of his many and diverse accomplishments in a very full life in public service, research, education, and activism.

Forest Harvesting to Wilderness Experiences

John Hendee was born in 1938 in Duluth, Minnesota, nearby to where his father worked with the US Forest Service (USFS). Clare Hendee, John's father, had a long and distinguished career with the USFS culminating as deputy chief, and was the person that John often mentioned as his professional model. After John had served 25 years with the USFS himself, and with one of his daughters and son also working in their early careers in the USFS, he would jokingly refer to the USFS as "the family business."

John earned his BS degree in forestry from Michigan State University (1960) and began his career in 1961 in reforestation, timber sale management, and road construction on the Siuslaw National Forest in Oregon. John continued work with the USFS as he did his graduate work, completing a master's degree from Oregon State University (1962) and later a PhD degree from the University of Washington (1967). During those years he was involved with backcountry activities with his family and with Boy Scout groups in places such as in Oregon, where he would take boys into backcountry areas that would later be part of the National Wilderness Preservation System. During his doctoral program and as a USFS employee, he spent a year in Washington, D.C., working as a legislative affairs intern for Senator Frank Church and Congressman Jim Weaver, focusing on wilderness legislation and designations.

John worked for the US Forest Service for 25 years (1961–85) in field forestry, research, legislative affairs, and administration. He received numerous awards during his career, and the one that he said meant the most to him was a Lifetime Leadership Award given to him at the 9th World Wilderness Congress in Merida, Mexico (2009) by the US Forest Service for his educational work in wilderness management and stewardship.

In those 25 years with the USFS, John came to see the values and benefits of all the national forest outputs, from timber to wilderness experiences. Some of those insights came from trips as a young man with his father to backcountry areas such as the High Sierras in California. During an interview on May 6, 2014, John mentioned that another important turning point later in his life

was attending a wilderness gathering where he learned how "to take people on a wilderness vision quest, [as] a time in the wilderness alone ... that introduced me to the healing and personal growth side of wilderness." Through his early research about wilderness experiences, and in his later support of his wife Marilyn's guiding business that took people into wilderness on vision quests, John would explore the positive and personally transformational impacts of wilderness experiences on visitors to wilderness and wild places.

Figure 1a – John Hendee

Figure 1b – John Hendee

Wilderness Researcher and Educator

In 1985, John left the USFS and joined academic colleagues in a different career as an administrator, researcher, and educator related to forestry, recreation, and wilderness management. He served in various positions at the University of Idaho as Dean of the College of Forestry, Wildlife and Range Sciences (1985–1994), Professor of Resource Recreation and Tourism, and Director of the Wilderness Research Center (1994–2002).

His academic career extended his writing efforts in research and educational materials that had begun with numerous research reports during his USFS career. During his life he authored or coauthored more than 150 professional publications, including contributing chapters to 18 books and coauthoring three textbooks – two of which are still in print. His most well-known publication, used extensively nationally and internationally as the standard text, is *Wilderness Management: Stewardship and Protection of Resources and Values.* Now in its fourth edition (Dawson and Hendee 2009), it was first published in 1978 as a result of USFS collaboration and an interest in federal interagency training for wilderness managers. To assure timely, cost-effective updates, John engineered the donation of publishing rights of this textbook to The WILD Foundation, which has been responsible for three subsequent editions.

Contributing to the fifth edition of *Introduction to Forests and Renewable Resources* was a special achievement for John, as his father, Clare Hendee, was previously a coauthor of this book. John would go on to contribute to and then lead the subsequent editions of that textbook through the current eighth edition (Hendee, Dawson, and Sharpe 2012).

One of the most ambitious projects John contributed to was his work as cofounder of the *International Journal of Wilderness* in 1995 and serving as its managing editor and later editor in chief for 16 years. *IJW* is one of the longest ongoing outreach projects of The WILD Foundation, and the only international journal dedicated to wilderness with an unparalleled online archive.

The WILD Foundation and the World Wilderness Congress (WWC)

John served on numerous boards of directors over his career, including nearly 30 years with The WILD Foundation, working for the protection of wildlands and natural areas worldwide. His contribution and leadership focused on promoting wilderness research and science-based stewardship and management of wild lands to support The WILD Foundation's global commitment to wildland and wildlife protection, as well as their World Wilderness Congresses (WWC), which convenes periodically around the world.

He first became acquainted with The WILD Foundation via discussions with Vance Martin regarding John's potential presentation in 1983 at the 3rd WWC in Scotland. The USFS would first reject and later approve John's request to travel to WWC3 to make a presentation, where he then personally met Ian Player and Vance Martin. The friendship with Vance and Ian would lead John into an international wilderness movement – through WILD and the

Hendee the Mentor

I often credit John Hendee as my very first source of knowledge about the National Wilderness Preservation System and igniting a career-long craving to contribute to the science of wilderness. Fresh out of the military, studying parks and recreation administration at a community college in 1974, the instructor assigned an article for us to read by John Hendee and Bob Lucas, published in 1973 in the *Journal of Forestry*, entitled "Mandatory Wilderness Permits: A Necessary Management Tool." As I've repeated so many times in my life, that article and the rejoinder by Behan in 1974 got this college student's attention and has never let go. Behan's suggestion that mandatory permits represented a "police state wilderness" resonated just as strongly with this reader as Hendee and Lucas's plea for use of permits as a way to educate visitors, understand visitor use and users better, and potentially control impacts through limits on use. The complexity of protecting the wilderness character of these places, assuring wilderness experiences for visitors, and meeting the purpose of wilderness for all people and future generations was a dilemma in trade-offs we still struggle with; these pioneer wilderness scientists educated us so well.

I didn't know it then, but that youthful image of John Hendee published along with that article represented my greatest mentor down the road for many years, first as a graduate student at Virginia Tech, later as a university faculty member in Georgia, and eventually as a Forest Service wilderness scientist in Montana. John was the calm hand that gave me a nudge in the right direction when I questioned the right way to go, the calming voice when I struggled with bureaucracy or criticism, the strength in resolve when I needed a critical analysis of a decision, and, most of all, a mentor in integrity and open-mindedness toward fellow human beings. He taught me so much. I will be forever grateful.

ALAN WATSON is the senior research scientist at the Aldo Leopold Wilderness Research Institute, Missoula, MT.

Figure 2 – John loved to travel in desert wilderness areas of the southwestern United States and especially southern California. Here he is in the North Maricopa Wilderness studying some cactus species while on a field trip with Bureau of Land Management staff in Arizona. Photo by Chad Dawson.

WWC – that would become one of John's most committed wilderness organization relationships.

Chad Dawson: My Personal Experience with John Hendee

While I had read many articles by John and the first and second editions of the *Wilderness Management* textbook, my first personal meeting with John was at the 5th World Wilderness Congress in 1993 at Tromso, Norway. He, his son Jared, and a group of graduate students were staying at the same camping resort in the hills outside the city as was the group of colleagues I was traveling with – all of us making presentations at the WWC. Through our informal conversations and my questioning him about his wilderness visitor research, I came to understand that the reason he was so prolific in writing and publishing was because his reasoned arguments for visitor management and resource protection were well supported by research. After a few in depth conversations, I was immensely impressed with how informed, organized, and passionate he was on numerous and diverse topics about wilderness.

A couple of years later, when I was teaching a class at State University of New York College of Environmental Science and Forestry using the *Wilderness Management* textbook (2nd ed.), I explained in lecture that some of the material on visitor participation in wilderness was outdated, and that visitor use had actually increased and not decreased as projected in one of the book chapters. After I showed some of the newer information to the class, one of the students asked: "If [I] know the book author, and did [I] plan to bring that new information to his attention?" The class got into a discussion about visitor participation, and the student's question to me was

put aside. In the following class, I explained that because the actual visitor use had increased it changed some of the implications for wilderness management as stated in the book, and so I began to outline the newer implications. The same student, who had asked me previously if I knew the book author, interrupted and asked again: "Have you contacted the author yet to share some of the newer visitor information"? I confessed that I had not, but added that I would do so by email that very afternoon.

My email to John was quickly answered by his invitation to me to submit a proposed outline for an updated chapter with supporting references because he was starting to plan for a third edition of the book. I provided the requested outline and quickly received an email to this effect: "Congratulations, you are now coauthor of the revised chapter. How soon can you provide a full draft of that chapter?" The class was delighted to hear that the book author, John Hendee, was interested in updating the book and they began to read it more thoroughly. As I presented each chapter through the semester and the class discussed the new material that should be considered in a book revision, the same student challenged me to communicate the ideas to John. Following each email to John with an outline of proposed chapter changes, I would receive back an email that saying, "Congratulations, you are now coauthor of this additional proposed chapter revision. How soon can you provide a full draft of the additional chapter?" As the semester came to an end, I began to worry about what I had gotten myself into with all these proposed revisions. That was about the time that I received another brief email from John: "Congratulations, you are now a coauthor of the entire

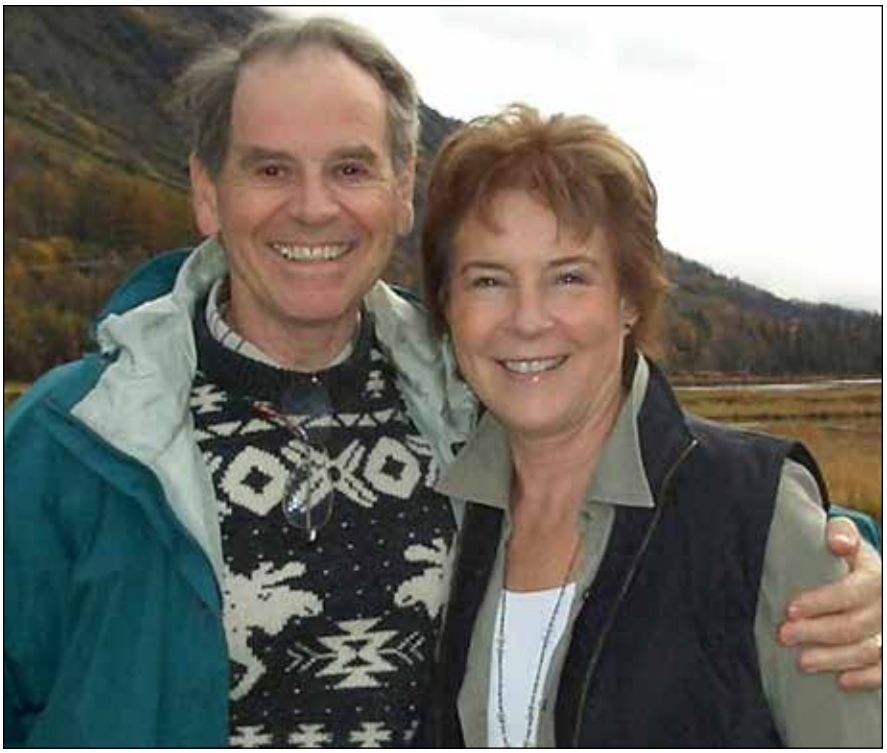

Figure 3 – John and Marilyn Hendee on a field trip near Homer, Alaska, following the 8th World Wilderness Congress in Anchorage. John attended eight WWCs during his affiliation with Vance Martin and The WILD Foundation. Photo by Chad Dawson.

The Hendee Influence

John Hendee and I began our careers in the same general era, which, let us just say, was a number of years ago. John, like many of us who worked in USFS social science during those early years, had many interests. All hovered around forest, recreation, and wilderness management social science. John believed studies of users, managers, youth, and other subsets of the American population were essential for improving management philosophy and practice. I had the privilege of knowing and working with John Hendee since beginning my career. John had a very strong influence with managers, researchers, and politicians. His research, writing, and professional involvements are still referenced. One of a number of experiences I had with John was to participate in a wilderness vision quest that he and a colleague had organized in North Carolina. Most of the participants were in research with the USFS's Southern Research Station. There were different "takes" on the quest by those of us who participated. One of my takes was that John had, and likely still has, a deep spiritual connection to wilderness. John excelled at leadership through his innovative ideas, guidance, encouragement, accomplishment, and eagerness. Along with others, his wilderness leadership is evident in the success of The WILD Foundation, the World Wilderness Congresses, and the *IJW*. I still struggle to fully realize that John Hendee has moved on to his ultimate wilderness vision quest. Good job, John!

KEN CORDELL is a scientist emeritus from the USDA Forest Service.

Figure 4 – At the 4th World Wilderness Congress (Colorado), recognizing China's massive re-afforestation work to combat desertification by presenting them with the first Green Leaf Award (from WILD Foundation). From left: Jonathan Bronson, Vance G. Martin, John Hendee, representatives from Embassy in the USA of the People's Republic of China, and Ian Player. Photo by The WILD Foundation©.

proposed third edition. Can you meet me at an upcoming wilderness conference to set a two-year work plan together?" I was flabbergasted – how was I going to keep up with this hard-driving colleague?

Over the next two years of collaboration with John on the third edition of the *Wilderness Management* textbook, I came to know him as a relentless and extremely talented science editor with some chapters undergoing up to 14 detailed revisions before being considered final. Some days I wondered if he could ever be satisfied with what we were doing, and then I took the time to compare some of the early chapter revisions with the later versions, and I learned two important lessons: (1) the chapters were decidedly improved and so was the integration between chapters resulting in an easier-to-read book for students, and (2) not only was I becoming a much better writer, I was learning to edit and was sending back revisions to John on some of his work. I do not recall when that editing "give and take" began, but I must have earned his respect because he began to accept my suggested editing to his writing.

Over the years that followed, we revised the *Wilderness Management* textbook in a fourth edition, the renewable resources textbook in an eighth edition, and other articles and publications on wilderness and wilderness experience programs. John as editor in chief of the *International Journal of Wilderness* invited me to become managing editor of *IJW*, and he mentored me along each step of the way. I have never had another colleague like him. If he promised some writing or editing by a certain date, it was done well and on time. He set and held extremely high professional standards for himself – he expected no less from me. When the work became intense or seemed overwhelming, he always had an anecdote from USFS days, a humorous story from his years in academia, or an observation about the contradictions in human behavior. He could tell a good story and enjoyed hearing them as well. As driven as he was to be highly productive at integrating wilderness research into wilderness management decision making and stewardship, he was a gentle zealot in his approach to engaging folks in wilderness experiences. He extolled the healing, personal development, and self-reflection experiences of wilderness to any and all who would listen and he regularly visited wilderness himself, with his wife Marilyn, and with other friends and colleagues.

Now John is in the far country with the creator of wild places. I hope he is at peace on a ridge overlooking a grand mountain landscape – the kind of place he liked to protect and to find on his wilderness hikes to reflect on life.

Vance Martin: My Personal Experience with John Hendee

Life's course is designed through personal relationships, many of them often unusual … "strange bedfellows" are not uncommon. Such is the case with how John Hendee came into his work with WILD and the WWC.

In the early 1970s, Ray Arnett was the head of California Fish and Game Commission under Governor Reagan, and as such represented his state and the hunting community in general when he was a delegate to the 1st World Wilderness Congress (South Africa 1977). An ardent political conservative and hunter, he became fast friends with Ian Player (a progressive changemaker and former hunter), and they stayed in touch closely. When Ronald Reagan was elected US president, he named Arnett his Assistant Secretary for

Fish, Wildlife, and Parks, under Secretary of Interior James Watt.

At that time, John Crowell was President Reagan's Assistant Secretary of Agriculture. He decided to visit South Africa, and Ray Arnett advised him to go on a wilderness "trail" with Ian Player. In 1982, the two men went, alone, into the iMfolozi wilderness for four days, and Crowell was incredibly impressed. He asked Ian if there was anything he needed done in Washington.

Ian had heard of John Hendee (political liberal and visionary), who had virtually pioneered the academic field of "the use of wilderness for personal growth and therapy," with at least 30 peer-reviewed papers on the subject by 1980. Ian asked Crowell, whose Department of Agriculture had responsibility for the USFS, if he could arrange for John Hendee to participate in the 3rd WWC. Crowell not only did that, he also advised the secretary of agriculture (John Block) to be a keynote speaker at the 3rd WWC.

"Even people who have not been to wilderness … go out and they come back feeling they have been in touch with a part of themselves that they had not touched before." –John Hendee

At that time, John Hendee was at the USFS Southeast Forest Experiment Station. Internet, email, and fax were not yet invented(!) so we talked often over expensive telephone calls, and I learned quickly that he was a Type A executive – a thinker, visionary, and hardworking leader

Figure 5 – Members of the Executive Committee, 4th World Wilderness Congress during a break in the 1985 planning meeting at Rocky Mountain National Park. From left: Vance G. Martin, Jay Hughes, John Hendee, Ed Wayburn, and Tom Thomas. Not pictured are Michael Sweatman and Peter Thacher. Photo by The WILD Foundation©.

with prodigious output. By the time John arrived in Scotland, we had become friends, and that friendship grew during the WWC. I learned a great deal by watching him operate. As the 3rd WWC proceeded, John Hendee and Ian also formed a strong friendship, and John told Ian that the WWC must come next to America and that he was prepared to help. Ian said he had just the young man to run it, and they both conspired to convince me that my future lay in the United States.

Ian Player had been "working on me" for a year, insisting that it was time I stopped living abroad and return to the States, to "be the American you are." In 1974 he had created the International Wilderness Leadership Foundation (IWLF) – a US nonprofit organization. It operated for some years with initial funding Ian raised, with a very influential board and a mandate to not only collaborate on the World Wilderness Congress but also to take young people out on wilderness trail with Ian's Wilderness Leadership School in South Africa – which it did thru a program with the US Explorer Scouts. It had slowed down its programs, and Ian wanted me to revive it. (I eventually did so, with John's help, in the process rebranding it as The WILD Foundation.)

By the end of the 3rd WWC, I agreed to do a site selection trip to the States, and John set up meetings with several universities that could arrange for sponsored offices, some support, and so forth. John traveled with us for most of that trip, on government funding ("international relations"), and we visited sites in California, Oregon, and Colorado. By the end of that trip, with a commitment from Colorado State University to provide offices and with the basic financial help of newspaper publisher Tom Worrell, we could take the next step. I moved my family from Scotland to Colorado, and we started the daunting task of organizing the 4th WWC.

