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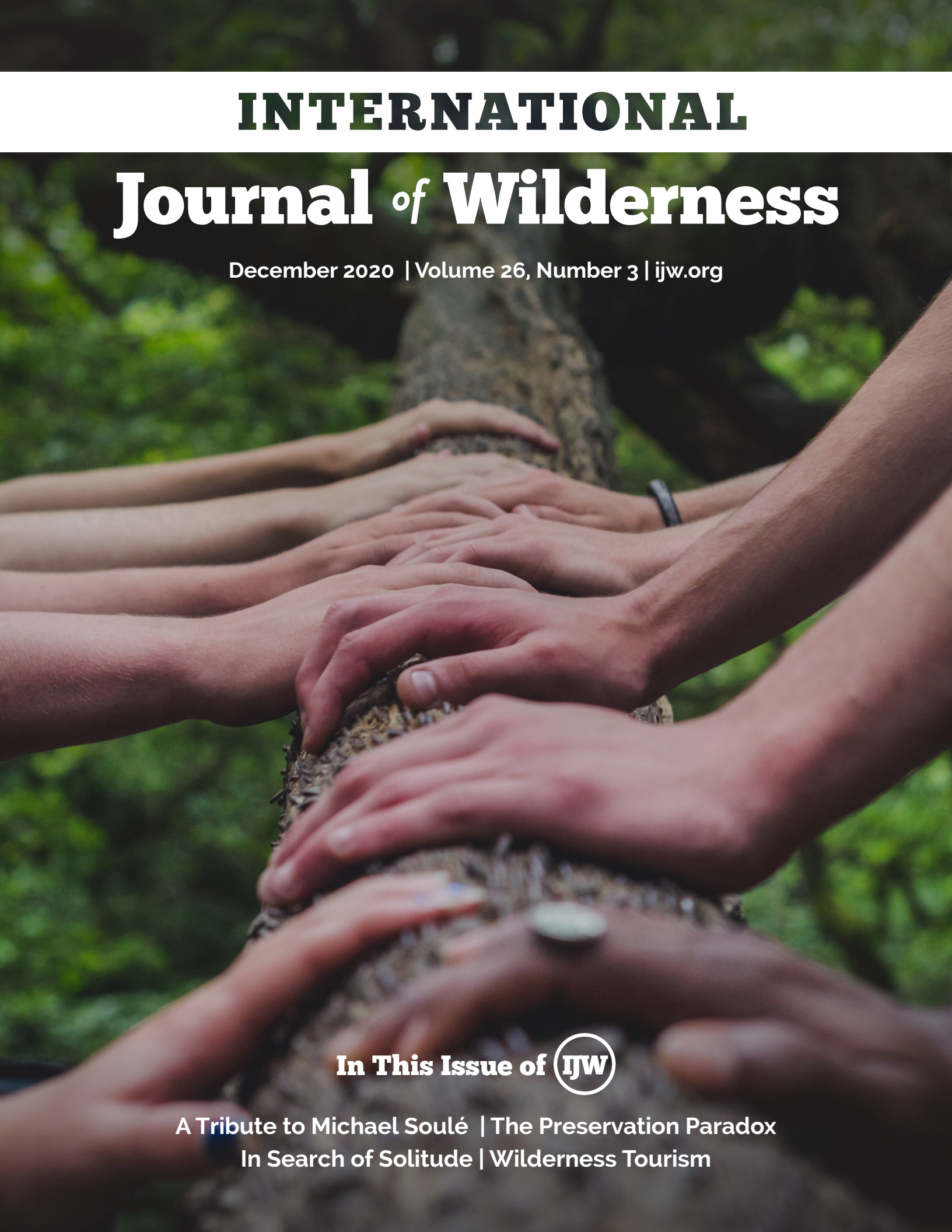

In This Issue of IJW

International Journal of Wilderness

December 2020 Volume 26, Number 3

FEATURES

On the Cover

Team building at RGB Parkour Tour back in 2014.

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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.—Chad P. Dawson

IJW Editor-in-Chief Emeritus

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International IJW Journal of Wilderness

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

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announcements, and information for the wilderness digest are encouraged. A complete list of manuscript submission guidelines is availablefrom the website: www.ijw.org.

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EDITORIAL PERSPECTIVES

What We Have and What We Need

by ROBERT DVORAK

Robert Dvorak

Well.

As we reach the end of the 26th volume of the International Journal of Wilderness, it is worthwhile to reflect on this year that was 2020. It has been a time of unpredictability with the global pandemic and COVID-19. We have experienced social and political unrest at a wide scale. And for many, it has been a year filled with uncertainty, stress, and loss. Hearing the term "unprecedented" is beginning to lose its meaning.

But, 2020 has also provided the opportunity for us to reflect and reevaluate what we need as humans, society, and a planet. We need community, where we are not isolated, but instead partnering and striving for a positive future. We need innovation, where new ideas and enthusiasm allow us to address climate destabilization and the conservation of nature with a broad and diverse constituency. And we need a planet where nature is valued for itself, and where the interface of society and nature is considered with humility and restraint.

While there is a great need, there is much that we have. We have been given the opportunity to change the pace of society, gaining time that allows us to consider our values and priorities. We have been given the opportunity to reengage with our neighbors, understand our community, and volunteer our time and resources for positive change. And we have been given the opportunity to unplug, slow down, and find solace

and solitude in the wonderous places that so many of us have committed to preserve and protect. So, while the need is great, we may have gained what was necessary to discover the best way forward.

This issue marks the retirement of Dr. Alan Watson from the IJW Editorial Board. Throughout the past 25 years, Alan has been an integral part of the journal's growth and development. He has championed its mission and influence amongst wilderness stewards, practitioners, and advocates. He has mentored many neophyte scholars and scientists to share their work in a meaningful way (including my first published manuscript in the December 2007 issue). And he has been a constant advocate for partnerships, connecting international scientists and managers across a multitude of protected areas and wilderness. Thank you, Alan, for all your passion and enthusiasm. We wish you the best as you continue exploring our wild places.

We would also like to take the opportunity to welcome Dr. Christopher Armatas to the IJW Editorial Board. Chris joined the Aldo Leopold Wilderness Research Institute as a social scientist in March 2020. As a new member of the Editorial Board, Chris hopes to contribute with his research background focused on wildlands management and planning through an interdisciplinary, social-ecological systems lens. More specifically, his research includes qualitative and quantitative approaches to understanding how human well-being is supported by the variety of benefits flowing from our public lands, social vulnerability to environmental and land use change, and methods for integrating science into public engagement efforts for large planning processes. Chris's desire to work in support of effective stewardship of wilderness and wildlands stems from years spent working on the Yellowstone River and exploring the wild places surrounding Yellowstone National Park. We are very excited to have Chris as part of IJW.

In this issue of IJW, we remember Michael Soulé and his contributions to conservation. Karen Mudar examines managing cultural resources in wilderness. Tyler Cribbs, Ryan Sharp, Matthew Brownlee, Elizabeth Perry, and Jessica Fefer investigate solitude for wilderness and nonwilderness users. And Grant Dixon discusses the implications of tourism on the Tasmanian Highlands.

ROBERT DVORAK is editor in chief of IJW and professor in the Department of Recreation, Parks, and Leisure Services Administration at Central Michigan University; e-mail: dvora1rg@cmich.edu

Michael Soulé and the Project Coyote membership

A Tribute to Michael Soulé

Editor's note: The following is a tribute to the life and contributions of Michael Soulé from several colleagues and friends. The Editorial Board of the International Journal of Wilderness would like to sincerely thank the authors for their contributions. We would also like to thank **Project Coyote** and **The Rewilding Institute** for granting permission to republish their tributes to Dr. Soulé.

In Memory of Michael Soulé:

Project Coyote Science Advisory Board, 2008–2020
Camilla Fox, Project Coyote Founder & Executive Director

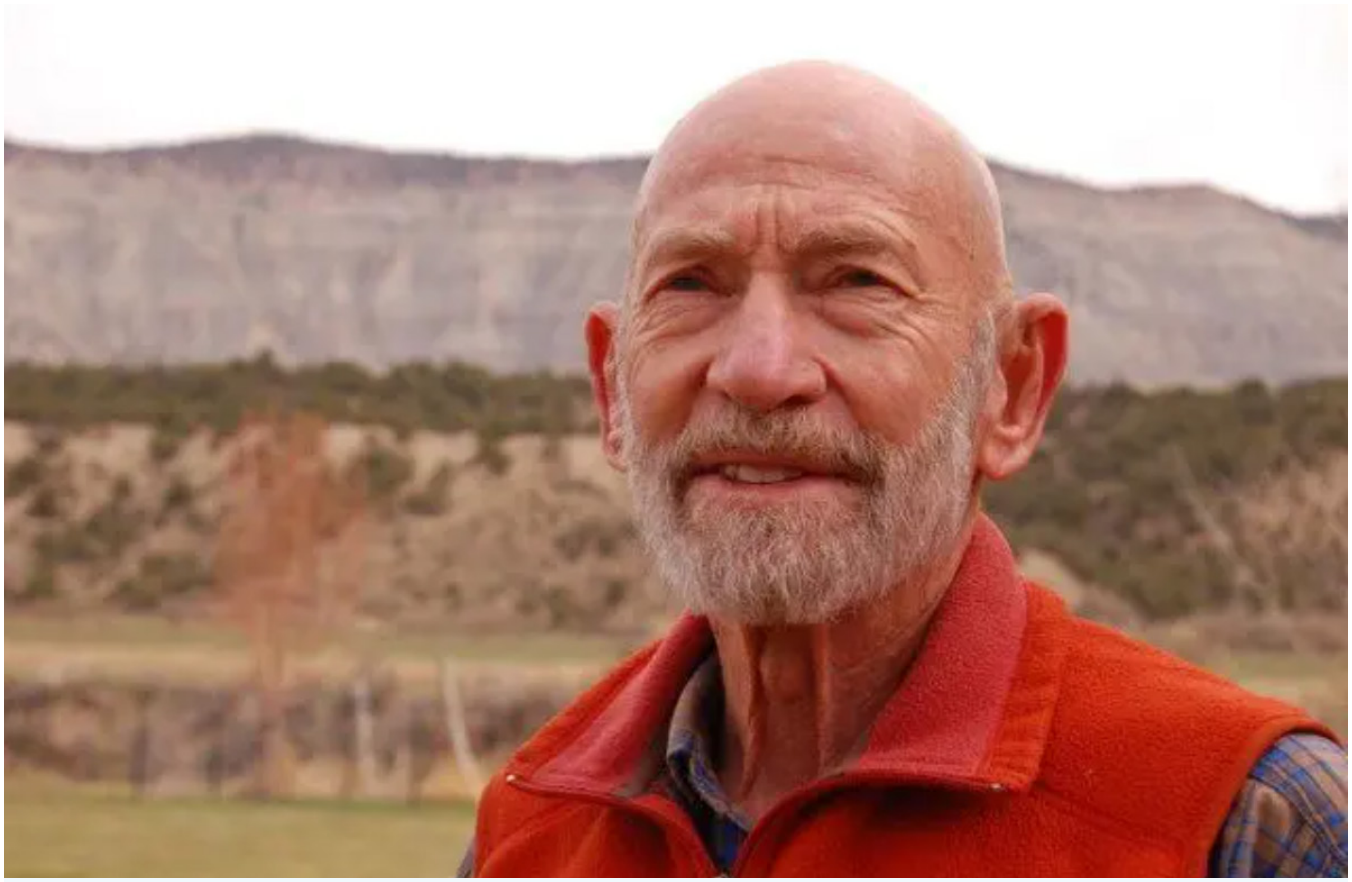
Camilla Fox

It is with a heavy heart that we share that Project Coyote Science Advisory Board member Michael Soulé passed away on June 17 at the age of 84.

Considered the "father of conservation biology," Michael cofounded the Society for Conservation Biology in 1985, also serving as its first president, and went on to cofound The Wildlands Project and serve as its president. He wrote and edited nine books on biology, conservation biology, and the social and policy context of conservation, and published more than 170 articles on population and evolutionary biology, fluctuating asymmetry, population genetics, island biogeography, environmental studies, biodiversity policy, nature conservation, and ethics.

I first met Michael in 2004 at a Society for Conservation Biology conference. A colleague introduced us, and I remember feeling a mixture of awe and excitement to meet this man I had long admired in the wildlife conservation sphere. I shared with Michael some of the work I was doing regarding carnivore conservation and predator management reform, and he encouraged me to publish and expose some of my findings.

Michael mentored countless conservationists – many of whom



Michael Soulé passed away on June 17th, 2020 in Grand Junction, Colorado at the age of 84. He leaves a lasting legacy of conservation, paving the way and showing us all how to be better stewards of this planet. **Photo credit** © Rewilding Institute

went on to have their own significant careers in wildlife conservation and environmental protection. Among his many noteworthy students was Kevin Crooks, whose seminal research with Michael in San Diego contributed to the mesopredator release theory. This ecological theory (developed by Michael to describe the interrelated population dynamics between apex predators and mesopredators within an ecosystem, such that a collapsing population of the former results in dramatically increased populations of the latter). Crooks, who was studying at the University of California at Santa Cruz, and Michael surveyed enclaves of land around San Diego. They found areas visited by coyotes had fewer small predators such as raccoons, skunks, and cats, but more native birds. Elsewhere, in areas devoid of coyotes, midsize predators like skunks and cats were common and birds were rarer. Describing the importance of this study and the theory behind it, Michael stated:

> *When we studied coyotes in the canyons of San Diego in the 1980s, we discovered that the canyons the coyotes still visited were healthier. There were more species of native birds than in those canyons that coyotes couldn't access because they were isolated from*

the surrounding rural areas. That pattern has been seen around the world many times, where the large predators are removed and the populations of small predators, including raccoons, foxes and birds like ravens, jays, and robins explode. We call these smaller carnivores meso-sized predators. Their populations explode because there is no cap on predation or behavioral inhibition of their hunting. The smaller animals begin to go extinct in the area, as we saw in San Diego. When coyotes are present, housecats and other predators are much less active and don't hunt as much. In this sense, it turns out that coyotes are good for native birds and ground nesting birds. These processes are called trophic cascades. You remove one part of the ecosystem, and it causes a ripple effect through other parts of the ecosystem that depended on the absent part. This can affect both flora and fauna. (Soulé 2020)

I was very fortunate that Dr. Soulé served on my graduate school thesis committee. It was during this time that I came to better understand Michael's thinking around the need for protecting wildlife corridors and rewilding the continent with large carnivores – and for integrating compassion and consideration of animal welfare into the field of conservation.

After I completed my graduate studies in 2008, Michael became one of the founding Science Advisory Board members of Project Coyote (PC) when I founded the organization that same year. He joined a gathering of our Science Advisory Board in Yellowstone in 2014 where we discussed such issues as how we shift the paradigm of predator management in the United States toward carnivore conservation and stewardship and how we define coexistence with large carnivores (Figure 1). We broke out into small groups to discuss these issues, surrounded and buoyed by the beauty and magic of Yellowstone. In this short video, Michael is joined by fellow PC science advisors Dr. Paul Paquet and Dave Parsons in a discussion about how best to define coexistence.

To have been in the presence of these three giants in the field of carnivore conservation discussing what it really means to coexist with wildlife (when we were literally surrounded by wildlife!) is a cherished memory that will remain with me forever (Figure 2).