John Hendee was incredibly committed to this process. Although he was still a leader in the USFS, he was literally on the phone to me

Figure 6 – John Hendee (left) and Ian Player on a hike at Taylor Ranch (University of Idaho) in 1987 following the globally successful 4th World Wilderness Congress. Photo by Vance G. Martin©.

every day, mentoring, coaching, and envisioning with me whatever we needed to do. John also saw that science needed to be fully represented in the international wilderness movement and that the WWC was the means to do this. It was his vision that started the Science Program that premiered in 1987 at the 4th WWC. With eight concurrent sessions it was very rigorous, with many practical outputs including (inter alia) the first promotion and intense research into the concept of marine wilderness. That Congress was pivotal in global conservation and in positioning the wilderness concept internationally, with Norwegian Prime Minister Gro Harlem Brundtland chairing the only US hearing on her UN-sponsored initiative (the Bruntland Report, which popularized the concept of sustainable development), with participation by 17 ministers of finance or environment, opened by President Ronald Reagan's Secretary of Treasury (James Baker), and chaired by Maurice Strong (chair of the first UN Conference on Sustainable Development that established UNEP). Out of the 4th WWC came many things, among them the first inventory of global wilderness (by Michael McCloskey, CEO and chairman of the Sierra Club) and the working concept of a World Conservation Bank (conceived by WILD chairman and former banker Michael Sweatman), which eventually became the Global Environmental Facility of the World Bank (GEF) and has since granted over USD 20 billion to environment and biodiversity projects worldwide.

John Hendee was responsible for helping me steer this global ship, and stood by me daily for many years. Even when he left the USFS and became dean at the University of Idaho, we stayed closely in touch daily, visiting and traveling frequently, with visioning sessions in the wilderness and agendas in Washington D.C., and elsewhere. The 4th WWC was a significant milestone in international conservation and greatly helped establish wilderness as an important global concept.

After the 4th WWC, John remained a key adviser, mentor, and visionary who guided my career. As is always the trajectory between teacher and student, we were constant colleagues. We almost always agreed on tactics and strategy, but when we did not – to the credit of John's vision, person, and style – we always remained fast friends and colleagues, sharing strategy, black humor, beers, and ideas. He was instrumental in my work and in creating wilderness as a core concept in international conservation and sustainability. I greatly miss his daily presence and wisdom.

Lifelong Wilderness Experiences

John always spoke fondly of his early backcountry experiences with his father in various places he was stationed with the USFS. He credited a trip with his father in the High Sierras in 1953 as being a turning point in his view of wilderness and wild places. As a young professional, John would lead Boy Scouts in his time with the USFS in Oregon into the backcountry – and some of those places would later become designated wilderness areas. As a father, John enjoyed taking his family on wilderness trips in the summer around the United States. Later in life, John and his wife, Marilyn, loved hiking and camping in the wilderness, especially the desert, and they spent many days and nights of their life together in beloved places in the eastern Sierras and Mojave Desert.

The positive power of wilderness experiences was often the subject of John's research or his stories of personal adventures. As he noted during his interview in 2014: "Even people who have not been to wilderness … go out and they come back feeling they have been in touch with a part of themselves that they had not touched before."

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Technology in Wilderness

Emerging Issues and Directions for Research, Policy, and Management

BY TOM CARLSON, JOHN SHULTIS, and JOE VAN HORN

Just as technology has had an incredible impact on contemporary society, so too have technological innovations had significant impacts on wilderness and the wilderness experience. In terms of the relationship between wilderness and technology, for example, the impact of technology associated with the Industrial Revolution in the late 18th to early 19th century shifted societal perceptions of wilderness (e.g., via the Romantic Movement); the appearance of the automobile in the early 20th century facilitated visitation of wilderness and acted as a catalyst for the wilderness preservation movement; and the rise of synthetic materials (e.g., nylon, aluminum) in the mid- to late-20th century further facilitated visitation and allowed people to become much more mobile, comfortable, and safe in wilderness settings (Shultis 2012).

The use of new technologies in the 21st century includes cell and satellite phones, Unmanned Aircraft Systems (UAS, aka drones), Geographical Positioning System (GPS) units, information sharing via the Internet, and personal locator beacons (PLBs). The effects of the use of these newer technologies is not yet well studied and understood in terms of their biophysical, psychological, and behavioral impacts. Informal discussions with wilderness managers indicate increasing use of many forms of new technologies in wilderness, but the scarcity of empirical study and specific agency policy, combined with insufficient resources, has generally led to a lack of direct management action.

Why are there inconsistencies and unresolved divergent opinions on the use of new technologies in wilderness? Does it reflect only inadequate policy and guidance, poor decision-making tools/processes, insufficient training, a wider societal unwillingness to consider the unintended consequences of technology in our lives,

Tom Carlson. Photo by Terry Carlson.

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Joe Van Horn. Photo by NPS.

uncertainty about the likely effectiveness of interventions in wilderness, lack of funding or other types of institutional support, or is it just because many of these devices and uses are relatively new? While all of these may contribute to some degree, our fundamental conclusion is that both a lack of empirical research on the impacts of increasing use of new technologies and inadequate policy and/or guidance are the foremost barriers to making good decisions about whether, where, and when to impose management actions. Without clear policy and guidance based on solid research, decision-making frameworks and training are not yet well studied and will inevitably be applied in inconsistent ways, reflecting the personal perspectives of the decision maker at the time regarding the impacts associated with use of new technologies. With necessary study and discussion leading to clear policy and guidance, wilderness stewards should be in a position to apply decision-making tools to make good decisions that hopefully will attract the funding and other institutional support to allow for effective implementation.

The objective of the article is to highlight the potential issues the use of technology might have on wilderness and wilderness management, review the limited literature that exists on the topic, relate these to issues identified by

wilderness managers, and examine the implications of this information on policy development and management of global wilderness and other protected areas. This article is based on a recent white paper by the Society for Wilderness Stewardship (Carlson, Shultis, and Van Horn 2015).

Technology in Wilderness: Perceptions and Issues

The use of contemporary technology in and outside of wilderness has the potential to change how wilderness is perceived, experienced, and managed (Douglas and Borrie 2015). These changes will likely range from being very positive to very negative for the variety of actors involved in wilderness preservation and management (e.g., wilderness visitors, special interest groups, and wilderness managers) and for the wilderness itself. As Stankey noted, "If any issue deserves characterization as 'Janus-like,' technology is it" (2000, p. 17).

The traditional perception of wilderness has been the physical and psychological challenges of visiting a wild, natural environment. This perception has necessitated acquiring skills of self-reliance to be able to successfully travel and camp in wilderness using nothing more than a map, compass, and good decision making. There has always been a degree of inherent risk in wilderness given the knowledge that natural hazards exist and the chances of swift rescue are diminished by the remoteness of the areas (Hall and Cole 2012). Off-trail travel was typically limited to those who had the necessary skills. Information about opportunities and experiences in wilderness was shared by word of mouth on a limited basis or through guidebooks. Areas in need of special protection (e.g., archaeological sites) were not typically identified to reduce potential impacts.

The use of personal electronic equipment (e.g., cell phones, GPS units, PLBs, etc.) in wilderness areas within the Unites States is not prohibited by the Wilderness Act of 1964 or subsequent legislation. But the widespread use of some newer technologies, along with the increased use of online information sharing platforms (e.g., social media, trip maps, blogs, websites, electronic guides, etc.) may prompt changes in the perception and use of wilderness and create real and potential impacts for wilderness and wilderness managers. These changes in visitor experience and behavior may include an overreliance by some visitors on technology in remote areas for travel-route location and decision making, and a perception that risk is decreased because emergency rescue can be more easily summoned (Shultis 2012). Changes may also occur because of information transfer that occurs outside of the wilderness. For example, visitors who map a new off-trail travel route can easily share that route via the Internet and social media, which leads to others using the same previously unused route. If the shared information leads to a significant increase in use and impacts to a fragile ecosystem or inadvertently causes others to discover and damage archaeological resources, social and biophysical degradation of wilderness may occur. In addition, some visitors may have a perception of wilderness not as an area of natural conditions and processes to be respected and discovered but rather as an area where they can use their technology (Ewert and Shultis 1999). This may lead to a perception of less contrast between wilderness and other lands and potentially a changed value for wilderness in society.

But there may also be more positive impacts from the use of technology. The increased comfort and safety provided by many recent technological advances (e.g., lightweight materials, improved communication devices) may also lead to additional or longer visits to wilderness areas, including those areas previously perceived to be "out of reach" before the widespread availability of new recreational equipment. The technological advances in new equipment may also allow older users to continue using wilderness areas (e.g., walking poles, lightweight materials) (Shultis 2015). The ability to use new technology may also help address the recent declines in use of many protected area systems. Increasing visits to wilderness may lead to a greater understanding and appreciation and ultimately public and political support for wilderness areas in the public lands.

There is also the potential for landscape scale impacts to wilderness. Requests for power lines, pipelines, water developments, cell towers, and so on, have been and will continue to be proposed for wilderness areas. New technologies may also help make these developments more feasible. Managers may also be tempted to use new technology (e.g., drones, trail-making machines) to perform research or management.

What's Missing: Gaps in Research and Policy

Underlying the discussion of the use of new technologies in wilderness is the lack of research on the issues noted above. The vast majority of published work on this topic is almost entirely written by academics and is anecdotal in nature, focusing almost completely on the potentially negative consequences of technology (Shultis 2012). Existing literature

on the topic also tends to focus on specific types of technology (e.g., communication tools such as cell phones and personal locator beacons or navigation tools such as GPS units), while ignoring others (e.g., lightweight synthetic materials) (e.g., see Borrie 2000; Borrie 2004; Dawson 2007; Dickson 2004; Douglas and Borrie 2015; Ewert and Shultis 1999; Roggenbuck 2000; Van Horn 2007; Watson 2000).

In general, no US agency policy or guidelines are readily available to help managers prepare or take action when needed. Nor has the previously published work managed to generate a sustained debate about the potential impact of technology in wilderness settings. Shultis (2012, p. 117) suggests, "The unwillingness of Western society to question the use of new technology or consider its impacts, the commodification of leisure experiences in our consumer society, and the public desire for safety, comfort and ease also provide challenging roadblocks to such a public debate."

Finally, the lack of adequate US federal agency wilderness management policy to help wilderness managers address issues of new technology has led to lack of action or, in some cases, inconsistent management approaches as well as uncertainty among wilderness managers over how to address existing and emerging examples of this issue. The consequences of inadequate policy may include unnecessary biophysical resource impacts and confusion or misunderstood opportunities for wilderness visitors.

Issue Identification: Wilderness Manager Anecdotes

Recently, an informal request for examples of new technology use in wilderness was distributed in the four US federal agencies with management responsibilities for wilderness. Where new technology is or has been an issue, most managers were addressing impacts on a case-by-case basis, using a combination of monitoring, information, education, and law enforcement techniques. Most respondents indicated a need for more emphasis on better definitions of the various types of new technology, discussion of the appropriate uses of new technology in wilderness, new or clearer agency policy to help evaluate impacts and formulate management strategies, and additional resources to prioritize actions such as visitor information and education (see Carlson, Shultis, and Van Horn 2015).

Managers stated they were experiencing more false alarms from PLBs due to the increasing use of this technology. While many were due to an inadvertent triggering of the device, sometimes alarms were sounded for a relatively minor problem or in a moment of panic. Managers were also encountering situations in which users with a PLB failed to check in with a designated contact person in a timely manner. Sometimes these were proven to be legitimate emergencies, but frequently it was a result of forgetfulness or being out of range. Managers also stated that many of the same concerns identified for PLB use applied to cell phone use (e.g., calls increasingly received for nonemergency situations). However, the ability to communicate directly with the user did provide a chance for the manager to limit the response to an appropriate level, or encourage the user to personally deal with it.

The larger concern was that these devices seemed to be changing the wilderness user's attitude away from self-reliance toward a reliance on others if a problem developed. Many managers wondered if a new generation of users would develop the necessary skills to deal with wilderness problems on their own if the technology were to fail. They were also concerned that users were taking more risks or extending themselves beyond their limits on the assumption that they could contact someone to bail them out. These concerns were based on conversations with users and appraisals of changing experience levels in users made by experienced field staff.

Managers reported several emerging issues related to the sharing of extremely detailed trip information that includes GPS data and digital imagery, sometimes captured by UAS flights, that is now widespread via the Internet. For example, they noted significant and sudden increases in use that can be directly related to information published on the Internet about a specific location or route and were particularly concerned about use changes in areas without designated trail systems (e.g., increases in informal trail development and a proliferation of campsites). Because use levels typically were low in these areas, they were often not viewed as a priority for monitoring in the past, and, in many cases, baseline information did not exist for quantitative evaluations. However, we also found several examples of sufficient monitoring leading to recognition of the issue. In these cases, management action taken through visitor information and education and proactive contacts with user organizations, web managers, bloggers, and others led to some changes in the availability and use of the information by visitors, and a reduction of impacts.

In addition, longtime managers felt that there have been several

significant changes in how users are interacting with wilderness. For example, users were routinely taking more electronic equipment (and solar powered chargers) into the backcountry. There also seemed to be a very strong desire to constantly "document" and share the trip with others. Hikers could be found gathered at "hotspots" for connectivity, the locations of which are noted in apps or on the Internet. Digital cameras allow hundreds of photos to be taken and linked to GPS points, and video footage of a hike or climb is commonplace. Are the more contemplative values of wilderness that are linked to its pristine and primitive aspects being missed because users never really leave modern society behind on their trips?

Similarly, staff that regularly contacted visitors also report that there has been a greater expectation and desire for very detailed trip planning information from others. They want a trip that has been determined to be the "best" by someone else rather than help planning a trip that might be the best for them. There is a reluctance to try something that isn't already rated and documented by someone else.

Managers also felt that lightweight equipment has allowed hikers to travel faster. This has changed use patterns, particularly along trails such as the Pacific Crest, where long-distance hiking is popular. Use allocation models based on previous hiker behavior are not working as well as in the past. Managers could not link a greater need for rescue to the use of lightweight equipment, but they did feel that many trips were ended sooner than expected due to lightweight gear not providing adequate protection during extreme weather conditions common to many wilderness areas.

Current Policy

As previously described, there exists a lack of current policy from the four US federal agencies applicable to new technologies (Table 1). The Bureau of Land Management (BLM) has addressed new technologies by requiring that "new activities and technologies will be evaluated as they are developed" and identifies specific concerns related to geocaches. The other agencies do not yet have specific policies to address new technologies, although the National Park Service (NPS) has recently prohibited all use of Unmanned Aircraft Systems (UAS) by visitors over national parks. The BLM, Fish and Wildlife Service (FWS), and Forest Service (FS) have considered forming separate task forces to address the UAS issue for wilderness areas they manage but are not currently formulating policy for other new technologies. The FS has also identified the commercial use of video filmed by UAS as an additional issue that requires new policy and management strategies.

Future Research and Management Responses

The existing literature from wilderness researchers tends to focus on highlighting the potential negative impacts of modern technology on risk perceptions and behavior of wilderness users. Most frequently, communication technology (e.g., cell phones and personal locator beacons) is identified as being problematic, based on anecdotes provided by managers and local/regional media outlets (e.g., see the comments provided by managers above). One empirical study found in a sample of northern California wilderness users a "substantial subset of visitors (high risk takers in the pro-technology cluster; 23% of the sample) with a combination of traits that managers have expressed concern over – high risk takers who (1) believe that technology reduces many of the dangers people associate with being in the wilderness, (2) believe that having technology makes people think their safety is not their personal responsibility, (3) believe that technology creates a genuine increase in safety for wilderness users, and (4) are willing to take more risks and then use that technology to bail themselves out of trouble" (Martin and Pope 2012, p. 125).

Future research could assess the following basic and frequently asked questions facing wilderness managers:

- How does the use of modern technology increasingly embedded within recreational equipment influence the perception of risks and actual risk-taking behavior in the wilderness?
- Does the use of advanced technology change the meaning of the wilderness experience, and if so, how and why do these changes occur?
- How do users think managers should deal with the increased use of technology in wilderness areas (i.e., which managerial approaches would be supported or considered most appropriate)?
- What are managers' perceptions of this issue?
- How important is it and what potential approaches are considered appropriate?

But the deeper questions about societal use of technology should not be ignored. For example:

- How do our social and cultural

Table 1 – US Land Management Agency Policies and Guidance Relating to Technology in Wilderness

Agency	Policy ID	Policy	Guidance
Bureau of Land Management (BLM)	BLM Manual 6340, 1.6 C13e	"New activities and technologies will be evaluated as they are developed. … The BLM must first consider whether the technology or activity violates one of the prohibitions of Section 4(c) … [Section 1.6B]. … If a new activity or technology does not violate one of the Section 4(c) prohibitions, the BLM may allow it as long as it does not otherwise impair wilderness character".	No additional guidance.
Fish and Wildlife Service (FWS)	FWS Manual – Natural and Cultural Resources Management – Part 610, Wilderness Stewardship	610 FW 2.34, How does the Service enhance solitude or opportunities for primitive and unconfined recreation in wilderness? We minimize the presence of modern artifacts of civilization, such as signs, bridges, structures, and technology; large groups; unnecessary managerial presence; and conflicting uses that tend to interfere with one's free and independent response to nature.	Additional resources available online to agency employees.
Forest Service (FS)	FS Manual 2300 – Recreation, Wilderness, and Related Resource Management, Chapter 2320 – Wilderness Management	There is no policy that specifically addresses use of technology beyond the Wilderness Act Section 4(c) prohibited uses.	The Chief's Letters of (March 27, 2015, and July 8, 2016) and the Director's Letter (April 17, 2015) provide direction on administrative use of UAS for all national forests including links to other guidance including tools, plans, and public education materials. "Drone Tips" (July 2015) encourages public UAS pilots to know and follow FAA rules and avoid flying over wilderness areas. There is also an effort under way to address commercial mapping and videography in wilderness.
National Park Service (NPS)	NPS Management Policies 2006, Chapter 6, 8; Director's Order #41: Wilderness Stewardship; and Reference Manual #41: Wilderness Stewardship	There is no policy that specifically addresses use of technology beyond the Wilderness Act Section 4(c) prohibited uses. However, Policy Memorandum, June 20, 2014, a temporary policy, directed NPS superintendents nationwide to prohibit launching, landing, or operating unmanned aircraft (drones) on lands and waters administered by the National Park Service.	Guidance is being developed to address administrative use of UAS in all national parks with specific guidance for use in wilderness areas.

perceptions of the role of technology in society reflect or influence wilderness users' perceptions of recreational technology?

- Why is concern expressed over certain types of technology and not others?
- Why is it so hard for Western culture to critically examine the cumulative impact of technology on society (i.e., the so-called "unintended consequences" of technology)?
- Why did concern over drones in natural areas lead to a relatively rapid response from the National Park Service (see Table 1 above), while other technologies have not been singled out as being worthy of concern?

The positive impacts of existing and future technology should also be assessed. A recent qualitative study of primarily highly experienced wilderness recreationists in New Zealand found that users almost completely focused on the positive attributes of technology: the increased comfort and safety provided by new technologies allowed users to gain new skills, undertake more trips, and visit new areas. They saw technology as a great enabler to access, remain comfortable, and stay safe within the wilderness (Shultis 2015). Similarly, Martin and Blackwell (2016) studied the impact of technology on visitors to the Sequoia-Kings Canyon Wilderness in California, and suggested that the use of new technology allowed visitors to have less stress and worry while on their wilderness visit, giving them and their loved ones an added sense of

security. Visitors suggested they were able to enjoy solitude when they carried the technology with them. Further, risk takers said they would be just as likely to take the same risks with or without the technology (e.g., cell phones, personal locator beacons). It is interesting that the very few empirical studies of wilderness visitors almost completely reflect the positive impacts of technology on the wilderness experience, while the nonempirical literature (reflecting management concerns) almost completely focuses on the negative impacts of technology on the wilderness experience. Why do managers and users have such different perspectives on the impact of technology?

In addition to the need for additional empirical studies on the impacts of new technologies in wilderness, there is also a need to explore the development of more definitive policies to manage potential and existing impacts. As noted below, the four federal agencies in the United States have not yet formulated policy related to new technology (except for the NPS prohibition on the public use of drones in all parks), and managers are struggling to address impacts when they do occur. Basic questions center around whether use of some or all of the new technologies should be allowed or encouraged or whether they should be discouraged or limited by either regulation or information/education.

Any regulatory action will require supportive data on changes in use level, patterns of use, and biophysical impacts. Our discussions with managers indicated that this type of data is not normally available. Agencies need to consider ways to gather this data for the areas where change is most likely to occur now because of the time required to acquire this information. Situations in which it appears changes are already occurring have been previously discussed in this document. Areas that are managed for dispersed use such as trailless zones or trail corridors where use is regulated by trailhead quotas seem to be priorities for immediate attention. Unique recreational opportunities for self-reliance, solitude, and naturalness that are key wilderness values can be quickly lost in these pristine areas once use escalates and impacts such as new informal trails or campsites occur.

"…our fundamental conclusion is that both a lack of empirical research on the impacts of increasing use of new technologies and inadequate policy and/or guidance are the foremost barriers to making good decisions about whether, where, and when to impose management actions."

Concentrated use management systems that employ designated trails and campsites have some resilience to change, as opposed to dispersed management systems, which can be quickly altered. The authors understand the budgetary and staffing limitations that land managers face today, but suggest it is essential that baseline inventories for these dispersed use areas be made a priority. Once again, additional research on more effective methods for inventory techniques in dispersed management systems could ease the already difficult job that managers face. Extensive research has been done on measuring the condition of designated trails and campsites. Some of these techniques are transferable, but many are not. The worst outcome would be for agencies to devote their limited resources to poor data collection that would not be useful or defendable.

There is also a role for nongovernmental organizations with regard to the issue of technology of in wilderness. One of the challenges for conducting baseline inventories is the amount of area that needs to be examined. The scale is likely well beyond the abilities of even the best staffed wilderness operations. Cooperative volunteer efforts with agencies to conduct basic presence/absence surveys of impacts could significantly increase the ability to accomplish the needed work. A side benefit for the agency is that it also provides a way to engage user groups and make them aware of an important issue in a constructive way. This type of collaborative engagement has been successfully used in other land management issues.

Perhaps the most important recommendation that can be made is for the agencies to acknowledge that the use of new technology can create changes, both negative and positive, in wilderness resources and visitor experiences, and that it is an important issue they currently face. Once it is recognized as such, wilderness managers have a wealth of professional experience and creative energy that can be focused on how best manage these activities for both the benefit of the resource and the users of wilderness. Partnerships with academic institutions could also be used to generate additional research and perspectives.

Conclusion

The current state of both knowledge and policy related to new technology use in wilderness seems inadequate to address the needs of managers and wilderness visitors. Also, decisions about whether to take action against use of new technologies have been inconsistent. Many managers take a reactive approach to these impacts as the basis for visitor education or regulation, but others wonder if there is value or even necessity in the use of new technologies in wilderness that can enhance both understanding and support for wilderness. In addition, the four federal agencies are not using a coordinated approach (e.g., only the NPS currently bans UAS in wilderness); clear and instructive agency policy, informed by research, is lacking.

To help move forward on the issue of new technologies in wilderness, it is important to remember that technology is always a double-edged sword in society, having both positive and negative impacts simultaneously. It seems likely that the impacts of technology on the wilderness experience and resource are similarly complex as well as mutually constructive and destructive: our managerial response to technology should address both aspects resulting from the use of technology in the wilderness.

Adams (1996, p. xii) noted that in modern society, "ongoing technological change presents us with a highly complex, contradictory set of challenges. Systematically linked in ways that are often counterintuitive, these challenges include irregular, nonlinear paths of advance that defy prediction. Enveloping and invading our lives at every level, they call for choices in which short-run and long-run considerations are forcibly blurred by attendant uncertainties." These challenges are certainly reflected in the issue of technology in wilderness, but the increased use of research on the topic, creation of policies, and increased internal and external discussion on the issues and questions raised by increasing new or emerging technologies would help wilderness managers take proactive as opposed to reactive steps to maintain or improve both the social and biophysical attributes of wilderness.

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2020 Vision Implementation Plan

As Interagency Wilderness Stewardship Priorities Nears Completion

BY NANCY ROEPER

The agency heads of the National Park Service, US Fish and Wildlife Service, Bureau of Land Management, US Forest Service, and US Geological Survey (USGS) signed *2020 Vision: Interagency Stewardship Priorities for America's National Wilderness Preservation System* at the 50th Anniversary of the Wilderness Act Conference in October 2014. This interagency vision for the future of the US National Wilderness Preservation System, based largely on the results of a 2014 wilderness managers' survey, contains 19 objectives grouped under 3 basic themes: Protect Wilderness Resources (Protect), Connect People to Their Wilderness Heritage (Connect), and Foster Excellence in Wilderness Leadership and Coordination (Lead.)

Following the 50th anniversary, the interagency Wilderness Steering Committee (wilderness leads for the four federal wilderness management agencies and the USGS) established an interagency team of 24 employees subdivided into three teams to focus on the three themes of the 2020 Vision. The team developed a draft 2020 Vision Implementation Plan (Plan) consisting of a series of action items that they agreed would be the highest priority actions that the agencies should implement to achieve the goals of the 2020 Vision.

At the 2015 Wilderness Workshop in Missoula, Montana, in October 2015, the team invited the public to comment on the draft Plan during sessions explicitly designed to capture their input. These comments were submitted to the committee, who incorporated them into the draft Plan as appropriate. The Wilderness Policy Council (policy level representatives of the four wilderness management agencies and research representatives from the Forest Service and the Department of Interior) reviewed the Plan and approved a four-week internal agency review in April 2016. Based on the approximately 450 comments submitted, the committee produced a revised draft Plan.

In early June 2016, with the approval of the council, the committee notified individuals and organizations that participated in the 50th Anniversary Conference and those that participated in the October 2015 Wilderness Workshop that further input would be sought on the draft Plan during a four-week public review period. The committee encouraged the public to submit comments via PEPC (the NPS Planning, Environment and Public Comment site). The committee also posted information about the public review on the wilderness.net website and held three webinars in June to explain the process used to develop the draft Plan. In total, the committee received nearly 1,100 comments from 830 individuals representing either organizations and/or themselves.

Of these, 177 were general comments that did not relate to a specific objective or action item of the Plan. These included many statements expressing general support for wilderness and keeping wilderness wild, untouched, and for future generations. Others expressed support for expanding partnerships, clarifying responsibilities and/or adding field offices as responsible parties for achieving action items, increasing the number of wilderness rangers, and recognizing the importance of special provisions for wildernesses based on their designating legislation.

Nearly 600 comments contained identical or almost identical language expressing concern that the Plan diminishes the central importance of wildness to wilderness character because many of the action times would allow various manipulations in wilderness for the benefit

of other values (e.g., naturalness) at the expense of wildness. They felt the Plan should treat all wildernesses as areas where humans won't manipulate them at all and ignores the importance and decline of the professional wilderness stewards within the federal agencies. The Plan should recognize that professionally trained wilderness rangers within the agencies are the ones who will provide long-term protection and care, and the Plan should state that additional research in wilderness must be conducted with methods that respect the wilderness and without motorized/mechanized means or permanent structures and installations.

Of the 131 comments specific to a theme, objective, or action in the Plan, more than 60 related to the Protect theme. These included concern that over time the agencies have come to rely on generally prohibited means to conduct stewardship activities in wilderness and the acceptance of ecological interventions as reflected in the many action items that refer to invasive species management, monitoring, fire management, and other items for managing or restoring wildlife or ecological conditions. It was also suggested that the Plan include a definition of wilderness character, and that the Plan measure success based on measurable wilderness character and wildness conditions rather than the quantity of plans, agreements, databases, personnel training, and so forth.

The committee also heard that we should include collaboration and partnerships with the states on many action items associated with the fish and wildlife conservation objective and coordinate more closely with the National Wildfire Coordination Group. There were concerns about restoring fire to ecosystems, including the fear that prescribed fire is yet another manipulation of the wilderness landscape and that responding to climate change may lead to additional reasons to intervene in wilderness.

"The team developed a draft 2020 Vision Implementation Plan … consisting of a series of action items that they agreed would be the highest priority actions that the agencies should implement to achieve the goals of the 2020 Vision."

Almost 40 comments related to the Connect theme. Many commenters supported expanding Leave No Trace education and messaging. There was interest in designating more areas as wilderness, as they are so valuable to the American public, and there was a suggestion to make sure that hunting and fishing were included as traditional, cultural, and recreational use of wilderness. There was also concern about commercializing wilderness as we seek new ways to support wilderness stewardship. Numerous commenters were concerned about the degradation of trails, especially as this is viewed as the primary means of public access to wilderness. While there was significant support for providing more volunteer training and other partner opportunities, others warned the committee to beware of giving too much power to partners and of replacing professional staff with volunteers and partners.

Approximately 30 comments focused on the Lead theme. These included the need for more emphasis on expectations for field staff rather than making the Arthur Carhart Wilderness Training Center, Aldo Leopold Wilderness Research Institute, and committee responsible for so many actions. Another suggestion was to develop mentoring programs to connect experienced wilderness manager with new employees and to increase consistency of policy interpretation and implementation across the agencies. Increasing our capacity to use traditional tools and practices was also expressed.

The committee was gratified to see the level of interest from a broad spectrum of our wilderness partners and other members of the public in the draft Plan. Even as the Plan is finalized, we have been implementing some of the action items, such as completing additional wilderness character baseline assessments, developing a Science Plan, and integrating wilderness content into agency non-wilderness training courses.

With the support of the Wilderness Policy Council, wilderness managers and other field personnel, our dedicated partners, and our new partners, we can achieve the vision of fulfilling the promise of the 1964 Wilderness Act and fostering the commitment, expectations, responsibility, and skills within and outside the agencies needed to protect America's National Wilderness Preservation System.

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The Aldo Leopold Wilderness Research Institute as a Historic Resource

The Importance of Metadata and Data Archiving

BY CARLY CAMPBELL

Digital archives are an increasingly important historical aspect of data management and science. Researchers, and the agencies that support them, are experiencing an increased demand for archiving of both new and older data. Emphasis is being placed on publication of collected data alongside peer reviewed reports. Traditionally, research findings have been distributed through presentations, trainings, and publications, in which data are available in analyzed and summary form. However, further management of raw data is now encouraged, and increasingly required both for funding and publication from a variety of journals and to meet federal standards.

The Aldo Leopold Wilderness Research Institute (ALWRI) has, like many research organizations, been under pressure to manage its data in a more open access environment. In May 2013, Executive Order 13462, and the associated memorandum, mandated that US federal agencies "collect or create information in a way that supports downstream information processing ... requirements include open formatting, usable metadata, data standards, and machine readability." This directive comes at the end of a long deliberation by the Office for Science and Technology (Goben et al. 2013). It is just one piece in a larger conversation about the role of data and digitization in the modern world. In 2010, the National Science Foundation (NSF) began requiring all grant applicants to include data managements plans (Hernandez et al. 2012). Early 2015 saw the latest in a series of meetings on the NSF Public Access Plan (Silverthorne 2015), as well as a new set of guidelines promoting public access for data related to all journal publications from the American Meteorological Society (Mayernik et al. 2015). Similar announcements have been made, or are under discussion, across many disciplines. For ALWRI, mounting requirements are only part of the drive to develop a comprehensive data archive.

Carly Campbell

A digital data archive is a resource. The more accessible data are, the more added value can be realized by current and future analysis possibilities. For wilderness social science, access to data is vital for understanding the changing dynamic between wilderness and wilderness visitors. Moreover, the methodologies used in wilderness data collection can serve as a model to researchers and organizations, drawing upon a database for precedent. An archive, and an internal catalog, is useful for any agency to understand its own progression through time. ALWRI, with protection responsibility of nearly 50 years of wilderness science (1967 to 2016), currently has only limited access to that history until archives are complete.

Widespread Issues and Possible Solutions

The call for digital raw data is the result of a global debate about the role of scholarly communities in a digital-technology world. As various disciplines and communities explore methods of archiving long-term data sets, conflicts have emerged over the methodology, and legalities, of the archiving process. There are several main issues of concern: primarily, on whom does the responsibility fall

to create the archive? How does a large online database preserve the context, and intention, of a study? Most importantly for individual organizations, what is the financial cost of putting together a database and an archiving team?

There are some implicit challenges to creating a data archive. An accessible database requires a searchable infrastructure. Commonly, data is structured and described through metadata – a data overview that gives information about the what, when, where, and why of the original set. Metadata creation also needs consistency and readability across changing formats, both digitally and in analog form. Who takes responsibility for sharing data and collecting information in a suitable format? The major candidates are the scientist and the archivist. One argument is that the scientist, who knows the study best, should be responsible for managing his or her own data (Wilson 2010). The opposing side argues that it should be handed over to a trained "data archivist" who knows formatting standards. The most common resolution to these concerns comes from two places: success of archiving teams composed of both scientists and trained historians, and the increasing encouragement for scientists to be trained to archive their data as part of the scientific process.

The question of responsibility is largely driven by concern for context. Although summarized publication data is no longer considered adequate for extending the use of research, providing raw data on its own removes the context in which it was created. Beyond the data itself, a traditional analog archive (i.e., hard copy files) generally includes all the components of a project, with researcher correspondence, study plans, measurement instruments, progress reports, budget sheets, and final publications. The danger of the digital archive and open-access data sets is the lack of meaning for sheets of numbers by themselves (Klein et al. 2014).

An Internet-based archive has the ability to bring together "large and dispersed collections of material" (Monks-Leeson 2011, p. 39). Data are organized outside of their original meaning, within pools of similar projects. How does one determine what is valuable? Economists writing for the *Canadian Journal of Economics* call for data to be coded and archived before submission, as part of the scientific process, especially as the logistics of the information is best understood with the expertise of the one who gathered it (McCullough et al. 2008). However, the data has to be understandable, and most importantly, replicable, to have valid meaning: "The ability to replicate a study is typically the gold standard by which reliability of scientific claims are judged" (National Research Council 2002).

In the realm of wilderness social science, this is further complicated by the necessity of combining quantitative data with qualitative research. Many studies that have come out of ALWRI have been concerned not just with the state of the wilderness (such as visitor perceptions of wear and tear and number of wildlife encounters) but also with the experiences and opinions of the wilderness visitors. Studies have investigated concepts such as dimensions of experiences, threats to solitude, and interpersonal conflict. Archiving in any form encounters the problem of context, but qualitative work especially has "special relationships – between the researcher and his or her data, research participants, industry partners and research collaborators – [which] could not easily ... be transferred into an archive" (Broom, Cheshire, and Emmison 2009, p. 116). For an organization such as ALWRI, neither summary publications nor raw data adequately reconcile this problem. The resulting argument is for the use of metadata in a digital format, and an internal catalog.

The financial investment into data archiving is a consideration of any institution and the managers making decisions. Scientists must be trained to archive, or archivists hired to revisit research. A database must be created, or found, and then maintained. Depending on the nature of the data, an enormous amount of time and effort may be required to scan or code documents. In 2013, more than US$30 million was paid toward the National Archives Record System through the Forest Service Greenbook assessment (USDA Forest Service 2016). Although cost varies significantly from project to project, an archive can be an expense.

However, development of searchable archived databases lead to data reuse, which can be an extension of the value of research. A study done in 2011 sought to quantify the touted benefits of data sharing. It found that a project originally funded in 2007 by the National Science Foundation resulted in 16 direct paper publications. They searched PubMed for the datasets from that 2007 project, which had been submitted to the Gene Expression Omnibus repository. They found that the data contributed indirectly to more than 1,250 published articles (Piwowar, Vision, and Whitlock 2011). Managers of the soil archives at the Northern Great Plains Research Laboratory expressed a similar sentiment in that "there are

numerous opportunities for research using the ... soil archives; opportunities that on-site personnel realize will only be brought to fruition through collaborative efforts with other researchers" (Liebig, Wikenheiser, and Nichols 2008, p. 977). Cooperative teamwork within and among research organizations should be part scientific and part economic consideration. A digital database that extends the use of a funded study is a positive investment.

Wilderness Social Science Research

The Aldo Leopold Wilderness Research Institute is a federal research group dedicated to the improvement of stewardship in wilderness and similarly protected areas. This collaboration connects an interdisciplinary and interagency team of scientists and is the center for research on the role of wilderness in larger social and ecological systems, evaluation of monitoring and management tools, and research on public attitudes toward restoration and intervention.