Before compassionate conservation became a movement and a field unto itself, Michael Soulé was advocating for the need to recognize and protect the interests and welfare of individual animals while also preserving biodiversity and species' populations. A prescient visionary, Michael helped develop Project Coyote's mission and vision, incorporating the concepts of coexistence and compassionate conservation into our work for wildlife and wildlands.

Those who knew Michael recognized that he struggled with grief and deep despair over the state of the world and our treatment of the planet and other sentient beings. He was a hyper-empath who felt the pain and suffering of others acutely – as well as the beauty and awe of wild nature. He shared that his Buddhist practice kept him mindful, aware, and centered in a world that he described to me as "unmoored" and "collapsing in despair." I always wished I could have

Figure 1 - Paul Paquet, Camilla Fox, and Michael Soulé

spent more time with Michael to absorb his knowledge, wisdom, and mentoring.

Going through old photos, videos, and e-mail exchanges with Michael since his passing has brought tears and laughter – and has served as a constant reminder of how fragile and precious this life is. One of my last exchanges with Michael included a sharing of Mary Oliver's poem, "The Summer Day," where she asks: "Tell me, what is it you plan to do with your one wild and precious life?" Michael certainly had a plan with his one wild and precious life, and he executed it with gusto.

RIP Michael. You are missed by many and appreciated and loved by even more.

For you and the wild ones and wild spaces to whom you dedicated your life.

CAMILLA FOX is founder and executive director of Project Coyote; e-mail: cfox@projectcoyote.org.

Memories of Michael Soulé

By David Parsons, Project Coyote Science Advisor, and Carnivore Conservation Biologist with The Rewilding Institute

David Parsons

I feel quite blessed to have been one of Michael's friends. I'm not quite sure exactly how and when our friendship began, but I suspect it came about through my hanging out with Dave Foreman over the past 20 years or so and being invited on river trips. I know I was on the river trip where Michael met his wife, June, then known as Joli, whom I already knew through contra dancing. Many of you might not know that Michael was once an avid contra dancer himself. Michael was an immensely intellectual and humble man; he made friends with people from all walks of life. Yet he commanded the stage for decades as a world-class scientist in an equally humble manner. In my view, one of Michael's most important contributions was the wedding of conservation science to conservation activism. This was his vision and the mission of the Society of Conservation Biology, which he founded. He believed that ecological science should serve a broader purpose than intellectual curiosity – it should serve the goal of saving nature from ravaging humans. Michael practiced what he preached. I have written many comment letters to the US Fish and Wildlife Service (USFWS) over the years, especially on issues of wolf recovery. I often asked scientists to endorse these comments, and Michael was always eager to sign on and add his world-renowned credibility to my recommendations, for which I will be forever grateful. Even in his final days on Earth, Michael was the first scientist to endorse comments submitted less than a week ago to guide the USFWS's heretofore-misguided efforts to recover the critically endangered Mexican gray wolf. His name tops the list of over 100 scientists who endorsed those recommendations, which were submitted on behalf of Project Coyote and The Rewilding Institute. Thank you, Michael! Would you mind if I continue to add your signature to my future comments?

DAVID PARSONS is a Project Coyote science advisor and carnivore conservation biologist with The Rewilding Institute.

Memories of Michael Soulé

By Paul Paquet, Project Coyote Science Advisor
and Raincoast Conservation Foundation Senior Scientist

Paul Paquet

My last conversations with Michael were serenely revealing and left no doubt why Michaels's legacy will be long-lasting and entirely admirable. He pondered on several occasions that among the few compensations of old age is the acuity of hindsight and how the awareness of limited time can paradoxically expand time. He spoke of being pleasantly overtaken by a feeling of the rightness and beauty and uniqueness of those he loved while in amazement of the curious ecstasy of simply feeling fine, feeling good.

He frequently reminded me that empathy naturally arises when the sense of oneness (nonseparation) is allowed to break through the ego's defenses, having a constant and daily effect on our relationship with the world we live in. An ethical circle begins with a knowledge or feeling of relationship and the compassion that arises from that. Michael said all such "openings" offer a glimpse of the "truth" of nonseparation or the nondual. Although some people are deeply alarmed or frightened by the insights, others are joyous. Both can happen to the same person. He understood, however, that in an anthropocentric world, anyone who loves nature as much or more than they love people is going to be avoided or distrusted. Not surprisingly, he helped to get the field of conservation biology started, in large part, due to insight from such an experience.

Michael, you are thanked from the bottom of my heart for your always thoughtful counsel and all that you have so generously shared. In paraphrase of your own words, if nature had a voice (and any influence, besides "batting last") I am sure that "she" would thank you too.

PAUL PAQUET is a Project Coyote science advisor and the Raincoast Conservation Foundation senior scientist.

The Conservation Movement's True North

By Alec Marr

Alec Marr

Conservationists and scientists around the world are mourning the death of Michael Soulé. Michael was 84. He was a dear friend, a great scientist, and a great warrior in the fight to save wild nature.

In Australia, Michael helped broaden and deepen our understanding of what "Nature needs to survive and thrive" on the Australian continent. His contribution to nature conservation in Australia is important now and will remain so far into the future. Our collaboration and friendship began in 2001 when, inspired by the US Wildlands project, The Wilderness Society (TWS) in Australia decided it needed a new strategic framework for its conservation efforts – a truly continental-scale approach, which would give nature the opportunity to continue its evolutionary path. As one of the founders of the Wildlands Project and a key advocate for its science-driven approach, Michael was a key player in continental conservation thinking globally. As then director of TWS, I pondered how we might involve Michael in the journey we had begun.

We were seeking an Australian adaption of the concepts pioneered by the US Wildlands Project in which Michael Soulé played such a seminal and visionary role. The 7th World Wilderness Congress in South Africa in 2001 to which we had both been invited provided the opportunity I had been looking for. My decision as director of The Wilderness Society in Australia to attend the World Wilderness Congress was driven by the opportunity to encourage Michael to help build and lead a group of high-level scientists to provide unfettered advice on "what nature needs" to strengthen the underpinnings of nature conservation efforts in Australia. We wanted to set up a team of the best environmental scientists in Australia to work with Michael and a continental-scale conservation program based on the best science available.

I managed to meet Michael and start talking to him about our ambitions, which we called the Wildcountry program, trying to

persuade him to become involved. I think the main thing I persuaded him of was that I was totally passionate about protecting nature. This was a good start, but not enough. If Michael was going to work with us, we needed some heavyweight scientists involved. So, the fact that Brendan Mackey was also at the World Wilderness Congress in Port Elizabeth was indeed fortuitous. In the conversations that followed, Michael could see that the ecological processes that underpin the survival of nature in Australia needed to be elaborated and better understood by us all and that many of Australia's top natural scientists were likely to be interested in contributing and could be encouraged to do so by his presence.

Once Michael committed to coming to Australia, he became a magnet that helped attract other scientists, and his involvement gave our continental-scale conservation ambitions a major boost. The Wildcountry Science Council was formed, cochaired by Michael and Henry Nix. The work done by the Science Council set a new level of ambition and scale for nature conservation in Australia.

Thus began a friendship that would last the rest of our lives. Between 2001 and 2010 Michael came to Australia at least once and often twice a year for extended periods. He would cochair the two-day Science Council meetings with Henry Nix, and then we would have a full work program for him ranging from meeting ministers and their advisors, meeting donors, spending time with grassroots groups discussing how to implement some of the connectivity principles on the ground, and meeting other experts and scientists involved in large-scale and particularly in connectivity conservation.

Michael had a particular interest in top-down regulation of ecosystems by predators, so in Australia Michael helped kick off an intensified discussion and new field research into the dingo and its role in suppressing cat and fox numbers. We also traveled extensively together in wild and remote places all over Australia. Michael was never happier than in a wilderness camp somewhere, discussing philosophy under the stars, with a glass of red wine or tequila. Even people who never met Michael will recognize his brilliant intellect through his many science papers, but I was fortunate enough to be able to hear his ideas firsthand and share his companionship and generosity of spirit.

I was fortunate enough to be able to attend Michaels 80th birthday in his hometown of Paonia, Colorado, with a great mix of friendly locals and various conservation luminaries. I spent a few days with June and Michael, either side of the party and I came away from the visit knowing that Michael was surrounded by people who loved and appreciated him and that he was content.

Many will speak of Michael's uncompromising clarity of thought and advocacy for nature and the inspiration he gave people all over the world, but for me Michael Soulé was the "True North" of conservation. Michael's vision for nature made it easy to navigate through a dark sea of mediocrity and false compromise. Michael's intellect and clarity of purpose was like a giant compass needle that never failed to point us in the direction of what nature needed to survive. As a biologist Michael understood better than most both the inevita-

bility and the necessity of death; he was at peace with its role in the universe.

The First Law of Thermodynamics states that energy can neither be created nor destroyed, and I like to think that the energy that manifested in Michael Soulé is now elsewhere in the universe, doing something interesting. Go well my friend, see you on the other side, don't forget to chill the martini glasses!

ALEC MARR led The Wilderness Society in Australia from 1997–2010; e-mail: alec@strategicinterventions.net.

Vance G. Martin

Soulé at the 7th World Wilderness Congress

By Vance G. Martin, President of the WILD Foundation and Wilderness Foundation Global

Michael had an unshakable commitment to wilderness, and over many decades his was a seminal voice in reorienting nature conservation and defining a new, ecologically based human relationship with wild nature. In 2001 we had a global alert, a wake-up call that shook the world and especially the United States like nothing else before it. The terrorist contribution to globalization, 9/11 galvanized us in a way never previously imagined in the post–World War II era. On that day in early September, we were just seven weeks away from convening the 7th World Wilderness Congress (WWC) in Port Elizabeth, South Africa, with almost 1,000 delegates from some 50 nations committed to advancing the global agenda for wilderness protection from Africa, where humankind had evolved in wild nature and from whence the modern human species began its migrations some 300,000 years ago that eventually began to subdue wild nature around the world.

Our planning was thrown asunder as we faced a new, seemingly existential threat – should we postpone … cancel … or continue? We needed to act quickly. With colleague and friend Andrew Muir (Wilderness Foundation Africa and executive director, 7th WWC), we made the decision to continue, thereby becoming the first

Figure 2 - Michael Soulé speaking at the 7th World Wilderness Congress in Port Elizabeth, South Africa.

major global gathering to convene post 9/11. We lost hundreds of delegates who were unwilling or not allowed to travel, but we eventually convened 700 who were committed to the role of wilderness as a visionary answer of hope for a united and positive future. Michael Soulé was one of them, and he said to me when I asked him if we could count on him being at the Congress, "Of course we will be there. We need to counter the real terrorism, that which we are inflicting on wilderness."

And so, we gathered at this most unusual time, as stated in the opening lines of the Port Elizabeth Accord that framed the 7th WWC:

> *At this time in our history, when the shadow of uncertainty pervades our thoughts and the presence of peril dictates our actions, all our aspirations and initiatives must, by necessity, be positive, determined, visionary, and collaborative.*

Michael was very on-target and uncompromising, of course. He called for an overhaul of the global conservation agenda in his plenary presentation, Wildlands Network Design. He posited that larger reserves and better connectivity constitute the foundation for any meaningful program of wilderness protection or nature conservation on a regional or continental scale, and the needed transformation is still possible in many parts of the world. The major elements of this new view of nature protection include (1) recognition of top-down regulation in ecosystems and the need for large core areas and regional wildlife linkages, (2) the need for ecological restora-

tion on unprecedented scales, and (3) a critique of "fashionable alternatives" such as sustainable development.

His critique of sustainable development was as precise and charming as it was scathing, yet calmly delivered as was his style, ending in:

> *In fact, the ascendance of the notion of sustainable development has slowed efforts to increase the size and number of strictly protected areas worldwide, and sustainable development projects do more harm than good for nature and wildness.*

In keeping with the 7th WWC's call to action for positive solutions, Michael's presentation ended with a summary of the value of the New Conservation Program presented in his plenary paper that he had developed in collaboration with the recognized and resolute conservation biologist John Terborgh:

> *A central concept of the new program for conservation is that large, interconnected, core protected areas are critical elements in regional wildland networks and, in these areas, the needs of large carnivores, other keystone species, and large-scale natural processes such as fire must be given priority over capital-intensive economic activity. Fortunately, it appears that nature protection benefits local communities materially and spiritually more, in the long run, than most economic development schemes that ultimately destroy environmental values and erode the communal bonds that bind people to the land and to each other.*

Fast forward to 2020, and Michael passes from this planet in the year that the threat of pandemic is added to the list of escalating, existential environmental threats, joining climate breakdown and mass species extinction as a triad of systemic issues seriously obscuring humanity's future. In the greater scheme of things and despite our own actions to the contrary, humans are not special and are, after all, just another species disregarding at its own peril the niche it occupies and polluting the promise it should not squander.

We can and must act on Michael's words. His vision and "new conservation program" two decades ago are even more relevant and urgent today than they were then, because protecting intact wilderness and implementing large-scale ecological restoration is still the best, most rational, economically minded, and sustainable solution we have to the ever-increasing, radically present threats that we face today.

VANCE G. MARTIN is an associate editor of IJW, president of the WILD Foundation, and director of Wilderness Foundation Global; e-mail:. vance@wild.org.

Immortalizing Michael

By John Davis, The Rewilding Institute

John Davis

The first time I met Michael Soulé, he was the dean of conservation biology. The second time, he was a frog.

That first meeting was the founding of North American Wilderness Recovery, which is now, almost 30 years later, Wildlands Network. Michael was a giant among giants at that inaugural meeting, and I (as the junior founding member, both intellectually and chronologically) listened in awe as he and Dave Foreman, Reed Noss, and other wilderness leaders explained to our host and sponsor, Doug Tompkins, how North American wildlife could be saved and restored. They outlined the "3 Cs" approach of designating large Core wild areas, reconnecting them via wildlife Corridors, and restoring keystone species, particularly the large Carnivores who keep ecosystems healthy – the basic approach of North American rewilding. Doug and his wife, Kris McDivitt Tompkins, then took the approach to South America; Michael and Reed soon explained it scientifically in their classic Wild Earth article, "Rewilding and Biodiversity: Complementary Goals for Continental Conservation"; and Dave soon expanded it into his landmark book Rewilding North America.

A year or so after that founding Wildlands meeting, our little Wild Earth editorial team drove cross-country in a talking station wagon that Kathleen Fitzgerald dubbed Norbert, to rendezvous in the Sonoran Desert with the Wildlands board and staff, our sibling group. Around the campfire one songful desert night – coyotes ululating, owls hooting nearby – the stories grew wilder and wilder. Wildlands Network always had more than its share of silverbacks, and this night several were in top form. Also, in attendance, though quieter, were some intellectually, spiritually, and physically attractive women, suspected of being potential or actual financial supporters; and psychologists could explain better than I whether

their pulchritudinous presence might have influenced the showmanship of the campfire storytelling. In any case, my clearest memory from that distant campfire is everyone rolling in laughter as Michael, with his elven features, hopped around, imitating and telling us of some rare frog he'd found on a research trip years prior. I'll never forget the twinkle in his eyes and the mischievously warm smile as he hopped past.