The delivery of knowledge to wilderness managers and other scientists has always been a long-term goal of ALWRI, and in recent years, it has taken up the call for data dissemination by examining its own historic files. One additional pressure is the aging of the researchers originally connected to studies, who have moved on to other positions, projects, or retirement. This is a classic dilemma of archiving, in which the context and knowledge behind data is in danger of being lost with the researcher who produced it (Rausher et al. 2010). However, Alan Watson has been instrumental in bridging that gap.

Alan Watson has been an active staff researcher since before the Leopold Institute was officially founded out of a Forest Service Work Unit (in 1993). Before 1988, Watson was an academic researcher working on several Forest Service–sponsored wilderness research projects. He is one of the founding executive editors of the *International Journal of Wilderness* and has represented ALWRI in five Fulbright appointments (Finland, Russia [twice], Brazil, and the Republic of China) as well as on the Executive Committee of the World Wilderness Congress. His contribution to wilderness science, the wilderness stewardship community, and to ALWRI, is vast and irreplaceable. He has provided leadership in more than 40 research projects, and has collaborated with many academic scientists on projects, each resulting in publications and data sets of long-term value.

"Effective wilderness stewardship demands an understanding of the consequences of management decisions. Every manager's knowledge and skill base can be increased by access to an archive of studies dealing with wilderness science."

Equally important is Watson's personal knowledge of each study: the reasons behind them and the linkages between them, the outcomes of each project, and the decision making involved. Expertise in various methodologies is important, as many of the studies overseen by ALWRI do not strictly involve quantitative, statistical results. Rather, there has been a dual approach of quantitative surveying and qualitative interview processes, which produce and inform complex decisions.

While most research reports include summaries of methods employed, often the descriptions in publications are insufficient to allow full replication or even full understanding of data transformations and coding (Corti 2012). Especially for US federal research agencies, the last decade has seen short funding for new opportunities. It is a critical time to gather and manage what has been produced up to this point, before it is lost between the digital process and physical realities of declining budgets and personnel.

Collaboration between scientists of various disciplines and experience is vital for a data archive that is as comprehensive as possible. Social science researchers such as Alan Watson transfer their knowledge of complex study methodology into context for data that would otherwise be lacking.

Standards

As research institutions put forward the effort to archive, the need for standard formatting and procedure arises. Different journals, libraries, and organizations have different standards; for the US government, common requirements have existed for some time.

In 1990, the Office of Management and Budget established the National Spatial Data Infrastructure Committee (NSDI) (Federal Geographic Data Committee 2015). The NSDI is a line of supervising committees that oversee nationwide interagency publishing of federal data. In 1995, the Federal Geographic Data Committee (FGDC) published a mandatory standard that dictates consistent formatting and terminology for

metadata. ALWRI and the US Forest Service are both guided by the NDSI and the FGDC Standard throughout the archiving process.

ALWRI, the Rocky Mountain Research Station, and the US Forest Service utilize the software Metavist, an R&D program that assists in the creation of metadata. The result is "data about data." Metadata are used to answer such questions as what data were collected, how they were collected, why they were collected, how reliable they are, and what issues should be accounted for when working with them" (USDA Forest Service 2015). The metadata produced by ALWRI follow the Biological Data Profile developed by FGDC in 1998, as well as profile category standards such as ISO 19115 and the National Research and Development Taxonomy. These standards are the necessary system in creating accessible and understandable data.

A dynamic team has been working with the ALWRI to create metadata for a digital archive. It is a slow process, as each study's methods, coding, and survey data reflect a unique team of scientists, as well as the research interests of a particular time and place. While meticulously going through old folders and study files, the archive team found several projects that stood out as resources for researchers and the agency.

Case Study I

One complicated metadata was a 1991 study done in the Alpine Lakes Wilderness. Focused on themes of visitor solitude and encounter rates, it was teamed with a biophysical assessment of visitor impacts and attitudes toward restoration (Watson et al. 1998). It was a study that explored methods of observation and data gathering, the effort and range of which were not fully described in the final publication. The researchers used nine different methods of measurement, which produced nine different data sets and coding manuals. Data were gathered by different groups of people, including wilderness technicians. One process involved "trained observers" systematically observing selected groups, in which a researcher would hike at approximately the same speed as a visitor group, and then stop at destination points to test real-time observations of social conditions and travel patterns. Ranger observations and exit surveys were also employed to learn about travel patterns and social conditions encountered on wilderness visits.

The Alpine Lakes project was a test of methodologies. Its value extends beyond the results in publications or even the varying success of each data set. For managers, and scientists struggling through form approval or study design, a project such as Alpine Lakes provides detailed descriptions of several monitoring methods as well as comparative results for each method. Each study and data set that is archived should be regarded as a historic resource in this way.

Case Study II

Some studies have been replicated over time, relying on older data for trend analysis. Periodically, ALWRI has conducted or funded studies with at least a partial purpose of replicating comparable data from earlier studies.

For instance, nine wilderness and wilderness study areas were studied very early by Lucas (Lucas 1980) specifically to establish baselines in visitor characteristics and attitudes at the following locations: the Desolation, Bob Marshall, Cabinet Mountains, Selway-Bitterroot, Mission Mountains, Great Bear, Scapegoat, Spanish Peaks, and the Jewel Basin Hiking Area. However, looking back on the studies that served as a baseline, it was discovered that there were missing and incomplete data sets. For example, The Selway-Bitterroot Wilderness baseline data set was not included in data files that had been maintained across computer systems.

While putting together the historic catalog, the missing data were found in the form of original surveys piled in boxes in the closet. After sorting through the boxes, and attempting to match the 1971 coding manuals to the surveys, the discovery took a remarkable turn. Alongside the 45-year-old surveys that had once been stored away were questionnaires that had no associated publications or research summaries. The original researchers had done a special sample of a primitive area in Idaho called Salmon-River Breaks, which were not included in the baseline publication. In previous compilations of data sets from the time period, there was no record of these data existing. Additionally, the Salmon-River Breaks primitive area itself no longer exists, since the 1980 Central Idaho Wilderness Act combined several smaller areas into the Frank Church-River of No Return Wilderness (Wilderness.net 2015). The process of archiving has therefore restored the full set of baseline studies and revealed an entirely untapped historical data set, as well as generated the rescue of paper-based data at risk of being lost.

The case of the baseline studies seems particularly telling as they were intended for determining changes in wilderness use and users over time.

For new analysis to be meaningful in the modern context, it is critical for researchers to have full access not just to the data from last year, or coming years, but also from 45 years ago.

Conclusion

Wilderness social science and conservation research involves careful observation of the natural world and the way humans interact with it. The value of research data only grows over time, when considering environmental impacts and shifting societal values. Effective wilderness stewardship demands an understanding of the consequences of management decisions. Every manager's knowledge and skill base can be increased by access to an archive of studies dealing with wilderness science.

The Aldo Leopold Wilderness Research Institute as a unique organization is committed to the creation of a comprehensive archive and file catalog. For scientific research, the process requires scientists, archivists, and the support of management. It is a critical moment to bridge digital processes and ensure data are preserved and accessible. For any organization, archiving is both an investment and a resource. In the realm of wilderness science, access to raw data and metadata is vital for understanding the changing dynamic of wilderness, the environment, and people.

The searchable database for wilderness research can be found at http://www.fs.usda.gov/rds/archive/.

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Boulderers' Attitudes and Beliefs

Regarding Leave No Trace in Rocky Mountain National Park

BY FORREST SCHWARTZ, B. DERRICK TAFF, DAVID PETTEBONE, and BEN LAWHON

Abstract: Bouldering is a growing recreational activity, frequently occurring in fragile wilderness areas. As bouldering use increases, so too does the potential for ecological and social impacts. Leave No Trace–based educational strategies are the most prominent form of indirect management used to influence wilderness visitor behaviors. Given the growth of bouldering in wilderness and the lack of understanding regarding boulderers' perceptions of minimum impact practices, the purpose of this study was to examine boulderers' attitudes and perceptions of Leave No Trace in Rocky Mountain National Park. Results suggest that boulderers' attitudes generally align with Leave No Trace recommended practices, although attitudes are less congruent with practices that are perceived as limiting to safety, access, and maintaining bouldering opportunities in the park. Findings indicate that global perceptions of Leave No Trace are positive and that educational communication strategies that target specific bouldering behaviors could minimize ecological and social impacts associated with bouldering. Results provide wilderness managers with baseline attitudinal data, which can be reevaluated in the future and monitored in conjunction with ecological data, after educational communication and outreach strategies have been deployed.

Keywords: Bouldering, Climbing, Leave No Trace, Education, Communication

Forrest Schwartz. Photo by Kevin Sliman.

Derrick Taff. Photo by Peter Newman.

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Ben Lawhon. Photo by Rob Stephens.

Recent research suggests that the majority of rock climbers in the United States, some two-thirds of the estimated 7.5 million recreational climbers, consider themselves to be boulderers or indoor/gym climbers (Outdoor Industry Association 2013). Bouldering is a recreational activity associated with climbing on small rock formations that are short enough in height that ropes and other climbing equipment are not used, given that heights of the climbing challenges rarely exceed 15–20 feet (5–7 meters). Instead of ropes for fall protection, boulderers rely on crash pads and fellow boulderers to act as "spotters." The increase of the sport in parks and protected areas can be attributed to the limited amount of equipment needed (e.g., climbing shoes, crash pad, climbing chalk) and the increase in dedicated climbing- and bouldering-specific gyms and fitness centers over the past decade (The Access Fund 2006). As bouldering continues to gain in popularity and participation, more climbing opportunities are being discovered within both public and private lands, including wilderness areas. It therefore becomes increasingly important that park and recreation managers be aware of the ecological and social impacts associated with bouldering.

Over the last decade, Rocky Mountain National Park (RMNP) has become an iconic bouldering destination, particularly in the Emerald Lake and Chaos Canyon areas.

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In 2011 a bouldering guidebook was published, increasing awareness and visitation to the park's vast bouldering resources, uniquely set within the stunning yet fragile alpine wilderness found within RMNP. Officially designated as wilderness in 2009, RMNP contains high alpine peaks exceeding 12,000 feet (3,658 m) and views of the Continental Divide that attract visitors from nearby urban cities and across the world (Pettebone 2013).

Like all outdoor recreation activities, bouldering has the potential to cause ecological degradation, such as vegetation loss, soil erosion, and resource modification; social impacts, such as user conflicts, crowding, and increased anthropogenic noise; and aesthetic impacts associated with residual climbing chalk on boulders. This is of particular concern in the wilderness environment where bouldering takes place in RMNP. Indirect management in the form of education is frequently applied to minimize ecological and social impacts in wilderness areas (Manning 2003). However, little is known regarding how boulderers perceive minimum impact behaviors such as those prescribed through the Leave No Trace Center for Outdoor Ethics (The Center).

The Center's seven Leave No Trace Principles and the associated messages are the most prevalent minimum impact education strategy applied in parks and protected areas (Marion 2014), including RMNP. Over the years the principles of Leave No Trace have been adapted to address existing and emerging outdoor recreation use patterns. These adaptations have addressed specific activities, such as fishing and llama packing, as well as recreation settings and contexts, such as the Appalachian Trail, winter recreation, and international travel. The emergence of outdoor bouldering introduces a new pattern of recreation use in parks and protected areas (e.g., the use of crash pads and climbing chalk, accessing areas typically not visited by other recreationists), calling for a need to examine the extent to which commonly practiced outdoor bouldering behavior aligns with Leave No Trace recommended practices. In order to deliver effective messaging campaigns about acceptable bouldering behaviors in RMNP, there is need to first identify common use patterns that may be less congruent with Leave No Trace recommendations. If appropriately implemented, bouldering-specific Leave No Trace practices can reduce ecological and social impacts and improve visitor experiences by influencing behaviors.

It is a wilderness area manager's responsibility to know the kinds and amounts of use that occur in the protected areas they oversee, and research can aid a manager's understanding of the visitor use that occurs on their administered lands (Dawson, Cordell, Watson, Ghimire, and Green 2016; Hammitt, Cole, and Monz 2015; Pettebone 2013). Land managers influence the "setting" through their management approaches, in which a visitor's experience takes place through decisions about recreational uses. In cases where uses are impactful, or have the potential to impact the ecological or social context of a wilderness area, managers may choose to engage in active management to accommodate recreation opportunities and mitigate associated impacts. However, knowledge about current use and resource conditions are necessary in order to ensure that decisions about active management, including conscious and deliberate lack of management, remedy impacts of concern (Pettebone 2013).

In general, a primary objective of the wilderness area manager is to strike a balance between satisfying public desires for recreational experiences without creating substantial irreversible losses of wildland resources (Hammitt, Cole, and Monz 2015). Given the rapid increase in bouldering, particularly in RMNP's fragile high alpine wilderness, it is necessary for park managers to develop a greater understanding of boulderers' attitudes and perceptions of Leave No Trace practices. This knowledge can improve communication strategies and influence climber behavior to better align with wilderness management objectives.

Previous research suggests attitudes to be an important driver of human behavior (Ajzen 1985; 1991). The Theory of Planned Behavior (TPB) is one of the most commonly applied theories in studies of human behavior (Ajzen 2011). Briefly, the TPB suggests that attitudes, along with beliefs, norms, and behavioral control, influence behavioral intent and ultimately behavior (Ajzen 1985; 1991). Based on this premise, researchers have provided evidence that to effectively change human behavior, efforts need to be directed at individuals' attitudes, or the belief structures underlying those attitudes (Ajzen 1991; Ajzen and Fishbein 2005). Thus, utilizing the Theory of Planned Behavior as a theoretical framework, the purpose of this study was to examine the perceptions of boulderers in RMNP in effort to establish a baseline understanding of their attitudes and perceptions of Leave No Trace–related practices.

Methods

Semi-structured phone interviews with key stakeholders (e.g., RMNP climbing rangers, guidebook author,

bouldering gym owners, Access Fund staff, Leave No Trace Center staff) informed the development of a quantitative survey. Respondents provided information about potential problem behaviors associated with bouldering, such as playing music through external speakers, stashing crash pads, impacting vegetation with crash pads, and leaving chalk tick marks. The quantitative survey examined boulderers' attitudes toward general Leave No Trace practices, attitudes toward minimum impact practices specific to bouldering, and overall global perceptions of the Leave No Trace program.

Attitudes were measured through several batteries of questions that examined perceived *appropriateness*, *effectiveness*, and *difficulty* associated with practicing Leave No Trace–related behaviors. The attitudinal batteries included items related to the seven Leave No Trace Principles generally, and additional items related to bouldering specifically. The items related to the seven Leave No Trace Principles have been used in previous research (see Lawhon et al. 2013; Taff et al. 2014; Vagias and Powell 2010; Vagias et al. 2014).

Global perceptions of Leave No Trace as a program were evaluated by seven Likert-type items anchored from 1 = Strongly Disagree to 7 = Strongly Agree (see Figure 1). The global perception questions were located toward the end of the survey to eliminate potential bias associated with using the phrase "Leave No Trace" in any of the attitudinal batteries that preceded these items. The *appropriateness* of specific Leave No Trace recommended practices was measured using 13 Likert-type statements anchored from 1 = Very Inappropriate to 7 = Very Appropriate (see Figure 2). All of these statements are considered inappropriate behaviors under strict interpretation of Leave No Trace. The perceived *effectiveness* of Leave No Trace practices in minimizing impact in RMNP was examined using 16 Likert-type behavior statements – considered appropriate behaviors as interpreted through the lens of Leave No Trace (see Figure 3). These items were rated on a seven-point scale anchored from 1 = Never Effective to 7 = Effective Every Time. The perceived *difficulty* of practicing the same 16 behaviors as in the *effectiveness* battery was assessed on a seven-point scale anchored from 1 = Very Difficult to 7 = Very Easy (see Figure 4).

The survey was administered to boulderers in RMNP's Chaos Canyon and Emerald Lake areas during the summer of 2015. Sampling was stratified by weekday and weekend at Chaos Canyon across 17 sampling periods, and at Emerald Lake through 15 sampling periods, each spanning from 10 a.m. to 5 p.m. A total of n = 229 boulderers completed the survey, resulting in a 95% response rate.

Results

Sample Characteristics

Approximately 72% of the sample was male, with a mean age of 27. More than 96% of the respondents were US residents, and approximately 65% resided in the state of Colorado. The majority (~60%) of bouldering parties consisted of three or more people, and the overall mean group size was three. On average, respondents reported approximately seven years of previous bouldering experience, and greater than 62% of the sample reported to be of advanced to expert bouldering ability (based on the commonly used "V-scale" bouldering route grading standards). When asked where they initially learned to climb, 67% of respondents reported to have learned indoors in a gym, while 33% learned outdoors. Nearly 30% of respondents were bouldering in RMNP for the first time, and just under 50% had been bouldering in RMNP for one year or less.

Global Perceptions of Leave No Trace

Respondents reported overall high support for the Leave No Trace program (Figure 1). Mean values for the statements suggesting support for Leave No Trace were above 5.70, indicating that boulderers perceive Leave No Trace positively on a global level. For example, more than 90% of respondents answered with a "6" or "7" to the items *Practicing Leave No Trace protects the environment* (M=6.52) and *It is important that all visitors practice Leave No Trace* (M=6.57). This implies further that the majority of respondents perceive Leave No Trace to be an important approach to minimizing recreation-related impacts in RMNP. Moreover, the majority of respondents disagreed that *Practicing Leave No Trace limits my freedom in the outdoors* and that *Practicing Leave No Trace is time consuming*, indicating that Leave No Trace behaviors do not constrain the quality of outdoor recreation experiences.

Attitudes toward Leave No Trace Recommended Practices

Attitudes toward the *appropriateness* of the behaviors of interest were evaluated with nine bouldering-specific statements and four general Leave No Trace behavior statements (Figure 2). Attitudes toward *appropriateness* were found to be

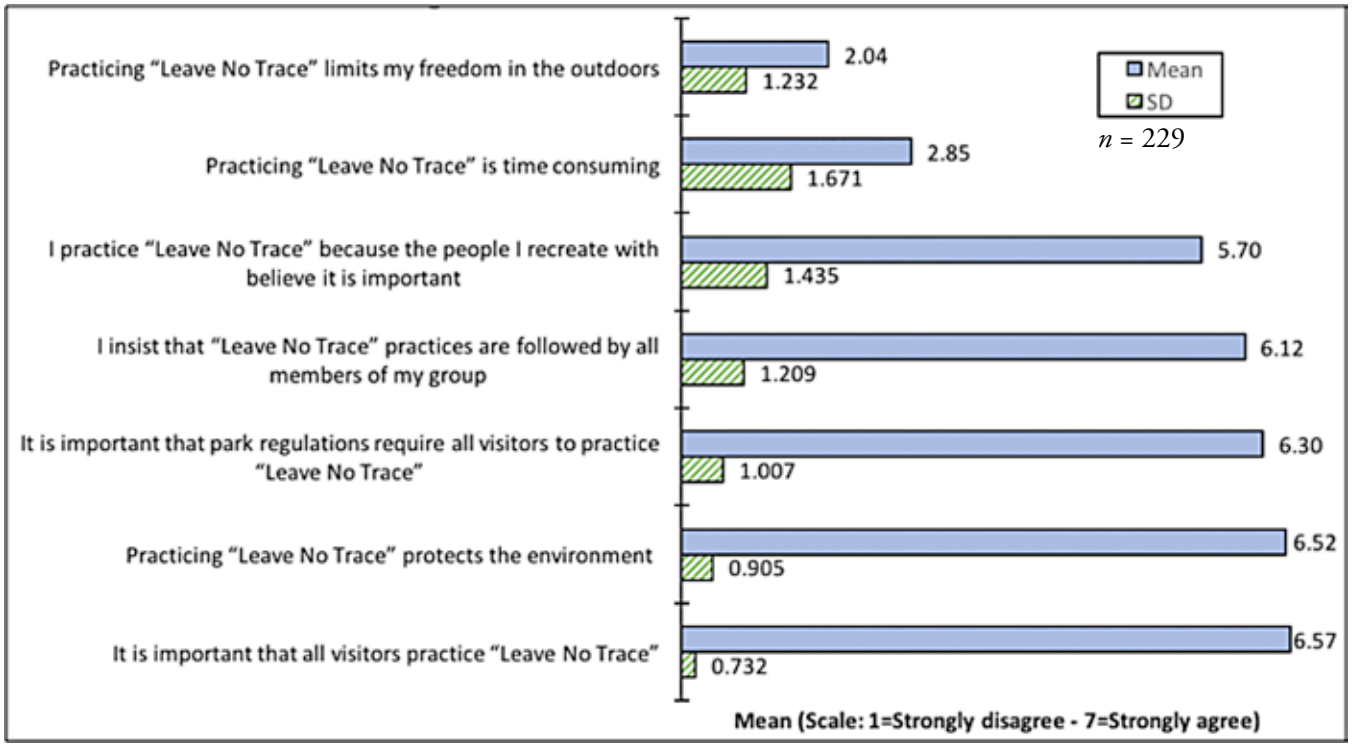

Figure 1 – Global Perceptions of Leave No Trace

mostly congruent with the general Leave No Trace behavior statements, although they varied depending on the principle in question. For example, 90% of respondents (M=1.45) answered with a "1" or "2" to the item *Dropping food on the ground to provide wildlife as a food source* indicating the behavior to be considered *highly inappropriate*. The standard deviation for this item was also comparatively low, suggesting a higher level of agreement among respondents. Alternatively, the item *Scheduling a visit during times of high use* was evaluated as being slightly more *appropriate*, as 80% of respondents (M=4.18) scored the statement with a "4" or higher. This result is counter to what would be suggested of Leave No Trace-related recreation behaviors.

Regarding *appropriateness* of Leave No Trace–related behaviors specific to bouldering, attitudes generally aligned with recommended practices. However, results indicated less congruence with behaviors more specific to safety and accessing or maintaining bouldering opportunities in the park. The item *Removing/cleaning lichen, moss, or plants from a boulder to establish a new route* was assessed as *somewhat appropriate*, with 70% of respondents answering with a "4" or higher. Moreover, the item *Traveling off designated trails to access boulders* resulted in a mean of 3.85, thus perceived as *inappropriate*; however, this was a comparatively higher mean score than many of the other behavioral items that were specific to bouldering. Furthermore, the standard deviation of 1.78 suggested less agreement among respondents about the *appropriateness* of this behavior. *Stashing crash pads near bouldering problems for later use*, *Leaving tick marks when done bouldering*, and *Playing music through external speakers* were considered among the *least appropriate* bouldering-specific activities (M=2.92, 2.92, and 2.43 respectively).

Perceived Effectiveness

To assess perceived *effectiveness* of Leave No Trace recommended practices, respondents were asked to indicate the extent to which certain behaviors would reduce impact while bouldering in RMNP (Figure 3). Nine general Leave No Trace–related behavioral statements and seven items specific to minimum impact bouldering in RMNP were evaluated. All of the general Leave No Trace items were perceived as *slightly* to *highly effective* with scale means ranging from 4.64 to 6.89. Similar to the results of the *appropriateness* measures, *Scheduling a visit to avoid times of high use* was perceived to be the *least effective* of the behaviors in question (M=4.64). *Carrying out all litter, even crumbs, peels, or cores was* perceived to be the *most effective* of the general Leave No Trace statements (M=6.89). And the standard deviation of .857 suggested strong agreement among respondents regarding this behavior.

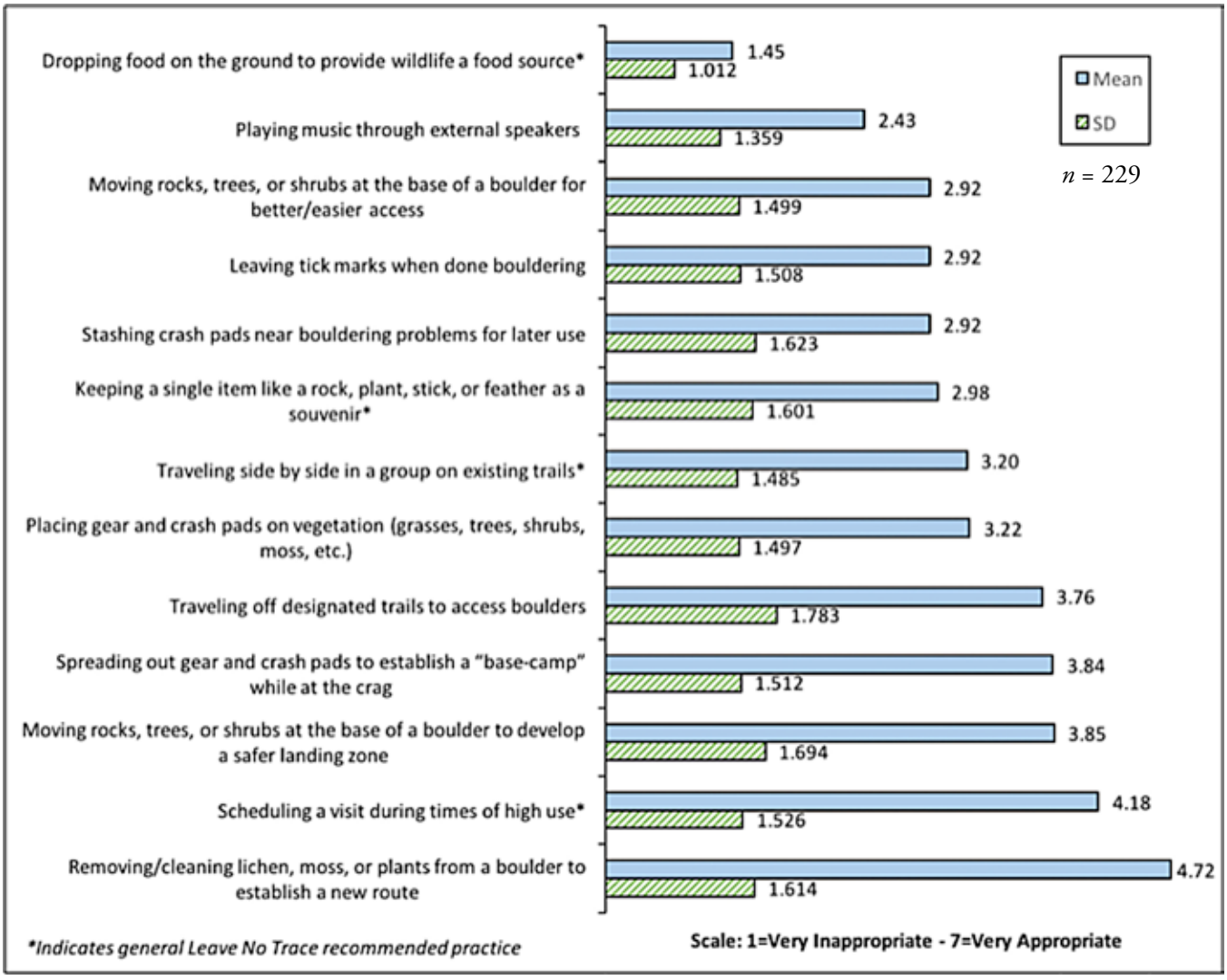

Figure 2. Attitudes toward Inappropriate Leave No Trace Practices

Leave No Trace–related behaviors specific to bouldering in RMNP were also all perceived as *slightly* to *highly effective*. In this case scale means ranged from 4.57 to 6.15. The statement *Leaving existing lichen, moss, or plants intact at boulder problems* was answered with a "4" or less by 53% of respondents, suggesting that this behavior was perceived as the *least effective* of the practices in question – a result similar to the findings in the *appropriateness* measures. Alternatively, *Carrying crash pads out of the park each time you exit* was perceived as the *most effective* of the bouldering-specific behaviors (M=6.15), and the comparatively lower standard deviation of 1.145 suggested fairly strong agreement among respondents.

Perceived Difficulty

Respondents were provided the same set of behavioral statements as in the *effectiveness* measures, but instead asked to rate the *difficulty* of performing each behavior while bouldering in RMNP (Figure 4). In the case of the general Leave No Trace behavioral statements, all but one (*Scheduling a visit to avoid times of high use*, M=3.95) resulted in a mean score above "5" on the scale, indicating the behaviors are perceived to be *moderately* to *very easy* to perform. Of the behaviors that scored above "5," *Staying on designated or established trails* was perceived to be the most *difficult* (M=5.24).

In regard to the bouldering-specific Leave No Trace–related behaviors, all but one (*Leaving existing lichen, moss, or plants intact at boulder problems*, M=4.65) resulted in a mean score of "5" or above. Of those behavioral items scoring above "5," *Placing gear and crash pads on durable surfaces* and *Leaving existing rocks, trees, or shrubs intact at the base of boulder problems* were perceived as more *difficult* to perform (M=5.21 and 5.25 respectively). Alternatively,

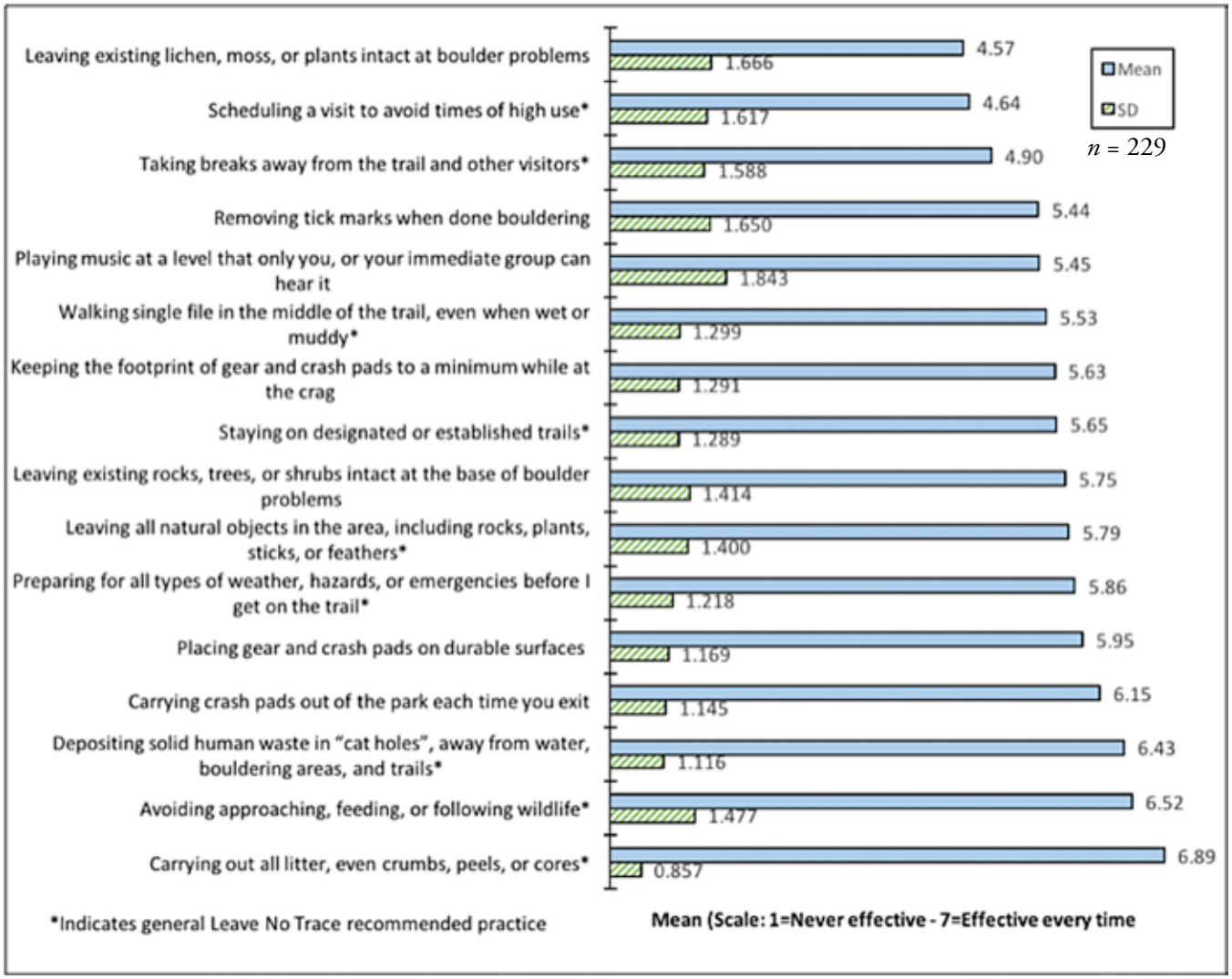

Figure 3 – Perceived Level of Effectiveness of Leave No Trace practices

Carrying crash pads out of the park each time you exit was perceived as one of the easier behaviors to practice, with 77% of respondents answering with a "6" or "7."

Discussion

The purpose of this study was to examine the perceptions of boulderers in Rocky Mountain National Park to establish a baseline understanding of their attitudes toward Leave No Trace recommended practices. These data provide insight into specific behaviors where attitudes align with Leave No Trace recommendations, and those practices specific to bouldering where attitudinal gaps exist. Results indicate that on a global level boulderers were highly supportive of the Leave No Trace message and corresponding behaviors. Overall, they reported positive perceptions of Leave No Trace and felt it is an important means of minimizing recreation-related impacts. However, attitudes toward some bouldering-specific behaviors were less favorable and merit additional attention. For example, *Moving rocks or trees at the base of a boulder to develop a safer landing zone* and the act of *Removing lichen, moss, or plants from a boulder to establish a new route* (a practice commonly referred to as "gardening") received greater support relative to the other Leave No Trace practices being evaluated. These identified attitudinal gaps between bouldering practices and Leave No Trace recommendations, which advocate no or minimal site alterations, highlight opportunities to develop collaborative solutions for mitigating potentially impactful behaviors related to bouldering in the park.

It is recognized that bouldering, like all outdoor recreation activities, comes with an inherent set of impacts that in many cases are aesthetically obvious. Clearly boulderers should be conscious of these impacts and take measures to adopt practices that

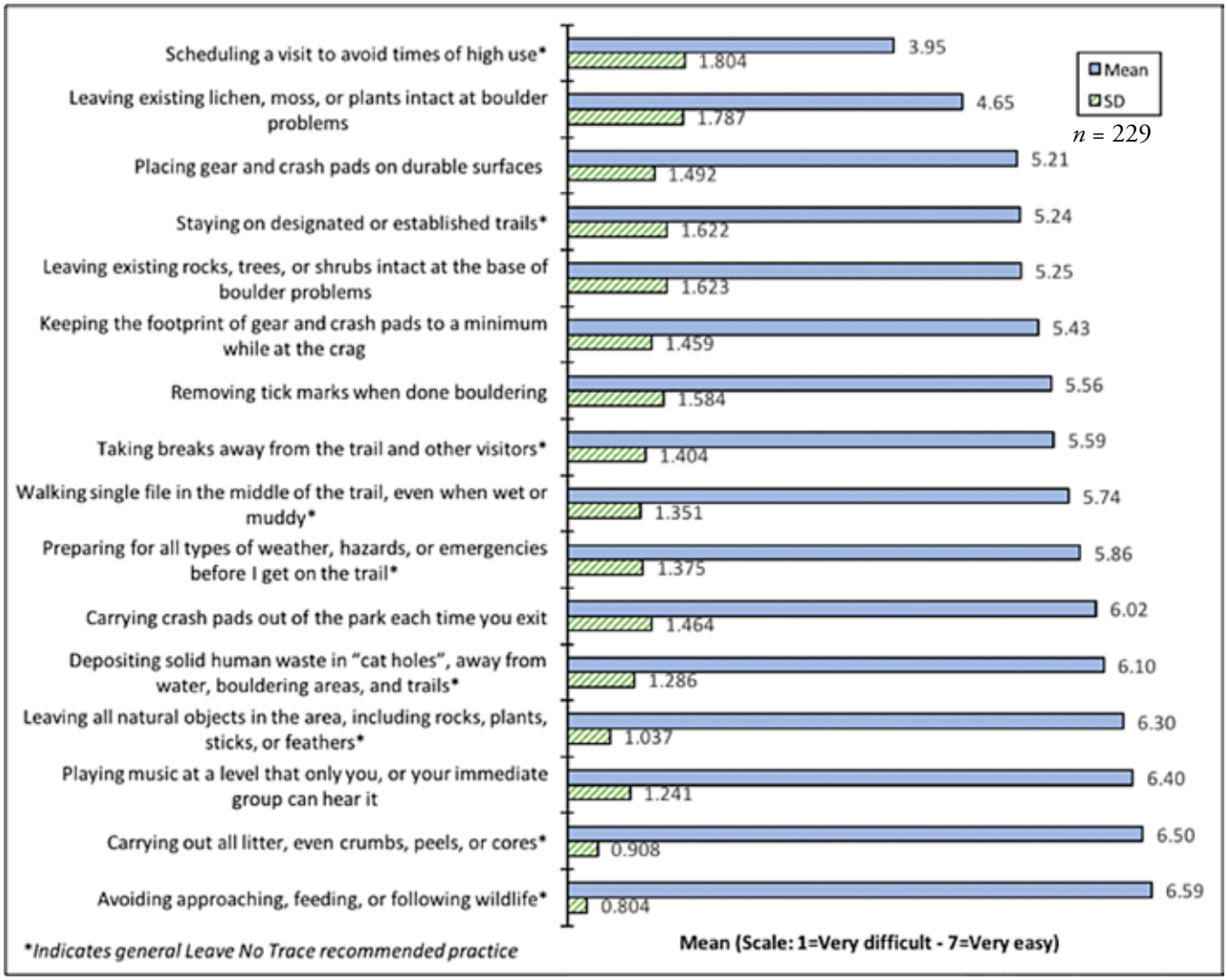

Figure 4 – Perceived Level of Difficulty of following Leave No Trace Recommendations

mitigate them (e.g., remove chalk tick marks, refrain from "gardening" on boulder problems, avoid creating new trails). However, it is important to recognize that many of these types of impacts are not entirely unique to bouldering. In other words, bouldering is not unlike many recreation activities that take place in wilderness, in that there is an inherent tension between recreational pursuits and wilderness character. For example, anglers often create informal trails in order to access desirable fishing locations, equestrian use can cause trail impacts that lead to erosion which is well documented in the recreation ecology literature, and overnight campers clear vegetation for tents and campsites (or agency has previously established a site by clearing vegetation for this purpose). However, managers often accept these recreation activities as "traditional" uses of wilderness and recognize the need to educate these users about Leave No Trace practices, monitor to understand changing resource conditions, and provide agency presence to enforce regulations to protect park resources.