One more small reminiscence, of the many I'll share with friends by campfires in coming months: Michael and I are driving together to a Wilderness Workshop event in White River National Forest, western Colorado. I'm quizzing Michael, who has begun a huge research and writing project on human nature and how we must understand it to address the extinction crisis. We agree that properly promoted, a book boldly titled SIN: 10,000 Years of Indolence, Sloth, and Debauchery might just sell, and might help scientists and activists build compassion for our wild neighbors. (With Michael's family's permission, we hope to soon share with Rewilding Earth readers some of the introduction from that unfinished work.) As Michael is explaining to me the biological basis for various human tendencies, I ask him to explain a few apparent anomalies. The one that he admits is hard to explain in evolutionary terms is this: Why do some people, me included, seem to have stronger nurturing instincts toward the young of other animals, particularly cats and dogs, than we have toward human children. (I admit to Michael, I never wanted kids, but I make an avuncular fool of myself cooing over kittens and puppies.) Maybe, Michael offered, we should simply celebrate that broader compassion as part of biophilia, part of humans' affinity for other creatures, too.

Anyway, enough of my rambling. These stories I tell mainly to make the point that Michael should be celebrated and his legacy carried on not only for his brilliant scientific mind but also for his deep and broad compassion for others, his love for nature, his wonderful sense of humor, and his hard work to save the wild world.

Immortality is best achieved, I trust Michael would agree, through permanent protection of wildlands and their wild denizens. I propose we honor and immortalize Michael Soulé by finishing the Spine of the Continent Wildway – which he proposed as the flagship for a National Conservation Corridors campaign (see his article in Rewilding Earth entitled "A National Corridors Campaign for Restoring America the Beautiful") – along the Rocky Mountains and restore the top predators, including gray wolf, grizzly bear, and puma, throughout. This we should be able to accomplish by 2030, in keeping with the popular Half Earth goal of protecting at least 30% of Earth's lands and waters by 2030 and at least 50% by 2050. Two big steps this direction will be voting in Colorado this autumn to restore the wolf and electing a president and Congress who will begin protecting all public wildlands for their highest and best uses: as wildlife habitat, climate stabilizers, and quiet recreation grounds.

Like Frodo and Hayduke, Michael lives. The Spine of the Continent Wildway will embody Michael's goodness forever.

JOHN DAVIS is the executive director of The Rewilding Institute; e-mail: hemlockrockconservation@gmail.com.

Michael Soulé's Unpublished Thoughts on Sin and the Human Condition

Shared by Brian Miller

(BRIAN MILLER is a member of the Rewilding Leadership Council for Rewilding Earth.)

These thoughts are a brief summary of what Michael was thinking on sin and conservation. They also include some thoughts from private conversations we had over the recent years. His many, and influential, publications are well known. We want to keep alive these thoughts from his last writings – which he hoped would become a book that would help inform efforts to end the extinction crisis.

Scale is one of the most difficult concepts in ecology. Two people can be arguing a point, and sometimes both are right because they are thinking at different scales. Another misunderstanding comes when someone extrapolates the effect at one scale to a different scale. This can lead to false dualisms, and nearly all dualisms are false. Fire can keep you warm and cook your food. At a different scale fire can destroy large areas and take human lives. Good and bad can be situational.

So can sin. Historically, people have recognized "seven deadly sins,", which are also called Horace's Heptad. Horace laid them out in about the first century BC, and the Desert Fathers (early communities of Christian theorists) adopted them. Those sins are inclinations that can be good or bad, depending on the situation. At least five of those "sins" are firmly based in evolution. Greed, anger, lust, gluttony, and sloth were key parts of sexual selection going all the way back to the earliest forms of life. Those five are embedded in the shared DNA of all species. Pride and envy are more recent and perhaps cultural. We can add denial and despair to the cultural part of the Heptad.

In a nutshell, the five were key to survival and reproduction. Fitness in any species is defined by the contribution of genes you can leave in the next generation. For example, gluttony was adaptive because food sources for many species are scattered and irregular. The survival strategy is to consume as much as you can when you have the opportunity because the next meal may not present itself for a while. Some reptiles and amphibians can eat up to 70% of their body weight in one sitting. Physical sloth helped an individual recuperate energy expended by gathering food. Greed collected what one needed to survive. Anger spurred one into action, and together with greed, anger protected what one needed to survive. So, the five are adaptive in the natural world going back to the earliest forms of life. They help an individual to survive and

reproduce. Reproducing increases fitness.

The key for humans and nature is that 10,000 years ago greed, lust, gluttony, sloth, and anger increased our individual fitness. The question now is: Can the planet survive the deadly sins at present human population levels, economic affluence, and technological level of sophistication? Planetary change is happening fast, perhaps 100 times as fast as just a century ago.

It took humans 200,000 years to reach a population of 1 billion. It took 200 more years to reach 7 billion. We are now at 7.8 billion, with predictions of reaching 10 billion by 2050. The rate of increase has been clearly exponential. Unfortunately, the rate of increase for resources humans use has been largely linear, and in relation to increasing the amount of area necessary to produce our needs. Right now, humans use over 70% of the ice-free land for food, fabric, building materials, and so forth. (Baillie et al. 2010). Slightly more than 40% of ice-free land goes directly to food production (Baillie et al. 2010; Crist et al. 2017). We use about 50% of the planetary fresh water, and about 80% of our water use is for agriculture (Crist et al. 2017). In some places, humans are withdrawing 4 to 6 feet a year from the Ogallala Aquifer, while nature is putting back half an inch (Little 2009). The aquifer is already dry in some parts of Texas and Kansas (Little 2009).

By 2050, we may reach 10 billion people, with a predicted per capita increase in buying power of 150% (Tilman 2012). The amount of land needed to feed us will double, and freshwater use will increase by 55% (Crist et al. 2017). Our food production causes 20% of the annual contribution of carbon to the atmosphere (Crist et al. 2017). The irony is that humans rely on a stable interglacial climate for food production, but our carbon contribution makes weather more and more erratic, potentially diminishing future food production.

Ninety-six percent of the global biomass of mammals is human and our domesticated animals (Yinon et al. 2018). The amount of agriculture to feed us has created 400 dead zones in the ocean (Crist et al. 2017). The rate of tropical deforestation is accelerating. Ocean life is already badly depleted. If we reach 10 billion in 2050, what will be left for other forms of life?

Added to growing human numbers is consumption. More people mean more consumption, but per capita consumption also increased by a factor of 40 from 1900 to 2006. The assumption of constant growth is false (Czech 2013). We cannot constantly grow with our limited resources. The Laws of Thermodynamics cannot be violated. Up to now we have been able to switch to a different resource when the one we had used expired. But we live on a globe, and if we keep gobbling up whatever is in front of us, eventually we come to our back door.

Right now, it takes about one year and seven months to replenish what humans use in a year (Crist et al. 2017). That is not a good strategy for long-term sustainability. All energy comes to Earth in the form of sunlight. We have been able to extend our growth by using past sunlight in the form of fossil fuels (Czech 2013). It takes millions of years to convert organic matter to oil fuels. They are not renewable.

So back to scale, I could swat at a mosquito that was biting me (only females draw blood – males eat nectar and pollen and thus pollinate). This is very different from trying to genetically alter mosquitos out of existence. Bats would be very unhappy if we did so. Another example is that jellyfish were clogging a nuclear power facility to the point that the facility had to temporarily close. The anthropocentric answer was to create robo-choppers that could chop jellyfish into pulp to the tune of 900 kilograms per hour (Crist 2014). That is different from swatting away a jellyfish while swimming. Sea turtles would not happy about the robo-choppers. The paradigm of constant growth is killing nature. We cannot continue to use 1.7 planets' worth of resources. The only way we can grow our numbers and consumption is to take more from nature and other species. Eventually we will reach a ceiling, and the harmful effects of constant growth will fall on us. We are clever but not very smart.

What is an acceptable number of humans that can live well and still allow a significant portion of the planet to exist as nature? Many figures say around 2 to 4 billion (Crist et al. 2017). The key to reducing human numbers is empowering women, family planning, and readily available contraception. When women are educated, and have a place in society, birth rates and poverty are reduced. In Africa, a woman who didn't go to school averages 5.4 children (Crist et al. 2017). With a high school diploma, the number of children per woman is 2.7. With a college degree the rate is 2.2. A replacement rate of 2.1 (or lower) with a longer generation time will lower population numbers over time. Available contraception will reduce unwanted pregnancies. Unfortunately, there is heavy political and religious opposition to empowering women. Some societies want to keep women barefoot and pregnant.

We conservation biologists are not optimistic, particularly in the short-term. Optimism and pessimism are rational responses to data analysis. But we have hope. Hope is irrational. You see a trend and try to change it. Hope has to be combined with passionate action.

We conservation biologists are not optimistic, particularly in the short-term. Optimism and pessimism are rational responses to data analysis. But we have hope. Hope is irrational. You see a trend and try to change it. Hope has to be combined with passionate action. Nelson Mandela thought he might be in prison for life, yet he never abandoned hope. If hope is combined with mental sloth it leads to inaction. Inaction implicitly supports the status quo.

For example, someone on Easter Island cut down the last tree, knowing that it was the last tree. They did it with the faith that their gods would take care of them. That is how we can add denial to Horace's Heptad. Many have faith that we can persist no matter what (mental sloth)

and deny that our actions can be harmful (climate change, extinction, COVID-19). Those imbued with feelings of human exceptionalism (anthropocentrism) put blind faith in technology. If fresh water is gone, then turn to desalinization. Global warming can be countered by shooting sulfur dioxide into the atmosphere. The list goes on. We must counter denial and delusion, and it will take a diverse group of people and skills. Students often ask, "What can I do?" Michael says, "Do what you do best." Maybe you wanted to be a biologist, but you didn't like organic chemistry or statistics. You can become a passionate lawyer defending nature against its enemies. Maybe you are an artist bringing a message for nature to the public. Maybe you study the political process and know how to get legislation passed. Maybe you are an activist and interlocutor for nature. Conservation is an interdisciplinary effort.

Michael was one of the best minds of this generation. He set the stage for the conservation movement of today. Never give up on the dream. jjw

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Historic road through Cumberland Wilderness. NPS **Photo credit** © Scott Teodorski.

STEWARDSHIP

The Preservation Paradox: How to Manage Cultural Resources in Wilderness? An Example from the National Park Service

by KAREN MUDAR

> *"The wilderness was 'ruined,' not just once but repeatedly, yet it has returned, because its seeds and the needed nutrients survived in the earth. This wilderness says the potential of earth and life is eternal, built into basic reality from the beginning. This wilderness becomes a symbol of renewal, the downs and the ups, the cycles of forever, the majesty of the universe, the dignity of life" (National Park Service 1979, p. 429).*

Karen Mudar

The US Wilderness Act of 1964 calls upon federal agencies to preserve wilderness character. Subsequent to the passage of the act, the earliest established American wilderness areas were located in mountainous land west of the Mississippi River, lightly inhabited historically, if at all, by Euroamericans. As a result of this western focus, wilderness lands were considered pristine, and conservationists considered evidence of Euroamerican habitation (and American Indian, too, if vegetation was altered), unwelcome intrusions. Western-centric perceptions of wilderness have influenced interpretations of the Wilderness Act, wilderness management guidance, and wilderness research.

At the same time that federal agencies must comply with protection measures of the Wilderness Act, federal cultural resource laws and policies require agencies to take into account

the effects of federal undertakings on cultural resources (through the National Environmental Policy Act and the National Historic Preservation Act) and to protect and preserve important cultural heritage. Remnants of Euroamerican habitation are more frequent in wilderness areas established later in the eastern half of the United States. Managers of eastern wilderness areas struggle to comply with the Wilderness Act and cultural resource federal laws and regulations using wilderness management tools that are not designed to address cultural resource management.

Mandates to preserve both wilderness character and cultural resources set up a dynamic tension that I have termed "the preservation paradox." How should the federal agencies that manage wilderness areas comply with both the Wilderness Act and cultural resource laws that call for consideration and appropriate management of cultural resources?

It is my purpose in this article to comment on court cases that examined management of cultural resources in wilderness and discuss an alternative reading of the law. Both sides of legal cases about management of wilderness cultural resources in the 11th Circuit and 9th Circuit Court of Appeals have made arguments that relied on incomplete understanding of cultural resource laws, legal inconsistencies, and previous cases that have influenced subsequent cases in nonproductive ways. A new reading of the Wilderness Act is needed to clear a path to consistent management of wilderness cultural resources.

Using the National Park Service as a case study, I identify ways that the recognition of cultural resources as a legitimate element of the fifth component of wilderness character as described in the Wilderness Act, and included in US federal agency wilderness character narratives, may influence future litigation. In view of a changing legal attitude toward wilderness cultural resources, I point to a need to update guidance for developing a wilderness character narrative and the execution of a minimum requirements analysis – two important management tools in the US context.

The National Park Service and Wilderness Management

The National Park Service (NPS) is the fourth largest US federal land-managing agency, having responsibility for 84 million acres (33,993,594 ha) of land. More than 40% of the lands that the NPS manages are designated or proposed wilderness. Unlike other federal agencies that manage land both for recreation and for resource extraction, the NPS has a single mission "which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (54 U.S.C. 100101). "Historic objects" we today call our cultural resources – historic and archeological sites, traditional cultural places, cultural landscapes, historic districts, buildings and structures, and museum collections.

A wilderness character narrative is one component of the US federal interagency strategy to improve stewardship by defining and monitoring qualities of individual wilderness areas over time. First proposed in 2008 (Landres et al. 2008), the strategy identified four wilderness qualities located in the definition of wilderness in the Wilderness Act (16 U.S.C. 1131-1136). Keeping It Wild:

An Interagency Strategy to Monitor Trends in Wilderness Character across the National Wilderness Preservation System (Landres et al. 2008) listed "Natural," "Undeveloped," "Opportunities for Solitude and Primitive and Unconfined Recreation," and "Untrammeled" as qualities comprising wilderness character.

The National Park Service added a fifth quality of wilderness called "Other Features of Value" in Keeping It Wild in the National Park Service (2014). This quality encompasses aspects of wilderness character that are of scientific, educational, scenic, or historical value. It is based on the last clause of section 2(c) of the Wilderness Act, which states that a wilderness "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value." The fifth quality captures unique elements of the wilderness that may not be covered in the other four qualities. The updated interagency guidance (Landres et al. 2015) now lists "Other Features of Value" as a fifth quality of wilderness character to accommodate ecological, geological, paleontological, cultural, and other notable resources that make an area unique and worthy of wilderness status.

Because of a mission to preserve cultural resources, unique among federal agencies, the NPS has had a major role in developing policy toward management of cultural resources that are in wilderness areas. In the last decade, NPS cultural resource specialists have developed cultural resource technical guidance in wilderness management. Encouraged by the publication of Keeping It Wild in the National Park Service (National Park Service 2014), there have been several efforts to address a lack of technical guidance, including a special edition of Park Science and guidance produced by the NPS Archeology Program (https://www.nps.gov/archeology/npsGuide/wilderness/index.htm).