With proactive interest to engage boulderers in the management process there is potential to develop specific minimum-impact practices associated with the activity. Research such as this provides insight to effective communication approaches to engage and educate this group in order to develop best messaging practices. There is need to develop a "standard" set of minimum impact bouldering principles. The Leave No Trace Center for Outdoor Ethics along with other stakeholder groups are currently in the process of developing these messages and materials (B. Lawhon, personal communication, May 26, 2016). Education and messaging efforts are being initiated in RMNP via signage, website, and direct ranger and park volunteer contact. Park staff have also begun, and continue, to collaborate with external agencies and constituent groups in outreach efforts. Of note,

nearly 70% of respondents in this study indicated they first learned to climb indoors in a gym. This research suggests that park staff focus education and outreach efforts within the climbing gym industry. Finally, an important implication for wilderness stewardship is that the bouldering population tends to be composed primarily of a younger generation of users. It is important to not alienate this group of wilderness users but instead work with this community to help foster interest in wilderness protection amongst a new generation of wilderness stewards.

Conclusion

Wilderness managers must understand the perceptions of growing user-groups, such as boulderers, in order to develop management strategies that promote the protection of resources while maintaining quality recreational opportunities. This study found that boulderers' attitudes toward common Leave No Trace practices generally aligned with recommended behaviors. However, a number of bouldering-specific practices were identified to be less congruent with Leave No Trace recommendations, indicating that opportunities exist to improve messaging efforts. Global perceptions of Leave No Trace were positive, suggesting that expansion of messaging and outreach specific to bouldering, in conjunction with the continued educational strategies currently promoted by the Leave No Trace Center and RMNP, could influence attitudes in a manner that better aligns with wilderness management objectives. Specifically, messaging could be crafted that focuses on the effectiveness and lack of difficulty associated with the practices currently perceived by some as limiting to bouldering opportunities. Finally, these results provide baseline data regarding attitudes toward Leave No Trace behaviors, which perhaps after the implementation of additional education strategies specific to bouldering behaviors can be monitored over time in conjunction with ecological conditions, to assess trends related to this growing wilderness activity.

Acknowledgments

The authors would like to acknowledge the staff at Rocky Mountain National Park and the Leave No Trace Center for Outdoor Ethics, as well as the key informants involved in the bouldering community for their support of this research.

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PERSPECTIVES FROM THE SOCIETY FOR WILDERNESS STEWARDSHIP

Psychology and Wilderness Manager Education

BY HEATHER MACSLARROW

Every summer, hundreds of wilderness rangers, resource specialists, trail crew workers, firefighters, and river rangers immerse themselves in wilderness and carry out the details of wilderness management.

Like all systems managed by large entities, the National Wilderness Preservation System (NWPS) reaps the benefits of coordinated resources while bearing the consequences of varied decision making. Addressing management variation occurs in two ways – either through the creation of policy, or the broad education of individual managers and workers. Managing a vast resource such as the NWPS requires some variation in application; all wilderness areas, and the communities they interact with, are unique. As such, policy cannot always be the answer. There must be some autonomy allowed to wilderness decision makers, both to meet local needs and to be responsive to issues in the way policy and bureaucracy cannot. This is where education comes in, and within the wilderness and natural resource sector, there are vast educational resources, from academia to Wilderness Ranger Academies to continuing education for managers. You can learn how to pack a pack, work with stock, interpret the Wilderness Act, administer wilderness first aid, manage visitor use, employ minimum requirement analysis, manage recreation, and to apply philosophy, ecology, and planning to wilderness management issues. However, there is one very important field that is not well represented in the wide range of wilderness education – psychology.

Wilderness management is incredibly dynamic, both ecologically and humanistically. The human side of managerial decision making is a complex web, with decision makers at every level engaging with coworkers, staff, and supervisors; other agencies; partner groups; and local, regional, national, and international communities. Understanding the psychological aspects of how communities interact with wilderness is becoming increasingly important as our political polarity and social unrest can play out on public lands. Wilderness has no shortage of controversial issues. Consider the issues of fire management and filming in wilderness.

In 2013, Paul Barrett wrote an opinion piece for the Fairfield (Montana) *Sun Times* about the management of wilderness fires. He starts the article this way:

> I question the decisions by the Lewis and Clark National Forest to continually let fires burn in the wilderness. The fires are let go early in the season in July and massive areas are burned and re-burned over the years. I disagree that there is a great resource benefit to this. By the end of the season, the fires have destroyed too much of our cool forest landscapes. In the past these early let burn fires such as the 1988 Canyon fire and the 2007 Fool Creek Fire have escaped out of the wilderness and forced numerous evacuations and even destroyed developed areas. (Barrett 2013)

In another example discussing the then-proposed US Forest Service wilderness filming rule, Zach Urness of the *Statesman Journal* (Salem, Oregon) said: "Far more troubling is the prospect of journalists being denied access to a wilderness area because a government agency didn't approve of a story area … the government can't determine what's news and not news – it's a pretty clear violation of the First Amendment" (Urness 2014).

From the first congressional committee meetings on the proposed Wilderness Act, wilderness has been controversial. It will continue to be. And as happens with controversial issues, discussions and opinions circle in interest groups so that by the time individuals interact with land managers, they are not necessarily open to different ideas or new information, no matter how nonpartisan or educational they may be. Wilderness managers need a new tool in their arsenal to break down the barriers of

"Inclusion of psychological disciplines and concepts in wilderness education may be furthered by curriculum development within upper level collegiate courses and wilderness staff training courses that investigate the various disciplines of psychology and offer application tools for wilderness students and managers."

preconceived notions, geographic and social norms, and ideological hostility. The disciplines within psychology offer enhanced insight into facilitating discussions internally and externally, so that wilderness management decisions can be made to better steward wilderness areas.

For example, understanding psychological climates can be key to understanding wilderness interest groups because all interests can share many of the same values – such as utilization of public lands, personal wellness, and community support. Opposition arises because of how given values are prioritized, with opposition increasing as opposing prioritization multiplies. Where one person sees ecological health as the most salient value, another sees community prosperity as the most salient. They may then disagree even on whether or not facts are valid, important, or reliable. And they disagree on the likelihood of a given outcome (Tuan 1974).

Recently retired Bitterroot National Forest district ranger Dan Ritter said it best when he described his job to the *Missoulian* newspaper in Missoula, Montana: "You are working with people 95% of the time and in the other 5% you make management decisions. I always say, give me an easy resource management issue to deal with any time. Paint that picnic table tan or red? That's easy. The truth of it is that there are few decisions that you make that don't require working with the public."

Inclusion of psychological disciplines and concepts in wilderness education may be furthered by curriculum development within upper level collegiate courses and wilderness staff training courses that investigate the various disciplines of psychology and offer application tools for wilderness students and managers. Such courses could and should provide basic information on developmental, eco, social, behavioral, and cognitive psychology; look at the primary tools of anticipating and analyzing public behavior around wilderness and natural resources (e.g., utilizing Maslow's Hierarchy of Needs; the Theory of Planned Behavior; attunements, affordances and effectivities; primary motivations; social norms, the perceptions of risk and control); and engage participants in applying those concepts to real-world wilderness management issues.

In order to better foresee and understand public opinion on, and interaction with, wilderness areas, and the impact those actions have on wilderness managers, psychological disciplines should be directly integrated into all levels of wilderness education.

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Continued from DOES WILDERNESS NEED A CELEBRITY..., page 3

is the Ian Players, Bob Lucases, John Hendees, and many other "defenders" that gave the foundation to wilderness conservation, protection, and education. Let us expand on that foundation, hoping that someday wilderness truly "needs no defense."

In this issue of *IJW*, we pay tribute to Dr. John Hendee and his legacy of wilderness conservation. Tom Carlson, John Shultis, and Joe Van Horn examine emerging issues related to technology in wilderness and the need for guiding policy. We also have a summary of the *Management Guidelines for IUCN Category 1b Protected Areas* by Sarah Casson, Vance Martin, and Cyril Kormos.

ROBERT DVORAK is managing editor of *IJW* and associate professor in the Department of Recreation, Parks, and Leisure Services Administration at Central Michigan University; email: dvora1rg@cmich.edu.

Wilderness at an International Scale

Management Guidelines for IUCN Category 1b Protected Areas

BY SARAH A. CASSON, VANCE G. MARTIN, and CYRIL F. KORMOS

In a time when environmental degradation and climate change threaten biodiversity and ecological processes around the world, it is vital to protect our remaining wild spaces and foster a healthy relationship between culture and nature. Technical guidance and resources for further learning can provide a significant boost to conservation efforts on the ground. While several resource manuals exist for different aspects of wilderness conservation (e.g., wilderness area management in the United States, international wilderness law and policy, and journals such as the *International Journal of Wilderness*) – many of which were developed by or in partnership with The WILD Foundation – until now there has not been a summary publication providing a comprehensive overview of global best practices for wilderness protected area management. The *Management Guidelines for IUCN Category 1b Protected Areas* were developed to fill this important gap.

These new guidelines were developed under the auspices of the World Commission on Protected Areas (WCPA), one of several expert commissions within the International Union for Conservation of Nature (IUCN, based in Gland, Switzerland), which is the largest international conservation network. WCPA consists of protected area experts from around the world serving in their individual capacities, who, inter alia, develop and maintain best practices for protected area conservation, including a protected area classification system used by many nations. In that system, Category 1b corresponds to "wilderness" protected areas. It is the goal of the *Management Guidelines for IUCN Category 1b Protected Areas* to provide guidance to wilderness planners, managers, and other decision makers around the world. These guidelines are the first to be developed for Category 1b. They were compiled as the result of a 14-month process by the Wilderness Specialist Group of the WCPA, which is facilitated by The WILD Foundation. The team producing and peer reviewing these guidelines was composed of diverse experts, including academics, policy makers, representatives from nongovernmental organizations and governments, Indigenous Peoples, and field managers.


Sarah A. Casson


Vance G. Martin


Cyril F.Kormos

The guidelines address numerous important topics, including

- background on the definition of wilderness protected areas in an international context,
- the history of this protected area classification.
- critiques of the wilderness concept,
- key principles for wilderness protected area management,
- governance systems applicable to wilderness protected areas,
- the importance of harmonizing governance type with on-the-ground realities to ensure effective conservation,

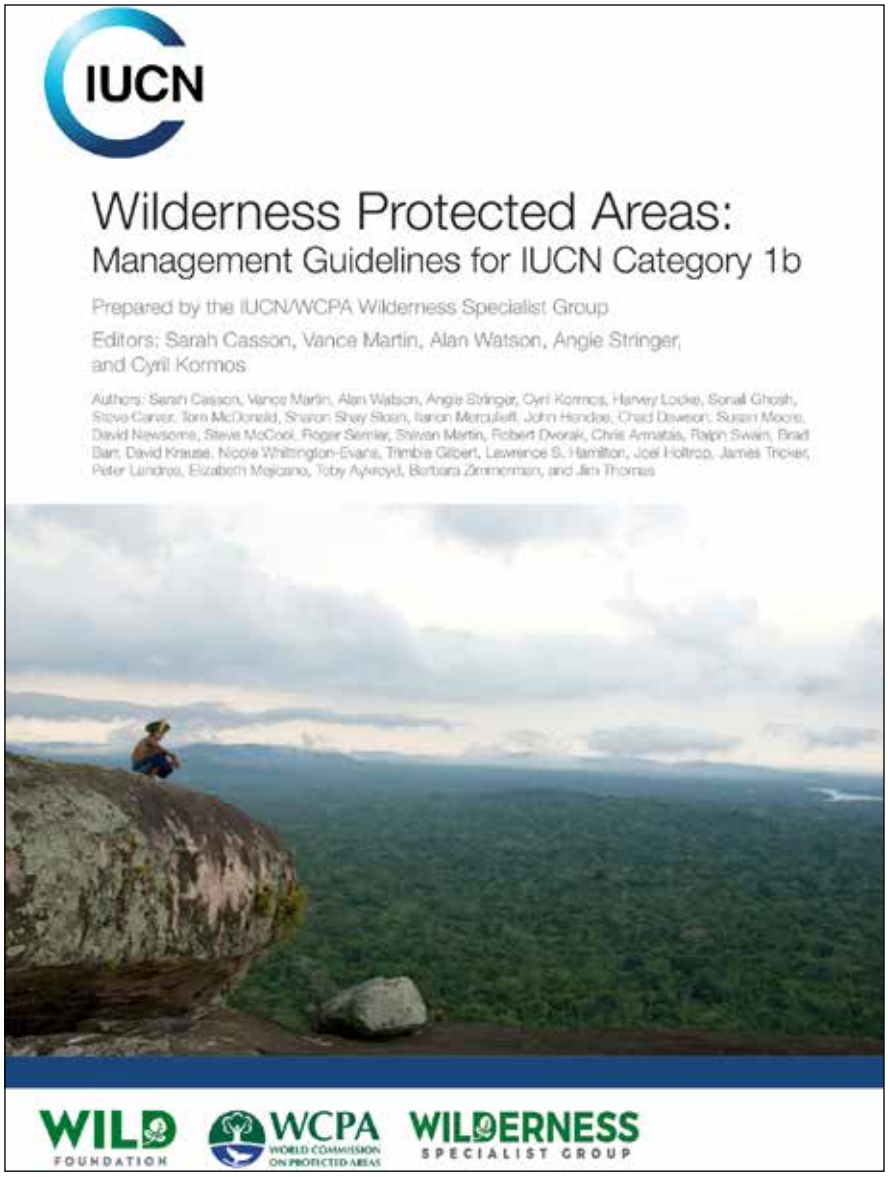

Figure 1 – Wilderness Protected Areas: Management Guidelines for IUCN Category 1b

- current issues most faced by wilderness managers and the tools available to address such issues, and
- ways wilderness areas should be evaluated for their social and ecological effectiveness.

Throughout the guidelines, recommendations for further readings and case study examples are provided. These guidelines address wilderness protected areas on land and sea as having the same underlying values and management approaches and also address areas that may not be actually categorized as 1b but are eligible – or can be restored to meet the criteria – should the relevant governing authority choose to use the information provided by the guidelines.

Defining Wilderness Protected Areas

In the IUCN Protected Areas classification system, the primary management objective of wilderness protected areas (Category 1b) is to protect the ecological processes and biodiversity of large-scale, intact areas with minimal human disturbance (Dudley 2013, p. 14). The guidelines recognize four other compatible objectives:

1. Recreation and access
2. Traditional ways of life
3. Cultural and spiritual uses
4. Education and science

These compatible objectives provide flexibility to include a range of human uses in wilderness protected areas that do not impact the primary objective of biological intactness. It is important to emphasize that humans are therefore not excluded from wilderness protected areas, and the guidelines provide extensive information on developing management partnerships with Indigenous Peoples and stakeholder relationships with nonindigenous local communities. Designation as a Category 1b site does, however, exclude specific human uses, including industrial uses, that are incompatible with a core set of wilderness values and attributes, which include "biological intactness, sacred areas, traditional use, absence of significant permanent infrastructure or commercial resource extraction, and opportunities for experiencing solitude, uncertainty and challenge" (Casson et al. 2016, p. 7). It is these values and attributes against which all variances to wilderness protected area management objectives are judged. The guidelines provide instructions for wilderness decision makers evaluating and managing variances.

History of Category 1b

There is a long tradition around the world of setting aside areas of minimal human impact and defining limited uses for these areas (Dudley et al. 2012). The category of wilderness within the IUCN protected areas

Figure 2 – Monitoring a wilderness area, such as in the Skeleton Coast National Park in Namibia, allows managers to know if site objectives are accomplished. Long-term stewardship of wilderness areas often includes monitoring recreational experiences. Photo by Vance Martin.

system, however, is relatively new and was only established in 1994. Including wilderness in IUCN's protected areas classification system was a longstanding objective of the World Wilderness Congresses, beginning with the first World Wilderness Congress held in Johannesburg, South Africa, in 1977. To formalize the longstanding relationship between IUCN and the World Wilderness Congresses, the IUCN Wilderness Task Force was created within WCPA in 2002. In recognition of the fact that wilderness protected areas would likely always require representation within WCPA, WCPA upgraded the Wilderness Task Force to a permanent Wilderness Specialist Group, responsible for overseeing and coordinating all wilderness issues within WCPA. The Wilderness Specialist Group, which is chaired by Vance Martin (president of The WILD Foundation), is facilitated by The WILD Foundation and was responsible for overseeing the production of the guidelines.