Federal Agencies versus Wilderness Litigation

Developing an appropriate balance between the dual responsibilities of caring for cultural resources and caring for wilderness has been an ongoing process, and decisions to preserve cultural resources in wilderness have been challenged in court. Six federal cases are directly relevant to our current perspectives on wilderness cultural resource management, of which three were filed against the National Park Service. The cases are:

- *Wilderness Watch & Peer v. Mainella (Cumberland Island Wilderness, GA, 2004) (U.S. 11th Circ. 03-15346)*
- *Olympic Park Associates & Peer v. Mainella (Daniel J. Evans Wilderness (Olympic Wilderness), WA, 2005) (Western District, WA-C04-5732FDB)*
- *High Sierra Hikers Assn v. United States Forest Service (Emigrant Wilderness, CA, 2006) (CCVF05-0496AWI DLB)*
- *Wilderness Watch v. United States Forest Service (Kofa Wildlife Refuge, AZ, 2010) (U.S. 9th Cir. 08-17406)*

- *Wilderness Watch v. Y. Robert Iwamoto and the United States Forest Service (Mount Baker-Snoqualmie Wilderness, WA, 2012) (W.D.WA – 853 F. Supp 2d 1063)*
- *Wilderness Watch v. Creachbaum (Daniel J. Evans Wilderness (Olympic Wilderness), 2016) (W.D.WA.-C15-5771-RBL)*

Wilderness Watch & Peer v. Mainella set a precedent for rejecting cultural resource contributions to wilderness character. While judges in the US Court of Appeals for the 11th Circuit agreed that, in cases of ambiguity, deference should be awarded to federal agencies, they did not conclude that the Wilderness Act was ambiguous. They set thinking about wilderness cultural resources off-course by defining "historical use" to refer only to exploitation of natural resources in the historical past and, although the case did not consider management of cultural resources in wilderness areas, offered that:

> *"We cannot agree with the NPS that the preservation of historical structures furthers the goals of the Wilderness Act. The Park Service's responsibilities for the historic preservation … derive, not from the Wilderness Act, but rather from the National Historic Preservation Act. (Wilderness Watch & Peer v. Mainella 2004)"*

The 11th Circuit Court's statement ignored the fact that Section 106 of the National Historic Preservation Act does not mandate historic preservation, but only that a process be followed for considering effects of federal undertakings on historic properties. Thus, through a misrepresentation of the National Historic Preservation Act, and alienation of the Wilderness Act from requirements to preserve cultural resources, the judges in Wilderness Watch & Peer v. Mainella stripped protection from historic properties located in wilderness. Furthermore, the judges did not consider the language of the NPS Organic Act quoted above when writing, "Absent … explicit statutory instructions, however, the need to preserve historical structures may not be inferred from the Wilderness Act nor grafted onto its general purpose."

These pronouncements were seized upon in Olympic Park Associates & Peer v. Mainella. The judges in this case found the 11th Circuit Court's arguments "persuasive." The 9th Circuit Court's ruling established a legal hierarchy in which the Wilderness Act, because it contained specific provisions, took precedence over the National Historic Preservation Act, which is a procedural law. It further disassociated cultural resources from any aspect of wilderness character, making it difficult for federal agencies to successfully argue that preservation of wilderness historic properties could further the goals of the Wilderness Act. Again, neither sides of the case looked to the NPS Organic Act for authority to manage cultural resources in wilderness.

It isn't until High Sierra Hikers Assn v. USFS that we see any change in the courts' thinking about wilderness cultural resources. In this case, the court found:

> *"The Wilderness Act … specifically acknowledges "historical use" as one of the values the Wilderness Act seeks to promote. Thus, while it remains ambiguous whether "historical use" can justify the maintenance,*

repair, or operation of structures that would otherwise be offending, at least it is clear that the purpose of the Wilderness Act is not directly offended by actions that seek to preserve historical use. Thus, at a minimum, the Wilderness [Act] is ambiguous with respect to the proposed preservation of dam structures on the grounds of historical use. (High Sierra Hikers Assn v. USFS. 2006. CCVF05-0496AWI DLB)"

In contrast to findings in Wilderness Watch & Peer v. Mainella, this case associated "historical use" with cultural resources.

In Wilderness Watch v. Y. Robert Iwamoto, the court affirmed that the presence of historic buildings does not categorically degrade wilderness character and deferred to agency judgment concerning appropriate treatment and commented:

The impact of merely allowing a pre-existing historical structure to remain in a wilderness area is quite different than the impact of taking affirmative action to preserve the structure, as the impact of minimal maintenance versus the aggressive reconstruction efforts.... The Court does not presume to know exactly where the line should be drawn. (Wilderness Watch v. Y. Robert Iwamoto and the United States Forest Service 2012)

The court in this case relied on the managing agency to distinguish between appropriate and inappropriate levels of intervention for preserving historic resources in wilderness.

Lawyers in Wilderness Watch v. United States Forest Service (2010) were able to successfully demonstrate that deference should be accorded US federal agencies in wilderness management of animal species because ambiguity existed in the law. This success was seized upon by lawyers in Wilderness Watch v. Creachbaum, arguing that a similar ambiguity existed with respect to cul-

Figure 1 - Botten-Wilder Patrol Cabin is listed on the National Register of Historic Places. Henry Botten built this hunting cabin in the present-day Daniel J. Evans Wilderness in 1929. Photo courtesy of the National Park Service.

tural resources. Wilderness Watch alleged that the NPS had violated the Administrative Procedure Act by improperly interpreting the Wilderness Act and carrying out preservation activities on five historic structures in the Daniel J. Evans Wilderness (formerly known as Olympic Wilderness) between 2011 and 2015.

The court concluded that the Wilderness Act was ambiguous and deferred to the NPS' interpretation that historic preservation work could further the goals of the act. Important in the decision, as well, was the acknowledgment of the fifth quality of wilderness character that included cultural resources among "Other Features of Value." This enabled the NPS to successfully argue that historic preservation work could further the goals of the Wilderness Act.

The use of the Minimum Requirements Analysis process was also another important element in the successful defense. The minimum requirements analysis documented NPS considerations and allowed lawyers to demonstrate that proactive management of historic structures could be appropriate, and that the way the management was carried out could be consistent with the Wilderness Act. Solicitors successfully argued that cultural resource preservation was established wilderness management practice.

Evolution of a Legal Basis for Management of Wilderness Cultural Resources

Each of the court cases discussed above, along with federal policy developments concerning the fifth quality of wilderness character, have contributed important elements to a more nuanced interpretation of the Wilderness Act. Courts have moved from asserting that actions to preserve cultural resources in wilderness conflict with the Wilderness Act to deferring to agency judgment that cultural resources can further the goals of the Wilderness Act. This resolution has relied, however, on the identification of discrepancies in the law, which can be, and have been, variously interpreted and are subject to change and new interpretations.

In the earliest cases, Department of Justice solicitors argued that the National Historic Preservation Act provided the authority to preserve historic buildings. As both the US 11th and 9th Circuit Courts demonstrated, the act does not dictate outcomes, and the federal agencies lost both cases. Lawyers for Wilderness Watch pointed out that because the Wilderness Act does mandate outcomes it takes precedence. In addition, the National Historic Preservation Act only concerns itself with properties that are eligible for the National Register of Historic Places. There may be additional properties worthy of preservation, because they are important to descendent communities, for example, that do not meet National Register criteria.

What the federal solicitors might have done, however, is argue that the NPS Organic Act provides further authority for historic building preservation activities. Chellis (2017), in an analysis of Wilderness Watch vs. Creachbaum, argues that Department of Justice solicitors should have looked to the legislation establishing the Daniel J. Evans Wilderness and, specifically, to the legislative history to demonstrate that the Washington Park Wilderness Act of 1988 was intended to

include preservation of historic backcountry cabins and shelters. While useful in demonstrating preservation protection for a specific case, this does not provide blanket discretion for cultural resource action in every NPS-administered wilderness.

The Wilderness Act stipulates that the provisions of the act are to be carried out in concert with other laws, "the designation of any area of any park, monument, or other unit of the national park system as a wilderness area pursuant to this Act shall in no manner lower the standards evolved for the use and preservation of such park, monument, or other unit of the national park system" (Wilderness Act, S)ection 4[a3] (italics added). Thus, actions that curtail the National Historic Preservation Act Section 106 process for considering activities to preserve wilderness historic buildings surely "lower the standards" evolved for the use and preservation of cultural resources. This is the crux of the preservation paradox for NPS wilderness managers.

The inclusion of a fifth quality of wilderness in the interagency wilderness management policy and individual agency policies, and implementation of technical guidance establishes an appropriate management of cultural resources as a standard wilderness management practice. Recognition of cultural resources as a component of the fifth quality of wilderness by the courts and, as such, within management purview, normalizes preservation activities related to historic buildings and structures. If successful, such a case would set precedent to allow federal agencies to exercise a wide range of management options to preserve historic buildings and structures in wilderness areas.

A New Interpretation of the Wilderness Act

A frequently overlooked section of the Wilderness Act supports the argument that the Wilderness Act was not meant to exclude cultural resource management. While the definition of wilderness is in Section 1(c) of the Wilderness Act (Pub. L. 88-577; 16 U.S.C. 1131–1136), there is additional comment in Section 4(c) about structures and installations:

> *(c) Except as specifically provided for in this Act, and subject to existing private rights, there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act and except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.*

Since the rest of this list consists of prohibited activities to be performed in the future, it makes the most sense that Section 4(c) prohibited any future structures or installations, not past ones. Viewed in this way, historic buildings and structures that existed when the wilderness was established as a legal entity that are part of the "Other Features of Value" quality do not have a negative relationship with other qualities of wilderness character. Instead, the relationship between historic buildings and structures and other wilderness values is neutral. They are inert elements on the landscape, and their continued existence does not alter their relationship to the "Natural" and

Figure 2 - Canyon Creek Shelter is listed on the National Register of Historic Places. The Civilian Conservation Corps built this log structure in the present-day Daniel J. Wilderness in 1939. Photo courtesy of the National Park Service.

"Undeveloped" wilderness character qualities as described in the Wilderness Act and the Keeping It Wild strategy.

The exception to this relationship is cultural landscapes. Cultural landscapes are frequently composed of living elements – orchards, fire-maintained glades, and abandoned fields, for example. Manipulation of plant and animal communities to maintain a cultural landscape has unavoidable and often unforeseeable effects on other species. A minimum requirements analysis to assess efforts to maintain or restore a cultural landscape may find that the "Natural" and "Undeveloped" wilderness qualities are significantly affected.

The Fifth Quality of Wilderness Character and Minimum Requirement Decision Guide

US federal management tools, including the wilderness character narrative and the minimum requirements analysis, require revision to better accommodate cultural resources. There have been inconsistent efforts to integrate "Other Features of Value" into overall wilderness character narratives, especially if the features of value are cultural resources. This perspective has also had an impact on the development of the Minimum Requirement Decision Guide and training in using the decision guide.

The goal of the Minimum Requirement Decision Guide (Arthur Carhart National Wilderness Training Center 2000) was to "develop a consistent process for considering the minimum requirements of accomplishing projects and activities in wilderness" (Arthur Carhart National Wilderness Training Center 2000, Acknowledgements). The earliest iteration was developed through the Arthur Carhart National Wilderness Training Center. The guide consisted of a flow chart/decision tree to narrow down the minimum required management action, and a series of questions to help identify the minimum tools to carry out the proposed action. While the guide does not specifically exclude wilderness cultural resource preservation activities, it is a product of a five-decades-old paradigm in which wilderness was pristine land untouched by human actions.

By 2016, the flow chart and open-ended questions had evolved into a series of metrics to quantify the effect of proposed actions to benefit one wilderness quality on other wilderness qualities and to use the quantified results to decide about actions to take. Cultural resources were acknowledged as an appropriate management issue, as a historic cabin is included among minimum requirements analysis examples on the Wilderness Connect website (https://www.wilderness.net/MRA, accessed July 23, 2018). The analysis, however, concludes that the cabin is to be documented and left to decay, because it degrades other wilderness values.

As the Wilderness Connect historic cabin example demonstrates, the current design of the process always yields a decision that the best solution for historic building projects is to document and allow to decay. Three alternatives were considered in the exercise. Two alternatives proposed restoration; the third proposed documentation and decay. The metrics rubric is structured such that any action taken to repair or maintain a historic building automatically has a negative effect on two or three other wilderness qualities. This is further illustrated in the text of the Step 2 Determination for the historic Cutler Cabin:

> *Alternative 1 would preserve the value of the historic structure through stabilization and continue education and interpretation about the value of the historic Cutler cabin which benefits the Other Features of Value quality and meets the requirements of law and NPS policy. But it does not improve the Undeveloped quality of wilderness character because the structure remains in wilderness and it causes negative impacts to the Undeveloped and Solitude and Primitive Recreation quality of wilderness character by including the use of a helicopter. (https://www.wilderness.net/MRA, accessed July 23, 2018)*

Some of the negative impacts cited here are due to the work to be done, and some of the negative impacts are from the very existence of the structure itself. The stabilization of the building was not considered a positive effect for "Other Features of Value" but was considered a negative effect for all other wilderness qualities. The current coding rubric of the Guide will always yield the same conclusion for all wilderness historic structures, as the same elements are always involved – the existence of a building and the need for action to preserve it. In light of recent court cases, which agreed that preservation of cultural resources furthered the purpose of the Wilderness Act, the rubric needs to be updated to accommodate cultural resource projects in a more equitable and flexible manner.

Addressing Step 1 of the MRA

While the Minimum Requirements Analysis is a decision guide, it also memorializes the steps taken to arrive at a decision. The US Court of Appeals for the 9th Circuit scrutinized the minimum requirements analysis for the five historic cabins very closely in Wilderness Watch v. Creachbaum (2016). Given this development, it is important to acknowledge that agency policy and practice allow the preservation of cultural resources in wilderness. The wilderness character narrative for the wilderness in which the cultural resource is located should include contributing cultural resources as part of "Other Features of Value"; Step 1 of the minimum requirements analysis should discuss why this particular resource type is an essential component of this wilderness quality, and how it contributes to wilderness character.

The importance of the cultural resource as part of an anthropogenic landscape that is being rewilded should not be discounted. In the long-term, natural processes will likely prevail. In the short-term, there is much to be gained by preserving structures that are important to a current generation of a descendent community. At present, there are no mechanisms in the minimum requirements analysis to accommodate legal requirements of cultural resource management, such as consultation. Prior to initiating the analysis, National Historic Preservation Act Section 106 consultation should be carried out and the results of the consultation, if relevant, incorporated into the Step 1 discussion.

Addressing Step 2 of the MRA

In Step 2, methods for achieving the specific preservation goal and the effect of those actions on other wilderness qualities should be the focus of the MRA. The rubric and rubric metrics should reflect a neutral relationship between other qualities and the "Other Features of Value" quality.

As discussed above, viewing the relationship between the historic building or structure and other qualities of wilderness character as neutral allows wilderness managers to focus on the best way to carry out the specific project proposed and the effects that those actions will have on wilderness qualities. Any references to the negative effects that the continued existence of the historic building or structure will have on other wilderness qualities should be eliminated from the alternatives proposed. This approach does not contravene the necessity to manage wilderness as a whole. Instead, it is acknowledging that the continued existence of the cultural resource does not change (much

less degrade) the other wilderness qualities (although the actions to preserve or maintain the cultural resource may temporarily affect other qualities) and is not relevant to the analysis. Ways that the alternatives can address results of any Section 106 consultations with descendent communities, including American Indian communities, should be encouraged.

Conclusion

This article briefly examines judicial rulings, legal interpretations, and guidance pertaining to the management of wilderness cultural resources. Recent court cases that have ruled in favor of federal agencies' actions to preserve wilderness historic buildings signal that a more encompassing attitude is needed about managing wilderness and wilderness resources. While the judges in Wilderness Watch v. Creachbaum ruled that the park had acted appropriately in protecting historic buildings, their ruling might have set a wider precedent for future cases had the Department of Justice made greater use of the NPS Organic Act and the specific legislation and accompanying House Report that established the Daniel J. Evans Wilderness, in their arguments.