Critiques of Wilderness Concept

A number of criticisms have been directed at international wilderness protected areas, and, more broadly, at wilderness as a concept. The first is that wilderness excludes humans and infringes on the rights of Indigenous Peoples. These guidelines emphasize throughout that wilderness protected areas only exclude certain human uses, that most traditional community and indigenous uses are compatible with wilderness conservation and that, as with all protected area classifications, wilderness protected areas must respect and fully implement rights-based approaches at all times. The guidelines also emphasize that Indigenous Peoples are partners – not merely stakeholders – in wilderness protected area decision making. They also provide concrete steps for how to implement this guidance.

A second critique is that there are no "pristine" areas left on Earth, and therefore that wilderness protected area management has by definition been a failed experiment. This critique sets up a supposed binary between pristine and nonpristine that simply ignores that "pristine" has never been a criterion for wilderness protected areas: IUCN's Category 1b, and many wilderness protected area

Figure 3 – Mountaineers enjoying wilderness recreation in Patagonia, Chile. Photo by Fiona Casson.

designations at national and provincial levels recognize that areas that are somewhat modified but are nonetheless capable of restoration can qualify as wilderness protected areas. In addition to being based on a false premise, this critique ignores a large body of literature showing that protected areas successfully conserve biodiversity when management is conducted in accordance with rights-based approaches, is adequately funded, and is supported with adequate technical and management capacity.

A third, and related, postmodern critique argues that humans in the Anthropocene have essentially destroyed wild nature, making it a lost cause to pursue extensive new protected area designations. This critique also suggests that the loss of wild nature is in fact not a bad thing because existing and new technologies will allow us to control the last remnants of the natural world for the benefit of humans. This argument fails to recognize two key points, however. The first is that, to date, the ecological integrity of our planet has steadily declined as technology has advanced. The second is that current knowledge of ecosystem functioning across the planet is limited and in many cases rudimentary. While technological advances will certainly help provide solutions to conservation challenges in coming decades, future technological advances cannot substitute for wilderness protected areas.

Management Principles of Wilderness Protected Areas

Section 2 of the guidelines examines 11 management principles to provide an ontological framing that can be used to solve the many management challenges presented within the on-the-ground protection of areas designated as Category 1b. These principles emphasize the conservation and management of large-scale, mainly intact wilderness with the minimal tool practice, directed and monitored by long-term objectives informed by Western science and, where applicable, indigenous science. Respect – for humans and nonhumans – underpins all of these principles.

The holistic maintenance of these areas should focus on upholding both intrinsic wilderness values and human values consistent with the Category 1b objectives. All activities must feature nonmotorized equipment (except in cases where variances are appropriate). Areas of nonmotorized human recreation should be prioritized as much as possible within the management plans of a site. All decision makers should work to uphold true partnership relations among stakeholders and nontribal government entities and indigenous, tribal, and local communities in all management, governance, and designation processes.

Scale and connectivity between protected areas is an important focus within the conservation movement today. This is true for all Category 1b sites. Comprehensive, intact, and connected wilderness areas are a priority at the institutional IUCN level as well as at the local, individual protected area level. Wilderness decision makers must work with others in the wilderness arena to create the best possible protection. Such protection may come from working with another wilderness protected area, from managing wilderness in relation to activities occurring on adjacent lands, or from focusing a site's limited resources on preventing damaging activities within a site and protecting threatened sites. Indicator-based planning systems can greatly assist wilderness decision makers in determining limits of acceptable change and the standards by which a site is assessed.

Figure 4 – Women of Gothangaon village in Maharashtra, India on the land that they and other local landowners have dedicated to rewilding. Photo by Sanctuary Asia.

Governance of Wilderness Areas

The governance type of a wilderness protected area determines the institutional structures, political bodies, and processes that direct the management objectives of a site (Graham et al. 2003; Borrini-Feyerabend et al. 2013). A site's governance is therefore separate from but closely related to its management. Governance dictates who has the political authority to make management decisions. Management dictates what actions are undertaken to fulfill those decisions.

In section 3 the guidelines summarize five major approaches to governing a Category 1b site: (1) by national and subnational governance; (2) by Indigenous Peoples and local communities; (3) by private institutional owners, individuals, or trusts; (4) by a range of actors that share the authority to govern; and (5) by multilateral treaties in which three or more sovereign bodies agree on the site's authority structure. The fourth category – shared governance – can overlap with any of the other four. Section 3 also describes the governance variances consistent with wilderness values that are allowed within the IUCN Category 1b designation.

In all governance decisions, respectful and equitable relationships are a priority. By exploring the diversity of governance structures compatible with Category 1b sites, these guidelines provide options for wilderness decision makers to best implement governance models that align with the forms of authority, mandates, and politics relevant to their individual sites.

Wilderness Management Tools

Section 4 examines 11 management tools to help wilderness decision makers address common management challenges. The guidelines suggest that wilderness managers rely on indicator-based planning systems and management frameworks when making decisions. Such a process allows multiple forms of knowledge, values, and interests to be incorporated into planning decisions in a consistent manner that looks to the social and biological conditions and long-term objectives of a site. These planning systems and

Figure 5 – Reindeer herding in Finland is an important element of Sámi culture and therefore allowed in wilderness areas. Photo by Aldo Leopold Wilderness Research Institute.

management frameworks emphasize and uphold transparency in decision-making processes of a Category 1b protected area. Transparency allows for consistent and defensible decision making, especially in instances of granted variance to the stated uses of a site given to uphold Indigenous Peoples' rights, legislative mandates, or other reasons. The guidelines provide examples of variance granting processes and of permitted variances that continue to maintain wilderness values.

Western science and indigenous science must be incorporated into management decisions. Without proper knowledge-based decision-making frameworks, it is conceivable that decisions become based on ad hoc, short-term considerations rather than baseline processes that can be established and monitored for the long term.

Section 4 also addresses several key issues that most wilderness–decision makers face. For example, infrastructure and technology present a perennial issue for wilderness protected area managers: what emerging technologies and what kind of built environment is permissible? Permanent built infrastructure, except in specific given variances, is not permitted within wilderness protected areas. Technologies, such as mobile phones, drones, and recreational accessories, are much more difficult to monitor and definitively exclude from wilderness areas. As discussed in the guidelines, these technologies can be useful in certain rescue scenarios and in scientific research science, but they can also degrade the wilderness qualities of Category 1b sites.

Many current conflicts – and presumably future conflicts – will center on issues related to what uses are permitted within a wilderness area, particularly related to recreational use, and who dictates permitted uses. The guidelines suggest ways in which wilderness decision-makers can work through these recreation management issues while adhering to the key tenets of wilderness values. Similarly, the guidelines address the issue of demographics and the relevance of wilderness in society to emphasize how managers can best include a wide diversity of peoples in wilderness protected areas.

These guidelines emphasize that wilderness areas are under threat from climate change and yet are also an essential part of the solution to mitigate and adapt to climate change. Section 4 addresses how managers may need to intervene in the adaptation processes within their site to create resiliency to climate change

and large-scale environmental degradation. It also provides examples and processes of rewilding, restoration, and passive management as ways to address the problems posed by climate change to wilderness areas.

The guidelines emphasize the relevance of both subsistence users and custodians of sacred natural sties (who are often but not always Indigenous Peoples) to many wilderness protected areas. Section 4 outlines how they are important partners in the conservation of a wilderness protected area and how stewardship of a Category 1b site should explicitly include subsistence use and sacred values.

Evaluating Effectiveness of Wilderness Protected Areas

Section 5 addresses ways in which wilderness decision makers can evaluate a Category 1b protected area's ability to uphold the management plan's objectives. It is critical for wilderness decision makers to know if the site will protect and maintain wilderness attributes and values, and the guidelines suggest a variety of ecological and social best practice tools and frameworks for evaluating management effectiveness.

Three key tools can be used to evaluate management for ecological and social objectives: frameworks, sufficient data collection, and assessment timelines. Frameworks such as the IUCN Protected Area Management Effectiveness framework, is a valuable decision-making tool that promotes monitoring and assessment of a site's multifaceted conditions. Data collection ensures decisions are based on long-term, multivariate, qualitative, and quantitative information. Evaluations should be informed by data collected from a plethora of academic disciplines as well as indigenous science. Assessment timelines for such data vary, and the guidelines suggest that the duration of assessments conform to the discipline's best practices, which often require at least a 5- to 10-year commitment to monitoring.

"These principles emphasize the conservation and management of large-scale, mainly intact wilderness with the minimal tool practice, directed and monitored by long-term objectives informed by Western science and, where applicable, indigenous science."

Often the measurements and understandings of ecological and social criteria overlap, but each also have aspects that need to be specifically and individually addressed. Section 5 outlines these specifics, such as tool types, baseline measurements, and inclusion of Indigenous Peoples as true partners in evaluation processes. Evaluation of a site is critical to its protection as a wilderness area. Such evaluation allows wilderness decision makers to improve a site's conservation endeavors, fix past mistakes, replicate successes, and designate new wilderness protected areas.

Conclusion

A study in 1989 recorded 44 wilderness areas registered with the IUCN system (Eidsvik 1989). At publication of these guidelines in 2016, 48 countries have established wilderness areas as Category 1b through legislative designation (IUCN and UNEP-WCMC 2016). Twenty-two other countries have wilderness areas established through administrative designation or wilderness zones within other protected areas. The 2016 guidelines provide instruction on how best to manage, govern, and protect these 2,992 marine and terrestrial wilderness areas (IUCN and UNEP-WCMC 2016). Many more areas are protected with the same wilderness objectives as Category 1b but not yet designated as such.

The guidelines are applicable to these areas and to areas wilderness decision makers are looking to restore and rewild to the status of wilderness. Dramatic and increasing efforts in the protection and official designation of wilderness areas have occurred around the globe in the last few decades. We hope this trend will continue and that these guidelines will assist managers in their challenging jobs of protecting our remaining wild spaces during a time of very rapid global change.

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Announcements

COMPILED BY GREG KROLL

50th Anniversary Wilderness Conference Is Topic of Special Issue of the *Journal of Forestry*

The Society of American Foresters has published a special issue of the *Journal of Forestry*, entitled *Wilderness Science and Its Role in Wilderness Stewardship*. Edited by Susan Fox, the May 2016 issue features papers and presentations from the Wilderness Act 50th Anniversary National Conference held in Albuquerque, New Mexico, in October 2014.

2016 Goldman Environmental Prize Honors Six Conservation Heroes

The Goldman Environmental Foundation has honored six recipients of the 2016 Goldman Environmental Prize, the world's largest award for grassroots environmental activists. Awarded annually to environmental heroes from each of the world's six inhabited continental regions, the Goldman Prize recognizes fearless grassroots activists for significant achievements in protecting the environment and their communities. The prize was established in 1989 by late San Francisco civic leaders and philanthropists Richard and Rhoda Goldman. Prize winners are selected by an international jury from confidential nominations submitted by a worldwide network of environmental organizations and individuals.

The 2016 honorees are:

EDWARD LOURE, Tanzania

Edward Loure led a grassroots organization that pioneered an approach that gives land titles to indigenous communities – instead of individuals – in northern Tanzania, ensuring the environmental stewardship of more than 200,000 acres (80,000 ha) of land for future generations.

LENG OUCH, Cambodia

In one of the most dangerous countries in the world for environmental activists, Leng Ouch went undercover to document illegal logging in Cambodia and exposed the corruption robbing rural communities of their land, causing the government to cancel large land concessions.

ZUZANA CAPUTOVA, Slovakia

A public interest lawyer and mother of two, Zuzana Caputova spearheaded a successful campaign that shut down a waste dump that would have poisoned the land, air, and water in her community, setting a precedent for public participation in post-communist Slovakia.

LUIS JORGE RIVERA HERRERA, Puerto Rico

Luis Jorge Rivera Herrera helped lead a successful campaign to establish a nature reserve in Puerto Rico's Northeast Ecological Corridor – an important nesting ground for the endangered leatherback sea turtle – and protect the island's natural heritage from harmful development.

DESTINY WATFORD, United States

In a community whose environmental rights had long been sidelined to make room for heavy industry, Destiny Watford inspired residents of a Baltimore neighborhood to defeat plans to build the nation's largest incinerator in proximity to her high school.

MÁXIMA ACUÑA, Peru

A subsistence farmer in Peru's northern highlands, Máxima Acuña stood up for her right to peacefully live off her own property, a plot of land sought by Newmont and Buenaventura Mining to develop the Conga gold and copper mine. (Source: http://www.goldmanprize.org, April 18, 2016)

Army Drops Plans to Land Helicopters in Alpine Lakes Wilderness

The US Army has dropped its plans to use landing zones in the Cascade Mountains, Washington State, to train combat helicopter pilots. The decision came after a review of 2,350 public and agency comments, according to the Aviation Division at Joint Base Lewis-McChord (JBLM). The

Submit announcements and short news articles to GREG KROLL, *IJW* Wildernss Digest editor. E-mail: wildernessamigo@yahoo.com

landing zones "have been removed from consideration, and will not be included in any follow-up environmental assessment," according to a statement by JBLM. The army says it will still analyze potential helicopter training areas and landing zones elsewhere in the state.

In June 2015, the army proposed seven takeoff and landing sites in the Cascades, including one location within the Alpine Lakes Wilderness. These high-altitude training sites were proposed for an area close to the base, near Tacoma. Currently, pilots must travel to Colorado for high-altitude training, and according to the army, the Colorado training area poses scheduling difficulties, consumes large amounts of fuel, adds to the cost of training, and requires pilots to spend time away from home.

The June 2015 proposal stated that JBLM aviators need areas where they can conduct rigorous and realistic training to prepare for missions in mountainous regions of Afghanistan and elsewhere. Training flights were to occur 365 days a year and 24 hours a day, with no set schedule. Almost 70 conservation organizations and Washington businesses submitted strongly worded comments about the proposal and its potential impact on wilderness and endangered species. The Wilderness Act also prohibits the landing of aircraft in wilderness. In addition, some organizations claimed that helicopters flying just a few feet above a trail posed unacceptable risks, particularly to people using horses and pack stock as the animals could be easily spooked. Scientists also raised concerns about landing helicopters in fragile alpine environments and the potential effects on wildlife and vegetation. (Source: *Methow Valley News* [Washington], April 14, 2016)

Former New Zealand National Park Is Granted Personhood

In New Zealand, a former national park has been granted personhood, and a river system is expected to receive the same status soon. The unusual designation, something like the legal status that corporations possess, came out of agreements between New Zealand's government and Maori groups. The two sides have argued for years over guardianship of the country's natural features. New Zealand's attorney general, Chris Finlayson, said the issue was resolved by taking the Maori mind-set into account. "In their worldview, 'I am the river and the river is me,'" he said. "Their geographic region is part and parcel of who they are."

From 1954 to 2014, Te Urewera was an 821-square-mile (213,000 ha) national park on the North Island, but when the Te Urewera Act took effect, the government gave up formal ownership, and the land became a legal entity with "all the rights, powers, duties and liabilities of a legal person," according to the statute. Personhood means, among other things, that lawsuits to protect the land can be brought on behalf of the land itself, with no need to show harm to a particular human. "The settlement is a profound alternative to the human presumption of sovereignty over the natural world," said Pita Sharples, who was the minister of Maori affairs when the law was passed. Visitors can still enjoy Te Urewera the way they always could. "We want to welcome people; public access is completely preserved," Mr. Finlayson said. But permits for activities such as hunting are now issued by a board that includes government and Maori representatives.

The Whanganui River, New Zealand's third longest, is next in line to receive personhood. The local Maori tribe views it as "an indivisible and living whole, comprising the river and all tributaries from the mountains to the sea – and that's what we are giving effect to through this settlement," Mr. Finlayson said. A board will also be established to manage the river. (Source: *New York Times*, July 13, 2016)

Study Identifies Wildest Corridors Between Key Protected Areas in the United States

In a paper published in *PLOS ONE*, "Identifying Corridors among Large Protected Areas in the United States," scientists from The Wilderness Society (TWS) and other organizations have identified the wildest corridors between large protected areas in the contiguous United States. According to TWS, development of natural areas in the United States, coupled with expected changes in climate, have increased the importance of migration corridors that connect protected natural areas, reducing the isolation of animal and plant populations and allowing for migration and movement that can help preserve populations of wild species and enhance genetic and ecosystem diversity.

"Our analysis identifies the most natural or wildest linkages between large protected areas across the lower 48 states," says lead author Travis Belote, research ecologist with The Wilderness Society in Bozeman, Montana. "We don't focus on habitat needs of any particular species, but rather believe that the [greatest] number of species will have the best chance to move around using the wildest linkages between protected areas. Our hope is to move from an aspirational vision of connected protected lands to actual conservation priorities."

The study ranks inventoried Roadless Areas and Wilderness Study Areas that should be prioritized for additional protection and suggests priorities for maintaining a connected network of protected areas. According to the study, concentrations of highly connected but unprotected land exist in southeastern Oregon, the Great Basin and Colorado Plateau, western Maine, and the "Idaho High Divide" country between the Frank Church-River of No Return Wilderness and Yellowstone National Park.

Authors of the study include R. Travis Belote, Matthew S. Dietz, Brad H. McRae, David M. Theobald, Meredith L. McClure, G. Hugh Irwin, Peter S. McKinley, Josh A. Gage and Gregory H. Aplet. The study can be accessed at http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0154223.

New National Park in Democratic Republic of Congo Protects Critical Rainforest

On July 7, 2016, the Conseil de Ministres (Council of Ministers) of the Democratic Republic of Congo (DRC) officially established Lomami National Park, the country's first national park to be created in more than two decades. The Rainforest Trust and local partner Lukuru Wildlife Research Foundation worked with local communities and governmental institutions to make the national park a reality.

While many parts of the Congo have suffered from decades of disastrous civil war, Lomami Basin has been spared much of this destruction due to its remote location. However, in recent years the area has been ravaged by gangs of ivory poachers terrorizing both wildlife and local people. According to Rainforest Trust, the declaration of Lomami National Park not only provides fundamental protection for wildlife, but also brings much-needed security and stability to the region. At the request of indigenous communities and with the backing of the Congolese Army, trained and well-equipped teams of park guards will be deployed throughout the new park to curtail poaching and lawlessness.