This article also argues that a new interpretation of the Wilderness Act Section 4(c) is needed in order to exclude cultural resources already present in the wilderness at the time of establishment from the list of prohibited uses. The previous interpretation has had a significant detrimental impact on guidance for development of wilderness character narratives and on the structure of the minimum requirements analysis. Both documents developed for the Daniel J. Evans Wilderness were scrutinized in the Wilderness Watch v. Creachbaum case. The recognition and inclusion of cultural resources in the wilderness character narrative is an important step to appropriate consideration of management alternatives.

Restructuring the process to eliminate the tension between wilderness values and cultural resources as represented by historic structures and buildings allows managers to focus attention where it is critically needed, on the minimum tools needed to carry out the specific projects, and the effects that these actions will have on other wilderness qualities.

Finally, this article offers suggestions for restructuring the MRA and guidance to facilitate a more consistent consideration of wilderness cultural resources in order to accommodate cultural resource management in a more equitable manner. The conflict between cultural resources and other qualities of wilderness character inherent in the analysis is a product of a dated wilderness paradigm that originates in a western-centric view of wilderness. Restructuring the process to eliminate the tension between wilderness values and cultural resources as represented by historic structures and buildings allows managers to focus attention where it is critically needed, on the

minimum tools needed to carry out the specific projects, and the effects that these actions will have on other wilderness qualities. A minimum requirements analysis process that more easily accommodates wilderness cultural resource projects, and incorporating those changes in guidance and training, will allow wilderness managers to consider a wider array of management and preservation options and promote the health of wilderness character.

A minimum requirements analysis process that more easily accommodates wilderness cultural resource projects, and incorporating those changes in guidance and training, will allow wilderness managers to consider a wider array of management and preservation options and promote the health of wilderness character.

Cultural resources can contribute to wilderness character in a positive way. The remnants of past habitation do not contradict the definition of wilderness, as "the imprint of man's work" is "substantially unnoticeable" (and more unnoticeable as time passes) and demonstrates that the "improvements and human habitation" were, indeed, not permanent. Moreover, many historic buildings and structures will likely eventually vanish. To see natural processes reclaiming houses, fields, walls, and paths is a powerful statement about the enduring qualities of wilderness. ijw

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STEWARDSHIP

Good News: Wilderness Is Not a Victim of Our Current Intense Political Partisanship

by DOUG SCOTT

Doug Scott

In these times of the COVID-19 virus and lockdowns, and deepening concern by perceptive people about the crisis of our global climate, we also face terrible problems with maldistribution of wealth skewed to the very top, leaving behind the 99.9 % – with a dreadfully sharp tilt toward racial minorities at the very bottom.

We have spent trillions in feverish attempts to reignite the pandemic-shuttered economy, but the spending priorities are not broad enough to encompass land protection. All this is seemingly locked in by the intense partisanship that infests everything about our politics.

We might easily throw up our hands and bury our heads in the proverbial sand in frustration. A deeply corrosive cynicism about the ability of our political leaders to do anything about these challenges is enervating.

Caring about wilderness and other protected lands – and wishing to do something about them – is part of this bitter mix. Sadly, these are no part of our current priorities, from Washington on down.

The four agencies administering our National Wilderness Preservation System face far worse budgetary challenges than ever before. The deep gloom in the stripped-down agency

offices is palpable. One may worry that you will never again see a ranger on a wilderness trail. This makes the work of local wilderness stewardship groups, fostered and trained by organizations such as the National Wilderness Stewardship Alliance, all the more important, getting trained volunteers on the job of trail maintenance and monitoring, with the aid of groups like Backcountry Horsemen of America, in packing in crosscut saws and supplies.

As for intense political partisanships, it is a fact of life in our politics and will always be. But it need not high-center progress for wilderness.

As for intense political partisanships, it is a fact of life in our politics and will always be. But it need not high-center progress for wilderness. For example, in the late 1970s, Republicans joined Democrats in the campaign to protect vast expanses of the federal land in Alaska in national parks, national wildlife refuges, wild and scenic rivers, and national monuments as units of the national park system and national forest system.

Alaska is huge – beyond a landscape anyone can ever hope to see in one lifetime, bush plane access notwithstanding. Some federal lands were set apart for protection of wildlife and park values in the years before statehood, notably the then-9-million-acre (3,642,171-ha) Arctic National Wildlife Range (Kaye 2006).

Democratic champions for Alaska were led by Representative Morris K. "Mo" Udall of Tucson, Arizona, chair of the Committee on Interior and Insular Affairs and lead sponsor of the legislation in the US House of Representatives (Carson and Johnson 2001). He was ably abetted by Representatives John F. Seiberling, of Akron, Ohio, chair of the Subcommittee on General Oversight and Alaska Lands who became personally expert about every area in the proposed legislation (Nelson 2009). Representative Phillip Burton of San Francisco, chair of the Subcommittee on Parks and Insular Affairs was powerful beyond his subcommittee's work and put his shoulder to wheel on every park, river, and wilderness protection measure of the era (Jacobs 1995). These leaders were staffed by amazingly talented women and men, and abetted by the far-flung lobbying, media, and grassroots work of the national environmental movement, with every group contributing people, membership lists, and money into a single operation for the only time in their history: the Alaska Coalition. In the era before e-mail, the combined mailing list reached more than 1 million conservation-minded Americans – and we mailed alerts to them first class.

For the only time in the history of the wilderness and environmental movement, money was no object.

The lobbying was intense, but conservationists had a key player in their corner from the start—the president of the United States. President Jimmy Carter made this a top priority and assigned a member of his White House lobbying team to the campaign full-time.

Republicans, in particular Representative John Anderson of Rockford, Illinois; Representative Thomas B. Evans of Delaware;

Representative Millicent H. Fenwick of New Jersey; and others joined Democrats to give us success in enacting the huge land designation package – the Alaska National Interest Lands Conservation Act.

The law was signed by President Jimmy Carter on December 2, 1980.

After they left the White House, the Carters visited the threatened Coastal Plain of the Arctic National Wildlife Refuge. In an opinion column published by the Los Angeles Times, President Carter remembered, "During my four years as President, I approved hundreds of bills. But one that gave me particular satisfaction was the Alaska Lands Act…. It was one of the great conservation laws of all time, protecting more than 100 million acres in our extraordinary 49th state" (Carter 1990).

Although some Alaskans were angered by this land protection, the law provided virtually unlimited subsistence hunting and fishing rights on the federal lands, based on where people live and not limited to Alaska Natives, as was the case previously. (Of course, sport hunting remains off-limits in all national parks.)

Perhaps surprisingly, progress for protecting wild federal lands in Alaska continued, always involving significant leveraging and compromise with the Republican congressional delegation. Another five wilderness areas totaling 250,000 acres (101,171 ha) were designated as part of the Tongass Timber Reform Act in 1990, which pulled back significantly on the kind of huge, ruinous clear-cuts that had been practiced on the Tongass National Forest in southeast Alaska for decades (Tongass Timber Supply Act 1990). This is a good reminder that progress for land and water protection is often propelled by the excesses of development interests.

Similarly, the California Desert Protection Act of 1994 was a thoroughly bipartisan success, championed by Senator Diane Feinstein and Representative Richard Lehman, both of California, but also nine Republican members of the House of Representatives – although none from California. This law established Death Valley and Joshua Tree National Parks and the Mojave National Preserve (which allows hunting) and designated 69 wilderness areas protecting some 7,661,089 acres (3,100,333 ha).

The best example of deep bipartisanship is the Wilderness Act of 1964 itself. Its lead sponsors were not only Democrats such as Senator James Murray of Montana and Senator Clinton P. Anderson of New Mexico (who, as a young civic leader in Albuquerque, was a friend of wilderness pioneer Aldo Leopold) (Baker 1985). Senator Frank Church, also a Democrat, led the floor debate on behalf of the Wilderness Bill in 1961 and, after the bill failed in the US House of Representatives, again in 1963 (Ashby and Gramer 1994). The great Republican preservation champion, Representative John P. Saylor of Johnstown, Pennsylvania. was invaluable in the lead for the Wilderness Bill from his first introduction of it in the US House of Representatives in June 1956 through the many laws designating the first additions, where it was vital to assure that the precedents being set were exactly as needed for the success of the whole wilderness preservation endeavor in the future (Smith 2006).

Saylor also played a key role in blocking

dam-building threats to protected land, notably the backcountry of Dinosaur National Monument at a place called Echo Park on the Utah-Colorado border. This win broke the back of the dam-building movement once and for all and was the vital platform deliberately built by Howard Zahniser, executive director of The Wilderness Society (Harvey 2005). He and David Brower, the executive director of the Sierra Club, were the perfect team and understood that success in blocking the dam would be key to launching the Wilderness Act, which otherwise would have been a nearly hopeless proposition in that era (Harvey 1990). We called Saylor "St. John" behind his back – which he loved.

The Wilderness Bill had been long stalled in the House of Representatives by demands of the crusty committee chairman, Wayne N. Aspinall, who represented the entire West Slope of Colorado, dependent on water stored behind dams on the Upper Colorado River. He wanted assurances both about water rights and a period for new mining claims in national forest "primitive areas." It is not widely known that Representative John D. Dingell, a very powerful member, was a key player in reaching an accommodation with Chairman Aspinall – a capitulation to his demands, really – thus allowing final action by the House of Representatives to send the Wilderness Bill to the Senate in 1963 (Schulte 2002).

The Wilderness Act was avidly sought by President John F. Kennedy and his secretary of the interior, Stewart Udall, then by President Lyndon B. Johnson – and by every subsequent president regardless of political party. Later, President Richard M. Nixon signed many wilderness designation laws, thanks to the influence of his top domestic adviser, John Ehrlichman (later of Watergate fame), who was avidly devoted to land protection and urged the president to sign these laws, in which he had no particular interest.

President Ronald Reagan signed more wilderness designation laws than any other president. He was actually signing roadless area release laws, but with ample wilderness designations attached to make them legislatively viable – while President Jimmy Carter signed by far the largest acreage, and not solely because of the huge acreage in the Alaska National Interest Lands Conservation Act (Turner 2012).

Secretary of the Interior Cecil Andrus, the former governor of Idaho, took President and Mrs. Carter and First Daughter Amy on a float trip down the Middle Fork of the Salmon River in the newly designated Frank Church-River of No Return Wilderness Area in Idaho in 1978.

As the Washington Post reported, "There were no handshakes, dignitaries to greet or protocol observed as the president, his family and a few friends floated gently down the Middle Fork of the Salmon River here." Imagine the Secret Service behind every tree and boulder. But the Post added, "Security, while thorough, was low-keyed. Reporters, though on the river with him, were kept miles behind except for one or two token contacts with the presidential party" (Barbash 1978). The president was proud of having signed this law.

The latest lesson in bipartisanship is the John D. Dingell Conservation, Management, and

Conservation Act of 2019, which became law when signed by President Donald J. Trump on March 12, 2019.

This law expanded several national parks and other areas of the national park system and established four new national monuments while redesignating others. It also designated more than 3,158,038 acres (1,278,913 ha) of wilderness areas, protected additional segments of wild and scenic rivers and historic sites, and withdrew land near Yellowstone National Park and North Cascades National Park from mining (Eilperin and Grandoni 2019).

The significance of the bipartisan support for this huge package law is not to be missed. It contained so many provisions, each strongly backed by the local congressional delegation, that it was carried through Congress relatively quickly on a bipartisan wave, led by Senator Lisa Murkowski of Alaska, the chair of the US Senate Committee on Energy and Natural Resources. The lead cosponsor was the ranking Democrat on the committee, Senator Maria Cantwell of Washington State.

Other provisions included a long-desired provision permanently authorizing the Land and Water Conservation Fund, thus allowing appropriators to simply fund it from year to year. This includes a specific line-item within the Omnibus Appropriations Bill for FY2020 that was passed and signed into law in late December.

The US Forest Service requested $3,500,000 for the critical "inholdings"/wilderness line, and they also received $8,000,000 for acquisition management. The Bureau of Land Management received a substantial bump for inholdings to $3,500,000. This increased funding is vital to the ongoing work of The Wilderness Land Trust, a nonprofit organization that negotiates win-win deals with landowners to acquire these lands, working from priorities for each state set with the land management agencies, primarily the US Forest Service and Bureau of Land Management.

Not all this money comes to The Wilderness Land Trust and other nonprofit organization, but the funds we can count on help to leverage donations, grants, and loans to support our work at a robust level. Funding is out there, and with shifting priorities and public support, maybe money can once again not be an object for wilderness protection.

And there is always more to do for our public lands. We need more money to support programs for getting kids out into parks and other green places – the kind of childhood experiences most of us took for granted. This is especially missing in our inner cities. We also need many more initiatives to engage and deploy our public workforce, such as a new Civilian Conservation Corps.

Through all my years as an advocate for wilderness preservation, I know none of these things are easy. But we have tremendous supporters today in Congress and state legislatures – of both parties. So, as I stated at the beginning of this article, there is good news. Wilderness is not a victim of political partnership. And it may yet continue to be a bridge to bipartisanship, consensus, and cooperation.

IJW

DOUG SCOTT spent decades as a lobbyist for The Wilderness Society, the Sierra Club, and the Pew Charitable Trusts, working to gain congressional protection for national parks, national wildlife refuges, wild and scenic rivers, and wilderness areas. He singles out the Alaska National Interest Lands Conservation Act of 1980 as a career highlight. Doug's most recent anthology is Wild Thoughts: Short Selections by Great Writers About Nature, Wilderness, and the People Who Protect Them will be published in 2021.

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Moose in the mountains, Mount Evans Wilderness **Photo credit** © Beth McCarley.

SCIENCE & RESEARCH

Biodiversity within the National Wilderness Preservation System:

How Well Do Wilderness Areas Represent Species Richness across the Contiguous United States?

by T. RYAN McCARLEY and JOCELYN L. AYCRIGG

PEER REVIEWED

ABSTRACT We quantified the spatial representation of amphibians, birds, mammals, and reptiles across the contiguous US (CONUS) by evaluating biodiversity, measured by species richness, within wilderness areas compared to CONUS. On average, amphibians and reptiles are underrepresented, although representation of biodiversity varied geographically for all taxa. The southwestern and southeastern United States are regions with the greatest concern and opportunity to increase biodiversity representation, maintain corridors between wilderness areas, and protect biodiversity hotspots. Protection of biodiversity in these regions can be strengthened through increased protection of federal lands and/or conservation partnerships between public and private landowners.

T. Ryan McCarley

Jocelyn L. Aycrigg

Faced with the pressures of an increasing human population, including urban development, agricultural expansion, and resource utilization, much of the United States has lost or is losing the ecological processes inherent in natural ecosystems (Jones et al. 2018, 2015; Newbold et al. 2016). However, ecological processes are preserved within the natural ecosystems of wilderness areas because many anthropogenic stressors such as road building, logging, mining, energy development,

agriculture, mechanical and motorized use, development of tourism facilities, and permanent structures are restricted (Dietz et al. 2015; US Public Law 88–577, 1964). Furthermore, the International Union for Conservation of Nature (IUCN) classifies wilderness areas as category 1b, which "protect the long-term ecological integrity of natural areas that are undisturbed by significant human activity, free of modern infrastructure, and where natural forces and processes predominate, so that current and future generations have the opportunities to experience such areas" (Dietz et al. 2015; Dudley 2008).