More than five times the size of Texas, the Congo Basin encompasses a mosaic of hill and lowland tropical forests, swamps and natural savannas that shelter an abundance of rare and endangered species found only in the DRC, including okapis, bonobos, Congo peacocks and a newly discovered monkey, the lesula. It is also home to African forest elephants, whose populations continue to plummet. Lomami National Park will provide a vitally important refuge for the elephants, covering nearly 2.2 million acres (890,000 ha), equal in size to Yellowstone National Park. Despite being the second-largest rain forest in the world, the Congo Basin ranks as the most underprotected rain forest wilderness left on Earth.

This is the first protected area in the DRC that was set up in a participatory manner and involved all levels of the community and administration, from village to province to national entity. "Thanks to the bottom-up approach in the establishment of this park, the local community feels a real stake in the protection of this area and its wildlife," said Dr. Paul Salaman, CEO of Rainforest Trust. "This strategy is absolutely fundamental for conservation to succeed. It is the only way that major protected areas will stand the test of time, allowing local communities to participate." In addition, efforts are under way to create Balanga Forest Reserve, bordering Lomami National Park and ultimately extending protection across an area the size of Connecticut. (Source: https://www.rainforesttrust.org, July 8, 2016)

The Gordon and Betty Moore Foundation Pledges US$100 Million Toward Andes-Amazon Protection

The Gordon and Betty Moore Foundation – the largest private supporter of conservation in the world's largest rain forest – has pledged another US$100 million toward efforts to establish and support protected areas across the Andes-Amazon landscape. The five-year commitment builds on the US$358 million the Moore Foundation has already invested in Amazon conservation areas and indigenous territories since 2001. "Over fifteen years, our grantees have helped conserve more than 140 million hectares [346 million acres] in the Amazon," Avecita Chicchón, the Moore Foundation's Andes-Amazon Initiative director, said in a statement. "We are proud of their significant impacts in protecting forest cover and biodiversity."

According to the foundation, which derives its endowment from funds provided by the co-founder of chipmaker Intel, the initiative will focus on three priority strategies: creating and consolidating existing reserves and indigenous territories, supporting policy that incorporates forest protection into land-use planning, and securing funding mechanisms, management systems, and monitoring platforms for national parks.

"Working at these different scales, from individual conservation units to land-use mosaics to national park systems, we believe we can help

create a regional conservation infrastructure," according to Guillermo Castilleja, the foundation's chief program officer for environmental conservation. "This approach will help ensure the long-term resilience and durability of the exemplary gains in forest conservation that our Andes-Amazon Initiative grantees and others have worked so hard to accomplish."

The foundation added that while 400 million hectares (988 million acres) of protected areas and indigenous territories have been created across the Amazon Basin, the potential exists to set up new reserves. "There are still opportunities to create a few new areas at the national level, but many more at the [state and municipality levels] – we are working with different grantees to accomplish this," Gordon Moore said, noting that the Paris climate agreement could increase funding streams for forest protection. While the annual deforestation rate in the Brazilian Amazon has plunged over the past decade, forest clearing is surging in Peru and rising in other key Amazonian countries. Slowing regional economies due to the global commodity collapse is causing uncertainty around conservation funding, while also increasing political pressure to weaken environmental laws. (Source: mongabay.com, March 22, 2016)

World Heritage Committee Adds Nine New Natural Sites to List

The World Heritage Committee added nine new natural sites to the World Heritage List during its 40th session in Turkey in July 2016. The additions include diverse landscapes such as Khangchendzonga National Park in India, a cultural and natural site home to endangered species including the snow leopard and musk deer; Canada's Mistaken Point, known for its unique, diverse, and well-preserved fossils; and Iran's Lut Desert, noted for its remarkable variety of desert landforms.

According to Peter Shadie, head of IUCN's delegation at the World Heritage Committee, "This year's World Heritage inscriptions are some of the most impressive landscapes and most important natural areas for the conservation of iconic species on Earth. Recognizing these exceptional places through the World Heritage Convention goes hand in hand with a commitment to secure the utmost quality of conservation management."

These are the nine new sites added to the list:

Khangchendzonga National Park (India)

The park includes the world's third highest peak. Located in North Sikkim in India, the Khangchendzonga National Park has a mix of subtropical broad-leaved forests, subalpine forests, moist alpine scrub forests, glaciers, rivers, streams and lakes. It has a huge diversity of animals and plants including the snow leopard, musk deer, red panda, Himalayan monal, and Himalayan snow cock.

Hubei Shennongjia (China)

Home to the largest primary forests remaining in central China, Hubei Shennongjia hosts species such as the golden or snub-nosed monkey, Chinese giant salamander, and the clouded leopard. The site has had a rich history of international plant collecting expeditions.

Mistaken Point (Canada)

Mistaken Point, Newfoundland, is home to a rich diversity of fossils from 560–575 million years ago preserved in layers of volcanic ash. The site's fossil records include some of the oldest deep-water marine fossils, providing a glimpse into species that once lived at the bottom of the sea.

Archipiélgo de Revillagigedo (Mexico)

Sometimes referred to as Mexico's little Galápagos, the Revillagigedo Islands are a group of four remote volcanic islands in the eastern Pacific Ocean. The unique ecosystem of the islands is home to numerous rare and endemic species such as the Socorro parakeet, Townsend's shearwater, and historically the now-extinct Socorro dove.

Sanganeb Marine National Park and Dungonab Bay-Mukkawar Island Marine National Park (Sudan)

This site hosts a complex network of coral reefs, seagrass beds, mangroves, and beaches that support populations of diverse fish communities, seabirds, marine mammals, sharks, and rays. Mukkawar Island is an important mass turtle nesting site and the Dungonab Bay is home to a sizable population of dugongs.

Western Tien-Shan (Kazakhstan, Kyrgyzstan, Uzbekistan)

This is a transnational mountainous site, spread across three countries – the Karatau and Aksu-Zhabagly nature reserves and Sayram-Ugam national nature park in Kazakhstan; the Sary-Chelek, Besh-Aral, and Padysha-Ata nature reserves in Kyrgyzstan; and Chatkal nature reserve in Uzbekistan. The Western

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Book Reviews

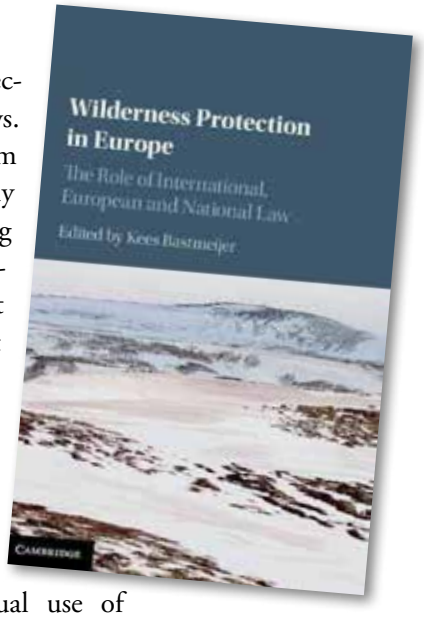
JOHN SHULTIS, BOOK REVIEW EDITOR

Wilderness Protection in Europe: The Role of International, European and National Law

Edited by Kees Bastmeijer. 2016. Cambridge University Press, UK. 641pp. $155.00.

In *Wilderness Protection in Europe*, 30 contributors brought together the first comprehensive appraisal of the role of law in protecting wilderness areas across the vast reaches of Western, Central, and Eastern Europe, including European Russia. Five chapters in Part I examine the location, meaning, and value of wilderness in Europe. They map where wildlands may be found, and discuss the ecological, social, and economic values of wilderness according to various European cultures. Five chapters in Part II examine how wilderness areas in Europe are protected under international and regional treaties and European law, including the World Heritage Convention, the Bern Convention, the Alps Convention, the Carpathian Convention, and the European Union's (EU's) Natura 2000 system. Part III analyzes wilderness protection under the domestic legal systems of 12 countries: Austria, the Czech Republic, Estonia, Finland, Hungary, Iceland, Norway, Poland, Russia, Spain, Sweden, and the United Kingdom. In the conclusion chapter, the editor summarizes the main similarities and differences between wilderness protection under the various legal systems and proposes options to strengthen legal protection of wilderness in Europe.

Europe is a culturally diverse continent with a long and complex history. In many countries the term *wilderness* is not explicitly used. People from different countries and even within the same country may have different attitudes toward wild land. In their analyses, contributors include not only legislations that explicitly aim to protect wilderness areas but also those that can provide protection to one or more of three main qualities of wilderness: naturalness, undevelopedness, and relatively large size. Summarizing the analyses from the preceding 22 chapters, the editor concludes that wilderness protection is not an explicit objective of most international and regional conventions, EU directives, or domestic laws. In most cases, the term *wilderness* is completely absent. While existing legal frameworks provide many tools that can be used to protect wildlands (such as protected area legislation, spatial planning, environmental impact assessments), the overall conclusion is that the actual use of legal instruments for wilderness protection in Europe is uncertain and heavily dependent on public awareness and political will. Most legal instruments are facultative and do not provide real legal guarantees that wilderness will be protected at a large scale. The editor recommends a three-pronged approach to strengthen the protection of Europe's remaining wildlands: (1) develop explicit policies for wilderness protection, (2) ensure effective use of existing legal tools to protect wilderness, and (3) adopt wilderness protection as a strategy to strengthen ecosystem services.



Wilderness Protection in Europe is an important contribution to the ongoing efforts to promote wilderness protection in Europe. It will stand alongside *A Handbook on International Wilderness Law and Policy* (Kormos 2008) as an invaluable reference for international and cross-cultural understandings of wilderness values, legislations, and policies.

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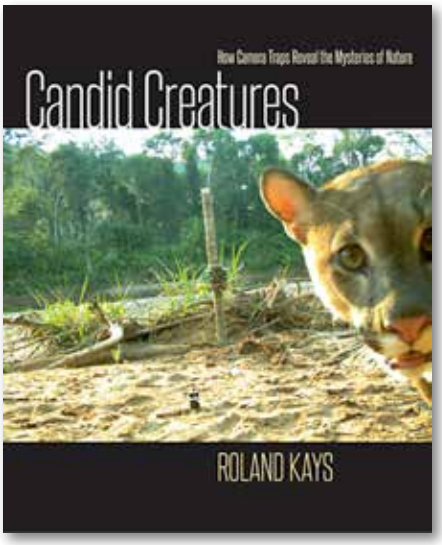
REVIEWED BY TINA TIN, independent environmental consultant interested in Antarctic and wilderness issues; email: tinatintk@gmail.com.

Candid Creatures: How Camera Traps Reveal the Mysteries of Nature

By Roland Kays. 2016. The Johns Hopkins University Press. 272 pp. $39.95 (hardback).



The use of camera traps as a scientific tool to record the presence and activities of wildlife in nature has become an accepted practice. "Camera traps" are cameras triggered by the presence of wildlife through a variety of mechanisms such as active infrared beams that are broken by animals moving through them. The camera and triggering mechanism become the equivalent of an animal taking a "selfie" photo. One of the benefits of such motion-activated imagery is that it is largely noninvasive to the behavior of the animal under study, thus allowing observation of animal behavior and movements that may not have been previously seen or documented. In particular, imagery of rare or nocturnal animals in their natural habitats is now possible even in very remote wilderness areas.

The book *Candid Creatures* makes several types of contributions to the field of wildlife science and conservation. While wildlife researchers have taken millions of images in recent decades, Kays has compiled 613 images from 153 wildlife research individuals and groups to highlight the contribution of this research to conservation efforts worldwide. In a chapter entitled "Critters," he presents photos of 73 species of animals ranging from iconic, charismatic megafauna such as black rhinos, snow leopards, and wolves to lesser-known or nocturnal species such as bats and aardvarks.

The chapter on "Animal Neighborhood Watch" highlights the urban and natural habitats of animals and helps relate the importance of this type of research on wildlife to conservation efforts and programs. A variety of 12 ecosystems and geographic areas are presented from the canopies of rain forests to a Polish woodland. The combination of wildlife observation in urban habitats informs conservation issues that help animals and people coexist.

The behavior of wildlife with the physical environment and other species is discussed in 22 examples in the chapter "Caught in the Act." Locations and situations presented range from animals using water holes and mineral licks to nest predation and feeding on animal carcasses. Traditional wildlife research methods for counting animals to estimate population, measure diversity, or survey mammal, bird, or fish populations are augmented by information from camera traps.

Throughout the book, Kays uses text, graphs, and maps to summarize how published literature, when combined with information from camera traps, provides a clearer and more complete information base to better manage human and wildlife interactions. Kays draws from 240 published scientific studies to make the case for the value of using camera trap imagery to more fully understand conservation issues and the alternative ways in which animals and humans can coexist in urban or agricultural areas and remote landscapes. The strength of the book is in Kays's understanding of the published literature and his collaboration with camera trap researchers to make an important contribution to conservation efforts. Roland Kays is well qualified to share his observations on wildlife conservation as the director of the Biodiversity Laboratory at the North Carolina Museum of Natural History and a research associate professor at North Carolina State University.

REVIEWED BY CHAD DAWSON, *IJW* editor in chief; email: chad@wild.org.

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Tien-Shan site has rich biodiversity and complex and diverse landscapes.

Lut Desert (Islamic Republic of Iran)

One of the hottest places on Earth, the Lut Desert (also called Dasht-e-Lut) is a large salt desert located in Iran. The site is known for its unique and diverse collection of desert landforms.

Ennedi Massif: Natural and Cultural Landscape (Chad)

Chad's Ennedi Massif is a natural and cultural heritage site known for its striking sandstone formations formed by years of wind and water erosion. The landscape is also an archaeological site, with large collections of rock art. The permanent presence of water in a canyon here has allowed animal and plant life to flourish.

The Ahwar of Southern Iraq: Refuge of Biodiversity and the Relict Landscape of the Mesopotamian Cities (The Republic of Iraq)

The site includes four wetland marshes that form one of the world's largest inland delta systems. A large expanse of the extensive marshlands was once drained by Saddam Hussein. The Ahwar of Southern Iraq is home to numerous bird and fish species and also includes the three archaeological Mesopotamian cities of Uruk, Ur, and the Tell Eridu. (Source: mongabay.com, July 18, 2016)

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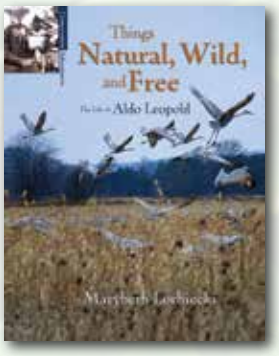
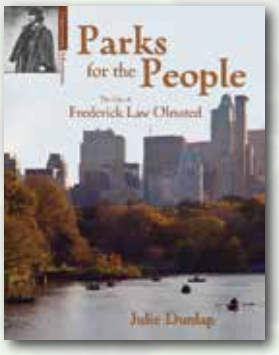
Aldo Leopold – Father of the Land Ethic



Things Natural, Wild, and Free
The Life of Aldo Leopold
Marybeth Lorbiecki

Aldo Leopold was a forester, wildlife scientist, author, and one of the most important conservationists in history. Leopold was the father of the *Land Ethic*, that states that plants, animals, all living things make up "the Land" and should be protected. Award-winning author Marybeth Loribiecki brings Leopold to life in this vivid new biography. Featuring resource and activity sections, a time line, a bibliography, and historic black-and-white photographs.

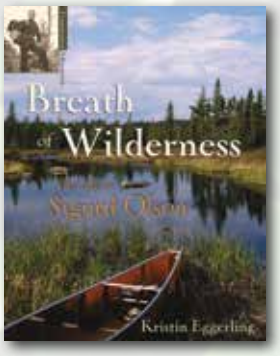
Frederick Law Olmsted – Landscape Architect



Parks for the People
The Life of Frederick Law Olmsted
Julie Dunlap

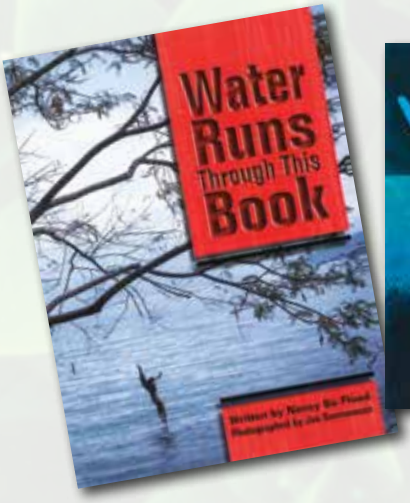
A contest to design the United State's first city park opened new doors for Olmsted when his winning design became New York's Central Park, just one of Olmsted's ideas that changed the nation's cities. Award-winning author Julie Dunlap brings Olmsted to life in this memorable biography, featuring resource and activity sections, a time line, and a bibliography, as well as black-and-white historical photographs.

Sigurd Olson – helped draft the Wilderness Act



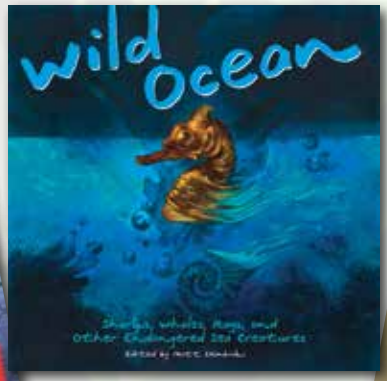
Breath of Wilderness
The Life of Sigurd Olson
Kristin Eggerling

Sigurd Olson's love for wild places and how that love transformed his life, inspired him to play a key role in the movement to preserve wilderness throughout North America, including the Boundary Waters Canoe Area Wilderness, the largest lakeland wilderness in the United States. Features resource and activity sections, a time line, a bibliography, and historic black-and-white photographs.



Water Runs Through This Book
By Nancy Bo Flood
Photographs by Jan Sonnemair
Paperback, 7 x 9, 64 pages, $19.95 us
Full color photographs throughout

Through photographs, verse, and narration, *Water Runs Through This Book* teaches how water runs through all aspects of our lives. Including everyday tips to help conserve, it will inspire children and adults to value water resources and to become better global citizens. Winner of the 2015 Sigurd F. Olson Nature Writing Award



Wild Ocean
Sharks, Whales, Rays, and Other Endangered Sea Creatures
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Paperback, 8 x 8, 156 pages, $19.95 us

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More Than 100 Hands-On Science Experiments for Children
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