The protection of natural ecosystems also serves to protect species biodiversity, which in turn is critical for ecosystem health and function (Cardinale et al. 2012). However, the purpose of the Wilderness Act of 1964 is far-reaching and provides many valuable services aside from ecological conservation. The act established the National Wilderness Preservation System (NWPS) to designate wilderness areas that preserve sites of geological, scientific, educational, scenic, or historical value as well as ecological value and natural condition (US Public Law 88–577 1964). Thus, biodiversity benefits from wilderness protection, but there are many other reasons for wilderness designation. Policy, politics, and the opportunity to protect ecological as well as nonecological treasures result in unequal protection and representation of ecosystems and biodiversity (Bleich 2016; Dawson and Hendee 2009; Sarkar 1999). For instance, studies have shown that wilderness areas and protected areas are often at high elevations and in areas with unproductive soil, which does not represent the full range of species biodiversity within a landscape (Aycrigg et al. 2013; Scott et al. 2001).

In 1964, only US Forest Service lands were designated as wilderness areas; however, the act directed review of all roadless areas under the jurisdiction of the secretary of agricultural and interior within 10 years, leading to new criteria for wilderness designation including the representation of as many natural ecosystems as possible (Dawson and Hendee 2009). The aim of representation is to save some of everything to reduce the risk of species decline and extinction (Shaffer and Stein 2000). Despite the goal of ecosystem representation, Aycrigg et al. (2013) demonstrated that representation within protected areas was insufficient for portions of the United States. Additionally, the representation of natural ecosystems is often used as a surrogate for species biodiversity representation, which remains a key question in wilderness research.

Other studies have sought to quantify species biodiversity representation within wilderness areas. Using ecological systems (i.e., habitat types) as a surrogate measure of species biodiversity, Dietz et al. (2015) demonstrated that during 1964–2014 the total area of the NWPS increased, but the diversity of ecological systems accumulated (436 ecological systems) peaked in 1984. Additionally, 21% of ecological systems were unrepresented in wilderness areas (Dietz et al. 2015). Similar patterns were observed by Aycrigg et al. (2016) for ecological systems within wilderness areas and by Aycrigg et al. (2013) within the entire US protected areas network. Using species richness (i.e., number of species by taxa in a given area) as a measure of biodiversity, Jenkins et al. (2015) found a mismatch between the location of protected areas in the contiguous

US (CONUS), which are mostly in the western United States and high levels of species richness, which are in the southeastern United States. However, the representation of biodiversity in wilderness areas compared to CONUS was not evaluated.

We sought to quantify the representation of species biodiversity in wilderness areas using species richness as our measure of biodiversity. Both total species richness and endemic species richness for amphibians, birds, mammals, and reptiles were acquired from Jenkins et al. (2015). Endemic species were defined as species that have their entire range within CONUS. Our objectives were to:

1. *Quantify average total and endemic species richness by taxa within wilderness areas and across CONUS.*

2. *Compare the frequency distribution of species richness in wilderness areas and across CONUS to see how different levels of species richness are represented in wilderness.*

3. *Observe how spatial distribution of species richness and wilderness areas differ.*

Using the results from these objectives we present areas of concern and opportunities where future efforts for protection and preservation of biodiversity could be most worthwhile.

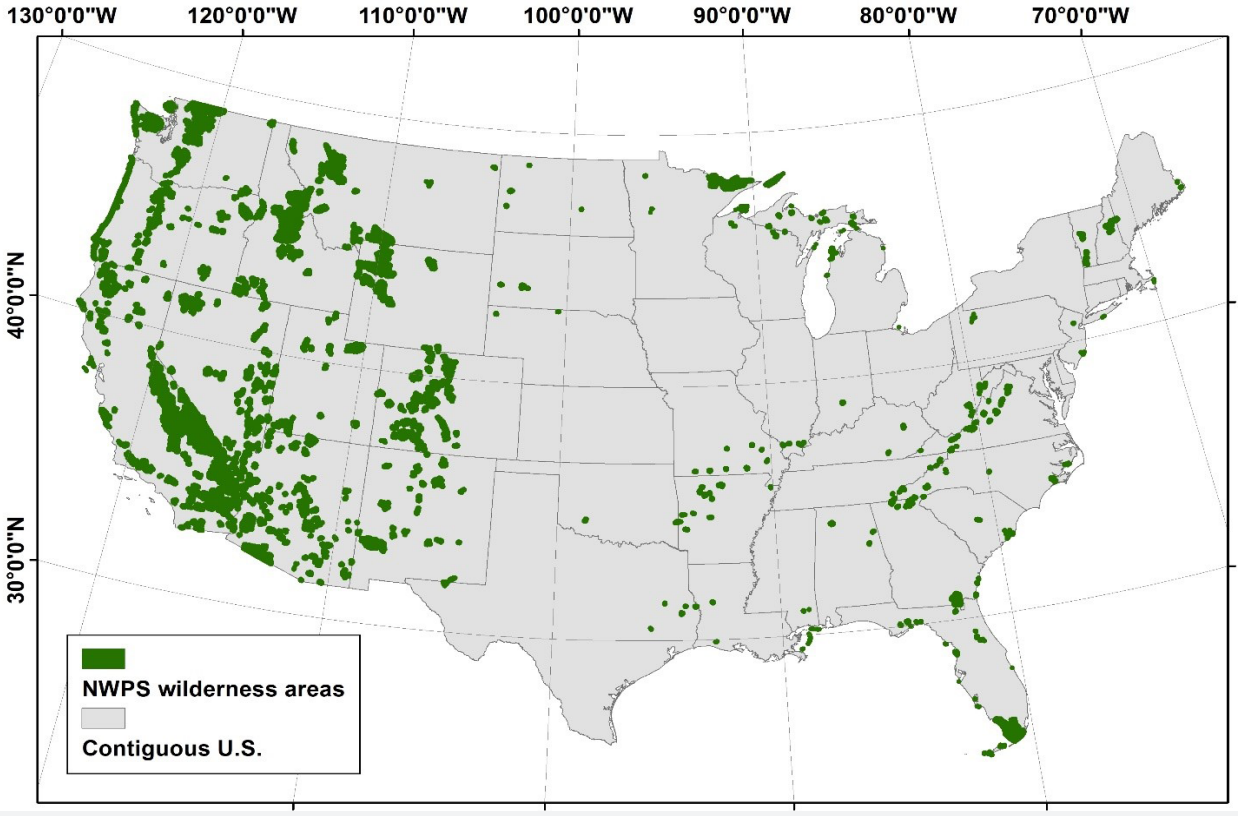

Figure 1 – Spatial distribution of current wilderness areas within the National Wilderness Preservation System. (NWPS) of the contiguous U.S. (CONUS). Wilderness boundaries obtained from Wilderness Connect (Available: http://www.wilderness.net).

Methods

Data

We obtained wilderness boundaries within CONUS from Wilderness Connect (www.wilderness.net). There was a total of 714 federally designated wilderness areas included in this analysis (Figure 1). We used species richness (i.e., the number of species in a given area) grouped by taxa (amphibians, birds, mammals, and reptiles) from Jenkins et al. (2015) as our measure of biodiversity. Species richness was determined by overlaying species range maps and counting the number of unique species in each taxon for a 6.2-mile (10 km) resolution grid across CONUS. This process resulted in raster maps where each pixel had an integer value describing the number of unique species for a given taxa in that pixel. Bird data were acquired from BirdLife International, NatureServe for reptiles, and IUCN for amphibians and mammals. Extinct and nonnative species were excluded for all taxa. For birds, both breeding and nonbreeding ranges within CONUS were included. Jenkins et al. (2015) calculated species richness in this way for all species (i.e., total) and for endemic species, which have their entire range within CONUS. Total species richness included 270 amphibians, 591 birds, 359 mammals, and 295 reptiles. Endemic species richness included 188 amphibians, 15 birds, 102 mammals, and 89 reptiles.

Analysis

For our assessment of biodiversity representation, we overlaid species richness maps by taxa onto the wilderness boundaries and extracted species richness values within wilderness areas. For our first two objectives, we used two measures to describe biodiversity: mean species richness and the frequency distribution of species richness. Mean species richness provides a single metric to evaluate if biodiversity across CONUS is represented in wilderness areas. If the mean species richness for wilderness areas was lower than for CONUS, then biodiversity was underrepresented in wilderness areas, whereas if the mean species richness for wilderness areas was equal to or higher than CONUS, then biodiversity was adequately represented.

The frequency distribution of species richness describes the area covered by each level of species richness. Due to spatial patterns of biodiversity, some levels of species richness are more common in CONUS. For instance, extremely high species richness (i.e., high biodiversity) is generally less frequent than low or moderate levels. Comparing the frequency distribution of species richness indicates how representative wilderness areas are across all levels. Equal frequency distributions indicated that biodiversity in wilderness areas was fully representative of biodiversity in CONUS, while unequal distributions of species richness indicated at what levels biodiversity in wilderness areas was under- or overrepresented. We calculated the density of the frequency curve for each level of species richness and used the difference between wilderness areas and CONUS to show representation at each level. We conducted these analyses for all species and endemic species by taxa. To address our third objective, we visually compared mapped species richness and wilderness areas to assess the pattern of biodiversity compared to the pattern of wilderness areas.

Results

The comparison of total mean species richness indicated that amphibians and reptiles were underrepresented in wilderness areas, while birds and mammals were adequately represented (Table 1). Similar results were observed for endemic species richness, with amphibians and reptiles again being underrepresented compared to birds and mammals (Table 1).

Comparing frequency distributions of total species richness for all taxa showed differences between CONUS and wilderness areas, suggesting underrepresentation of certain levels of species richness (Figure 2). For example, amphibians tended to be represented at lower levels of species richness (fewer than 10 species), but mostly underrepresented at more than 10 species. Birds were better represented at levels above 171 species. Lower species richness values (fewer than 53 species) for total mammal species within CONUS were not represented within wilderness areas even though average species richness was higher in wilderness (Figure 2). On the other end, high values of species richness (greater than 40 species) for total reptile species were largely underrepresented in wilderness areas, even though some levels (mostly between 1 and 4 and 28 and 39 species) were represented.

Different trends were observed in comparing frequency distributions of endemic species (Figure 3). Amphibians were generally underrepresented at most levels of species richness, with most wilderness areas representing only one species. Much like total species richness, birds were underrepresented more at lower levels (between 2 and 5

		CONUS total	Wilderness total	CONUS endemic	Wilderness endemic
Amphibians	Mean ***(Std. Dev.)***	**14.5 *(6.9)***	**11.8 *(9.4)***	**8.0 *(8.0)***	**6.8 *(7.9)***
	Number of pixels	77,682	666	44,016	344
Birds	Mean ***(Std. Dev.)***	**165.1 *(18.7)***	**169.6 *(19.3)***	**2.1 *(1.6)***	**2.1 *(1.9)***
	Number of pixels	81,066	705	48,203	283
Mammals	Mean ***(Std. Dev.)***	**53.0 *(9.5)***	**58.5 *(12.0)***	**5.1 *(3.6)***	**5.1 *(3.0)***
	Number of pixels	79,710	703	59,384	550
Reptiles	Mean ***(Std. Dev.)***	**25.9 *(16.9)***	**23.8 *(14.9)***	**7.6 *(8.2)***	**5.8 *(8.1)***
	Number of pixels	79,755	703	50,160	347

Table 1 – Mean and standard deviation for total and endemic species richness in the contiguous US (CONUS) and in wilderness areas by taxa

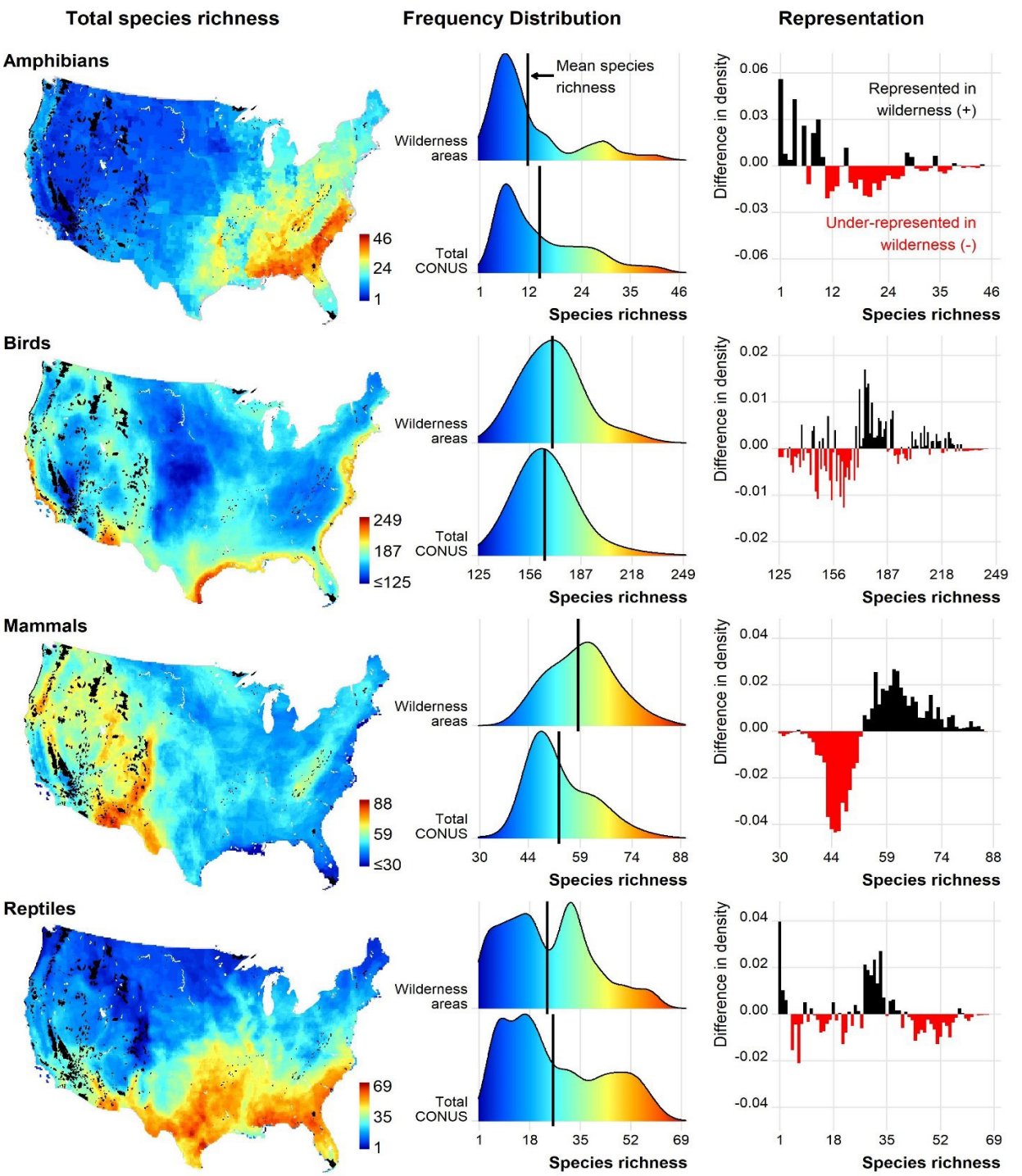

Figure 2 –Total species richness mapped across the contiguous US (CONUS), frequency distribution of species richness within wilderness areas and within CONUS, and representation of species richness in wilderness areas calculated as the difference in density values of the frequency distributions.

species). Mammals were only underrepresented at low (1–2 species) and high (more than 10 species) levels of species richness. The difference in frequency distribution of reptiles exhibited the opposite trend, with the lowest (1–2 species) and highest (more than 27 species) levels being represented in wilderness areas.

Total species richness varied across CONUS for each taxon and highlights areas of concern

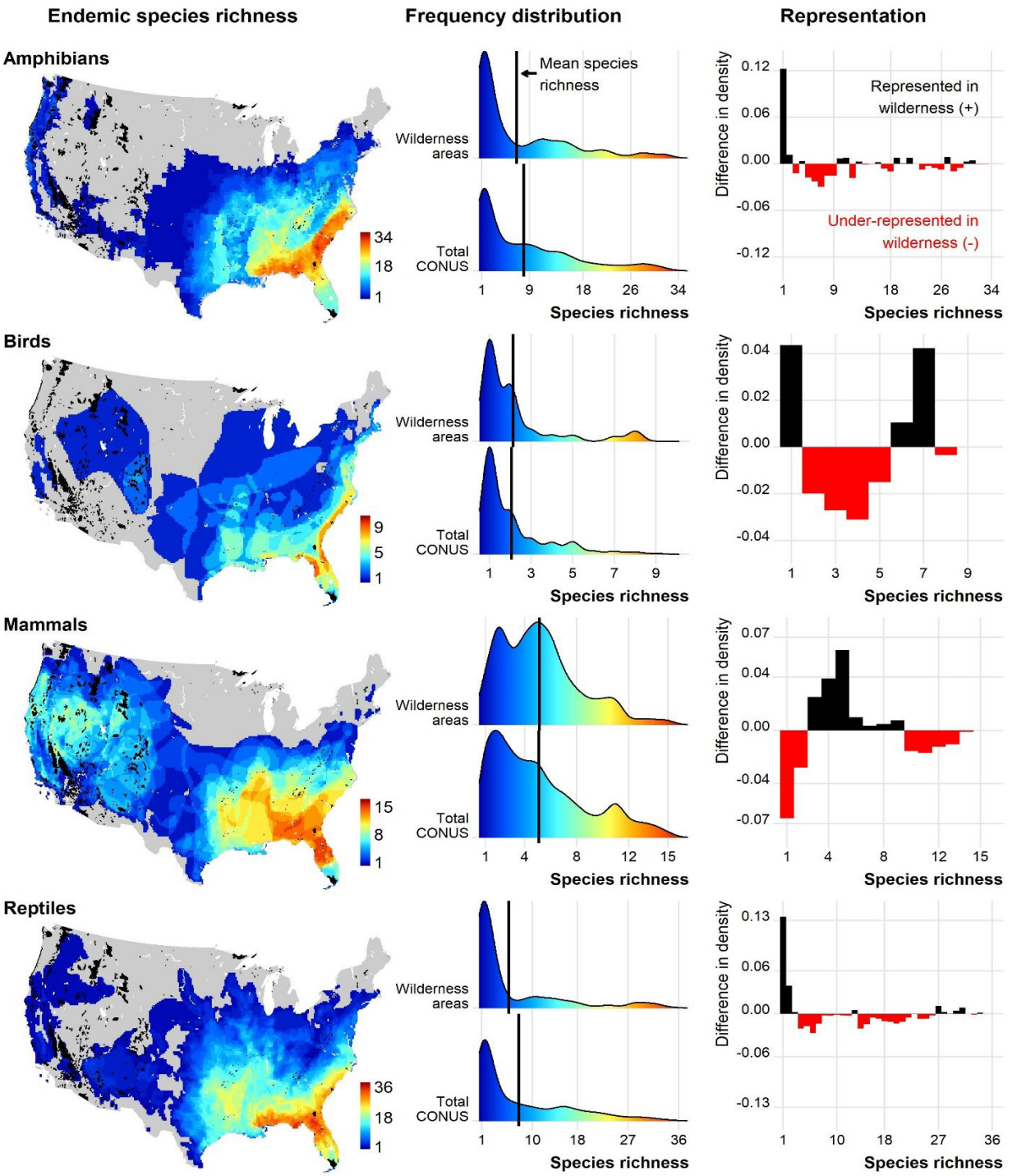

Figure 3 –Endemic species richness mapped across the contiguous US (CONUS), frequency distribution of species richness within wilderness areas and within CONUS, and representation of species richness in wilderness areas calculated as the difference in density values of the frequency distributions.

and opportunity for species conservation. Amphibian species richness was highest in the southeast, bird species richness was highest along the coasts, mammal species richness was highest in mountainous areas, and reptile species richness was highest across the southern United States (Figure 2). For all taxon, endemic species richness was highest in the southeastern United States (Figure 3).

The spatial trends appear to be tied closely with our results of the frequency distribution analysis. For instance, endemic mammals were well-represented between 3 and 9 species, which corresponds spatially to wilderness areas in the intermountain west, Appalachian Mountains, and Ozark plateau (Figure 3). Likewise, total mammal species richness occurs at lower levels of species richness throughout much of United States where there are fewer wilderness areas (Figure 2). These observations highlight the importance of geography in translating underrepresentation of biodiversity into actionable opportunities to gain representation by targeting specific regions for conservation.

Discussion

Biodiversity Representation in Wilderness Areas

We found differences in the mean species richness and frequency distribution of species richness between wilderness areas and CONUS, which appears to be driven by the mismatch between distribution of wilderness areas and underlying environmental heterogeneity across CONUS influencing species ranges, including topography, climate, and land cover. Most amphibian and many reptile species occur in southeastern United States, hence, fewer amphibians and reptile species are represented in wilderness areas because most wilderness areas occur in the western United States (Figures 1 and 2). Likewise, most endemic species for all taxa occur in the Southeast and are therefore underrepresented in wilderness areas (Figure 3). The spatial pattern of biodiversity and wilderness areas across CONUS also explains why some levels of species richness are underrepresented for birds and mammals (Figures 2 and 3).

There are multiple approaches for assessing and comparing biodiversity between areas, such as hotspots, indicator species, and dissimilarity indices (Van Dyke 2008). Each approach measures biodiversity differently, and the conservation goal needs to be considered when choosing the appropriate biodiversity measure. For instance, Rodrigues et al. (2004) found that globally, conservation areas did not match biodiversity and that any attempt to include more biodiversity would need to account for biodiversity patterns, such as endemism, rather than a percentage-based approach, such as species richness. This is a valid concern, which we observed comparing the results of our analysis of representation and the visual assessment of species distributions with wilderness areas. For example, average endemic species richness for birds was 2.1 species for both wilderness areas and across CONUS, suggesting adequate representation by this measure. However, the spatial pattern of endemic birds and wilderness areas presents a different conclusion. Along the Texas gulf coast, which is an area of high bird diversity, there

are no wilderness areas. Therefore, it might be true that overall endemic bird biodiversity is represented in wilderness areas, but certain species may rely on other types of protected areas or be lacking any significant protection at all. Representation of biodiversity is meant to be only a starting point with which to assess the overall state of biodiversity protection in wilderness areas. Wilderness managers and policy makers will likely find additional opportunities for targeted protection, which is equally worthwhile.

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Another factor influencing our results is the difference in species ranges. Numerous factors influence species ranges, but large mammals (e.g., grizzly bears [*Ursus arctos*]) need large ranges in which to survive (Diniz-Filho et al. 2005; Gaston 1996; Jenkins et al. 2015). Graham and Stenhouse (2014) demonstrated that young adult male grizzly bears in western Canada had an average range of 501 mi^2 (1,298 km^2), while female bears with cubs had an average range of 82 mi^2 (213 km^2). In CONUS, only 4% of wilderness areas are larger than the range of a young adult male grizzly bear, and 26% are larger than the range of a female grizzly bear with cubs. Wilderness is an important part of their range because it provides areas where conflict with humans is minimized (Bjornlie et al. 2014; Landry et al. 2001; Mattson 1997). The difference in size between wilderness areas and a species' range suggests that many large mammal and bird species are likely to intersect wilderness areas, but that adequate representation of biodiversity may not translate to successful conservation as wilderness may only capture a portion of their range. This is particularly true for bird species, which rely on portions of their range for different purposes such as breeding. Further analysis would be useful to determine if wilderness areas proportionately represents all life cycle ranges for birds (La Sorte et al. 2015).

Using the definition of an endemic species provided by Jenkins et al. (2015) in which a species has its entire range within CONUS, the large discrepancy between total bird species richness and endemic bird species richness can be explained Many bird species spend part of their life cycle outside CONUS and would not be considered endemic. The sky island region of southern Arizona and New Mexico has high values of species richness for birds, mammals, and reptiles (Figure 2), but low values of endemic species richness (Figure 3). This could be an artifact of defining endemics as only within CONUS because the range of many local species may extend into Mexico.

Figure 4 – Large, uninterrupted protected areas are needed to support species richness of wide-ranging mammals. At 2,358,940 acres, the Frank Church-River of No Return Wilderness is the largest undivided wilderness area in the contiguous United States.

Amphibians and reptiles, which we demonstrated are underrepresented in wilderness areas, have smaller ranges compared to large mammals and birds, but there are many mammals and birds that have small ranges. Of the 359 mammal species we assessed only 19 have large ranges. Species with small ranges or fine-scale variation in range may not be captured by the coarseness of the biodiversity data (i.e., 6.2 miles [10km]; Jenkins et al. [2015]). Just over 51% (368) of the wilderness areas in CONUS are smaller than the area of one pixel (i.e., 38.6 mi^2 [100 km^2]). Therefore, uncertainty exist in our results, particularly for topographically complex areas where species richness might vary within a pixel.

Areas of Concern and Opportunity

Even though many wilderness areas and protected areas were not established to protect the representation of biodiversity, the value of an ecologically represented system has long been recognized. However, additions to the global and national protected area network have not increased representation (Aycrigg et al. 2013; Watson et al. 2014). Dietz et al. (2015) found that even though the NWPS has expanded during the last 50 years, it has not achieved full representation of ecological systems found on federal lands. Our results indicate that in addition

to ecological systems not being fully represented within wilderness, amphibians and reptiles are underrepresented, while birds and mammals are not fully represented at all levels of species richness. Therefore, there are areas of concern and opportunity within the NWPS.

Areas of concern have low species richness and few wilderness areas as well as few protected areas. We found the lowest representation of species richness in the southeastern United States (for both total and endemic species richness) and the southwestern United States (especially southern Arizona). Because our results support the findings of Aycrigg et al. (2013), Dietz et al. (2015), Jenkins et al. (2015), Aycrigg et al. (2016), and Dietz et al. (2020) there is growing evidence that if biodiversity representation is an important metric of overall species conservation then these areas are a priority.

To evaluate opportunities for increasing representation within the NWPS, Aycrigg et al. (2016) simulated the expansion of the NWPS by adding lands eligible for wilderness designation. The area of concern within southern Arizona could increase in representation if any of the following federal land designation were added to the NWPS: national park lands that have yet to be designated wilderness, lands managed so as not to degrade their wilderness character, US Department of Agriculture Forest Service Inventoried Roadless Areas, or Bureau of Land Management (BLM) roadless lands. The greatest amount of representation would be gained by including the BLM roadless lands, which total 72.3 million acres (29.3 million ha).

New wilderness areas in the southwestern United States would support greater representation of species richness, particularly reptiles (Figure 2). But there are other tangible advantages to designating new protected areas in that region. Studies such as Belote et al. (2016) have highlighted the need for connectivity between wilderness areas to facilitate the movement of species with large ranges. In their study, they found the greatest opportunities for protection of corridors in federal lands. Large amounts of federal land in the southwestern United States managed for multiple use are permanently protected, but allow for extraction of natural resources (i.e., energy development, logging). If the emphasis of management was shifted more toward species conservation on some lands managed for multiple use, then within the protected area network representation of species could be increased. Aycrigg et al. (2013) found with a management shift toward conservation, the percent area protected for ecological systems could be increased by up to 39%. Dietz et al. (2020) demonstrated significant opportunities for conservation on publicly managed multiple use lands for 91 species of conservation concern in the southwestern United States.

Another advantage of expanding biodiversity protection in the southwestern United States is the opportunity to capture high diversity hotpots in small areas. The sky islands of southern Arizona and New Mexico fit this criterion due to high topographic diversity resulting in many ecosystems in close proximity and high biodiversity (McCormack et al. 2009; Spector 2002). Spector (2002) notes that preserving biodiversity at biogeographic crossroads, such as the sky islands, can be a strategic way to gain biodiversity representation by capturing diverse species

Figure 5 – The Pusch Ridge Wilderness near Tucson, Arizona, is an example of a protected sky island. The high topographic diversity (6,000 feet in under 6 miles) results in high biodiversity due to the many ecosystems, including desert canyons (pictured).

and communities in a concentrated area (Figure 5). The opportunity to increase biodiversity representation, maintain corridors between wilderness areas, and protect biodiversity hotspots suggest that the southwestern United States should be a high priority for future efforts to protect biodiversity.

There are also some opportunities in the southeastern United States to protect corridors (Belote et al. 2016) and to increase conservation in multiple use federal lands (Dietz et al. 2020). However, strategies must be different due to the significantly smaller proportion of federal lands in the region. Aycrigg et al. (2013), Jenkins et al. (2015), and Belote et al. (2016) all suggest establishing and maintaining public and private conservation partners to increase biodiversity representation in the southeastern United States. Any form of additional protection will be valuable, though, as this region represented the highest levels of species richness for amphibians and reptiles, which we demonstrated were the least represented in wilderness areas (Figure 2). The southeastern United States also included the highest levels of species richness for all endemic species in our study (Figure 3), suggesting additional conservation importance. Mittermeier et al. (2003) highlight the global importance of targeting endemic species for protection due their irreplaceability. In the southeastern United States there is both a need to protect endemic species and increase biodiversity representation, as well as the opportunity to maintain

corridors and establish joint public and private protected lands.

Conclusions

Wilderness areas are highly protected areas, which have a role in species conservation. One way to gauge species conservation is to assess biodiversity representation using species richness. Our results demonstrate that overall, for both total and endemic richness, amphibians and reptiles are the most underrepresented in wilderness, while birds and mammals are adequately represented on average. Therefore, the greatest need for improvement is greater protection in areas of high amphibian and reptile biodiversity. However, the comparison of frequency distributions and spatial assessment of geographic patterns suggest that some levels of species richness for birds and mammals are underrepresented. We further identify two regions that should be prioritized for increased biodiversity representation: the southwestern United States (especially southern Arizona) and the southeastern United States. Within these regions there exist opportunities to strengthen biodiversity representation, maintain corridors between wilderness areas, and add protected areas through the increased level of protection for federal lands and/or public-private land partnerships. The results of this study can also be used to inform federal land management plans for wilderness areas and other public lands at the national level..

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Recreational use on wilderness rivers.

SCIENCE & RESEARCH

In Search of Solitude: A Case Study of Wilderness and Nonwilderness River Users

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ABSTRACT According to a 2016 report by the US Forest Service, national visitation in designated wilderness has been steadily rising since 2007, which raises the question: What are the social conditions desired by the public in designated wilderness? Responses from a sample of river users (n = 344) in wilderness (n = 190) and nonwilderness (n = 154) sections of a national river in the southeast United States helped address this question. The results revealed that even though wilderness visitors experienced substantially higher use levels than nonwilderness users, their acceptability scores for different levels of use were not significantly different.

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The popularity of outdoor recreation has grown in the past few decades, with many sites experiencing a significant increase in visitation since 2010 (National Park Service 2019). With annual visitation to US national parks surpassing 300 million people (National Park Service 2019), unintended impacts to both the recreation resource and the visitor experience can occur (Manning 2011). In many cases, visitors might experience spatial and/or temporal displacement (e.g., recreating at different times or locations) due to undesirable social and resource conditions (Cribbs et al. 2019; Fefer 2019). For instance, visitors seeking solitude may choose to visit federally designated wilderness, rather than a more developed, front-country, recreation site (Manning 2013).

It was not until the inception of the Wilderness Act (1964) and the creation of the National Wilderness Preservation System (NWPS) that managers and researchers began monitoring wilderness-based recreation for adherence to legislative mandates for solitude and unconfined recreation. A 1996 report stated that the NWPS saw a six-fold increase in visitation in its first 30 years of designation (Cole 1996). According to a more recent study by the US Forest Service (2016), national visitation in designated wilderness has been steadily rising since 2007, marked by an increase of almost 17%.

Wilderness areas were designed to preserve natural and untrammeled conditions and to provide outstanding opportunities for solitude and/or primitive and unconfined recreation (Wilderness Act 1964). With the consistent rise in wilderness visitation, one prominent question continues to deserve investigation: What are the social conditions desired by the public in designated wilderness? The concept of social norms and the tenets of normative theory help answer questions about desired conditions (Manning 2011; IVUMC 2016). In the context of parks and protected areas, norms are considered visitors' shared beliefs about appropriate conditions or human behavior in a protected area (e.g., level of crowding). Norms can be measured by identifying indicators of quality and developing quantifiable thresholds of acceptability for certain conditions, as reported by the visiting population. Indicators are measurable and manageable variables that help define the quality of a recreation experience, whereas a threshold represents the minimum acceptable condition of an indicator (IVUMC 2016).

In terms of wilderness-related norms, Shelby (1981) asked visitors what they felt was the appropriate encounter levels with other recreation groups for three different outdoor settings. Between the three outdoor settings (wilderness, semiwilderness, and undeveloped recreation), visitors reported that wilderness should have the least number of encounters per trip. A similar finding was revealed by Hallo et al. (2018) at Cumberland Island National Seashore, where visitors to designated wilderness desired fewer people at attraction sites on the island than nonwilderness visitors. Traditionally, studies have revealed that visitors generally report that wilderness should host the lowest number of encounters, and wilderness users have been found to possess different motivations and desired outcomes compared to nonwilderness users, such as the desire to experience unconfined recreation

and solitude (Basman et al. 1996; Brownlee and Hallo 2013; Donnelly et al. 2000; Stankey 1980; Stankey et al. 1984).

However, research has also documented shifts in how wilderness is being used, and who is visiting designated wilderness. For example, a study of National Park Service wilderness managers estimates that as many as half of all wilderness visitors are day users, and that day users' motivations and expectations differ substantially from more conventional overnight wilderness visitors (Abbe and Manning 2007; Hallo and Manning 2010). As another example, Hallo and Manning (2010) demonstrated that some park visitors enjoy viewing the landscape of designated wilderness from the comfort of vehicles without venturing into a wilderness area. This documented shift begs the question: What are the social conditions desired by the public in designated wilderness? Furthermore, this question extends to wilderness in a river-based system, which may offer an even more unique perspective on the issue.

Although there have been many studies about management of wilderness for solitude conditions, most of this work occurred before recent increases in visitation and potential shifts in user-type, motivations, or visitors' conceptualizations of wilderness (Hallo and Manning 2010). Historically, recreation research tends to combine both wilderness and nonwilderness users when examining use-level-related norms, but few have focused on the implications that use levels may have on wilderness visitors in a river-based system (Manning et al. 2000; Manning 2003). Therefore, we investigated if river users' expectations and thresholds for use levels differed between those recreating in designated wilderness or nonwilderness sections of the same river. Four hypotheses, underpinned by elements of the 1964 Wilderness Act and findings from previous empirical studies, guided our work:

1. *Wilderness users will have lower acceptability ratings for high use conditions than non-wilderness users,*
2. *Wilderness users will report experiencing fewer encounters with other boaters than nonwilderness users,*
3. *Wilderness users will report experiencing less crowding, and*
4. *The conditions experienced by wilderness and nonwilderness users will not influence their acceptability ratings for different use levels.*

Ultimately, this study was designed to help explain if wilderness visitors differ from nonwilderness visitors in desired conditions related to use levels and potential crowding. Additionally, we explored if management action may be needed to adhere to wilderness values defined by both legislation and visitor opinion.

Methods

Study Area

We conducted this study, focused on day-use river users (i.e., boaters), in both federally designated wilderness and nonwilderness sections of the same national river in the southeast United States. This river offers more than 100 miles (161 km) of free-flowing water surrounded by karst topography, undeveloped viewsheds, and river bluffs that exceed 400 feet (122 m) in some locations. There are few roads that parallel the river, but boaters access the river by using well-documented and managed access areas. In both the wilderness and nonwilderness river sections, management does not limit the number of boaters allowed on the river at one time. Use levels are indirectly influenced by concessionaire availability and seasonal water levels. Roughly one-third of the river and its riparian area is within or adjacent to federally designated wilderness.

We present the following as an empirically grounded opportunity to reflect on questions of visitor use and preferences inside and outside of wilderness, rather than as an examination or critique of management at a particular wilderness site. To maintain focus on our research questions and what the results may contribute to the conversation of visitor preferences and standards of wilderness character, we have chosen to refrain from naming the specific site or associated identifiers.

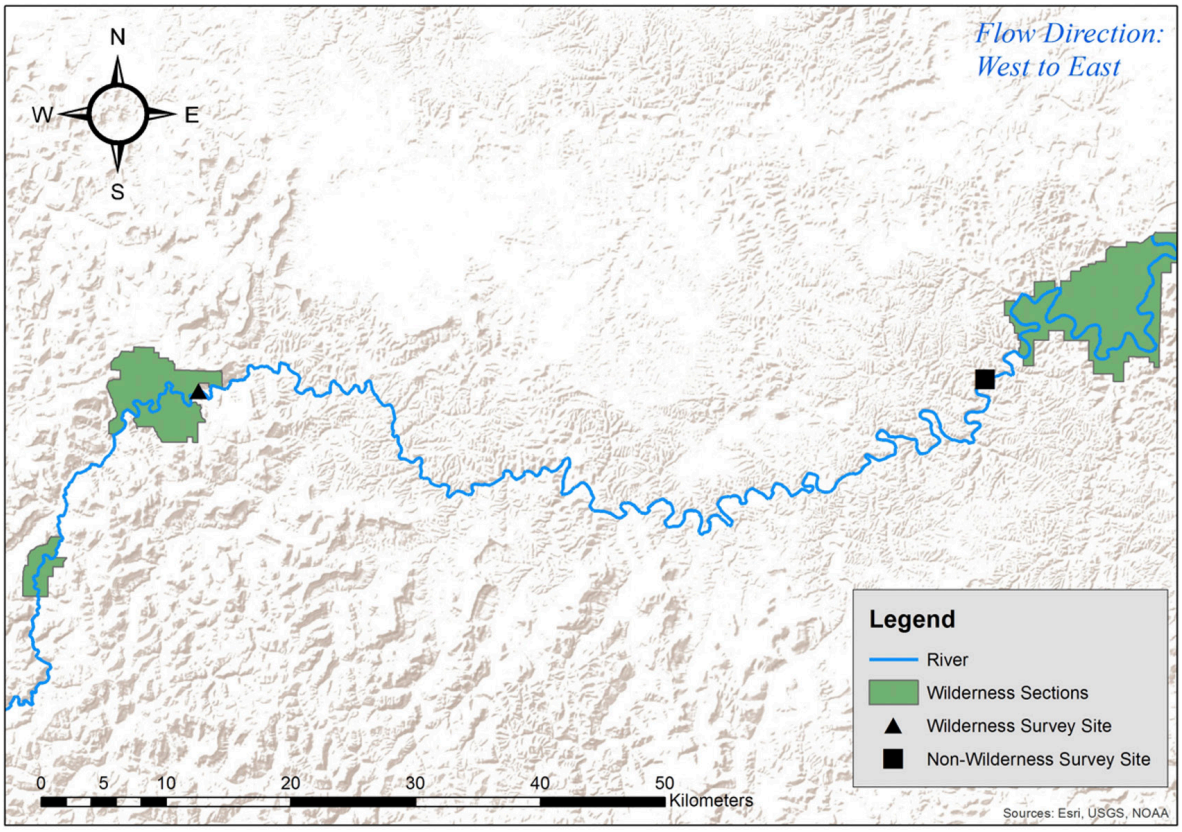


Figure 1 – Map of research site and survey locations.

Sampling Design

We used two survey stations to capture both wilderness and nonwilderness users. The first survey station was positioned at a river access point where boaters would exit the river after having floated at least 13 river kilometers (8 miles) directly through designated wilderness (i.e., wilderness users). The second survey station was selected at another river access point where, given its substantial downstream distance from designated wilderness, it was highly unlikely that any day-use boaters would have encountered designated wilderness sections (i.e., nonwilderness users) (Figure 1).

Regarding instrumentation, we used standard visual methods embedded in the quantitative survey consistent with methodological procedures reported in previous studies (Stankey 1980; Hallo et al. 2018; Hallo and Manning 2010). Sampling occurred in 2016 and 2017 during peak season, April through October, simultaneously at the two survey stations to intercept wilderness and nonwilderness users. Sampling was stratified by time of the day, day of the week, and week of the season. All respondents were >18 years old and selected via nonprobability sampling. After finishing their river experience, respondents at both intercept sites completed a self-administered survey containing questions regarding a series of five photographs representing varying numbers of boats at one time on the river (BAOT; Figure 2). Respondents rated the acceptability of the conditions in each photograph on a scale ranging from very unacceptable (-4) to very acceptable (+4). Surveys were administered with Samsung Galaxy TabA® tablets using Qualtrics® survey software. The series of five 8" X 10" digitally edited photographs ranged from zero BAOT (solitude condition) to 24 BAOT (saturated conditions) and were displayed in a photo binder viewed by each respondent. The level of BAOT depicted in each photograph series reflected a range of current or potential conditions verified by park managers.

In addition to questions regarding BAOT, respondents rated their level of acceptability for visitor encounters per hour while boating on the river (six conditions presented: 0, 20, 40, 60, 80, and 100 encounters per hour). Visitors also responded to questions regarding other evaluative dimensions of use levels and potential crowding, such as the BAOT condition or an encounter rate that (a) they experienced during their visit (experienced condition), (b) requires management action, (c) would lead to no longer using the site (displacement), and (d) is so high that visitor use should be limited. Survey response completion times ranged from 10–15 minutes.

Analysis

Using statistical software package SPSS® (v. 24), we generated descriptive statistics and used a series of independent samples t-tests and chi-square tests of homogeneity to assess if boaters' thresholds for BAOT, visitor encounter rates, perceived level of crowding, and demographics differed significantly ($p < 0.05$) between wilderness and nonwilderness users. Additionally, we used the Potential for Conflict Index (PCI2) to determine if the two user groups possessed agreement relative to acceptability scores and associated norms (i.e., norm crystallization) (Vaske and Shelby 2008). The PCI2 index spans from zero (maximum

agreement; or potentially well-developed norms) to one (minimal agreement; or potentially minimally developed norms). This index describes a variable's central tendency and dispersion along a social norm curve. If a population has agreement about a specific norm, the information can be used confidently for a range of management decisions.

Photo 1- 0 BAOT

Photo 2- 6 BAOT

Photo 3- 12 BAOT

Photo 4- 18 BAOT

Photo 5- 24 BAOT

Figure 2 – Digitally edited photographs of BAOT on the study river. Edited photographs ranged from zero BAOT (solitude conditions) to 24 BAOT (saturated conditions).

Results

We intercepted 447 boaters during the study, with 190 participants surveyed in designated wilderness and 154 participants in a nonwilderness section, yielding a 77% response rate. The mean age of the participants was 40 years old, and the gender distribution of participants was relatively even with 53% of participants self-identifying as male. Most respondents reported primary residencies within three to four hours of the river, and 61% of respondents reported having at least two years of experience at the river. Chi-square and t-tests revealed that wilderness and nonwilderness users had no significant differences across income, education, age, residency zip code, or gender ($p > 0.05$), suggesting a demographically similar visiting population was intercepted at both survey sites.

Thresholds

For both wilderness and nonwilderness users, PCI2 values suggest relative consensus about the acceptability level for each presented condition for BAOT and encounter rates. In general, both user groups displayed decreasing levels of acceptability as BAOT and the hourly encounter rate increased. On average across groups, visitors reported a threshold, or a minimum acceptable condition, of 13 boats within view at one time and 40 encounters per hour. In other words, if visitors were to encounter more than 13 boats within view or encounter 40 or more people per hour while on the river, they would likely report unacceptable conditions. These findings also suggest that the range of acceptable conditions is 0 to 13 boats on the river and 0 to 40 encounters per hour, with the solitude condition (0 BAOT and 0 encounters) being the most acceptable for both user groups.

Differences between Groups

There were no statistically significant differences between user groups for acceptability ratings of all BAOT conditions and five of the six visitor encounter conditions (Tables 1 and 2). There was a significant difference ($p = 0.05$) between user groups for encounter rates of 60 people per hour, although the difference in mean scores was only 0.26 on a 9-point scale (see Table 2). Regarding conditions experienced while on the river, wilderness users reported experiencing a significantly higher BAOT ($p \leq 0.01$) and a significantly higher encounter rate ($p \leq 0.01$) than nonwilderness users (Table 3). There was no significant difference, however, between the user groups' thresholds for encounters per hour (40) or BAOT (13) (see Figures 3 and 4, respectively).

On average, wilderness users reported seeing four more boats at one time than nonwilderness visitors. Wilderness visitors also reported encountering around 12 more people per hour (Table 3), suggesting that wilderness boaters experienced higher use levels than nonwilderness boaters. When researchers asked visitors "Which conditions, if any, warrant management action to improve the area," "Which conditions are so unacceptable that you would no longer use the area," and "Which condition is the highest level of use you believe that park managers should allow? In other words, at what point should visitor use be limited?," there were no significant differences between user groups (Table 3). Also of note, of the 54 total respondents who indicated that "Use should never be limited" as their response, more than half (57%) were wilderness users.

	Encounters per hour					
	0	20	40	60	80	100
Wilderness (*M*)	2.75	1.38	-0.13	-1.59	-2.28	-2.89
Nonwilderness (*M*)	2.66	1.36	-0.17	-1.33	-2.21	-2.64
t-value	0.44	0.37	0.90	1.97	1.65	1.32
p-value	0.66	0.71	0.37	0.05	0.09	0.19

Means on a scale of -4 = very unacceptable to +4 = very acceptable

Table 1 – Summary of the mean acceptability of BAOT for wilderness and non-wilderness users

	Photo 1 (0 BAOT) ***M*** (PCI_2)	**Photo 2** (6 BAOT) ***M*** (PCI_2)	**Photo 3** (12 BAOT) ***M*** (PCI_2)	**Photo 4** (18 BAOT) ***M*** (PCI_2)	**Photo 5** (24 BAOT) ***M*** (PCI_2)
Wilderness users	2.83 (0.19)	1.66 (0.21)	0.26 (0.31)	-1.44 (0.29)	-2.29 (0.25)
Nonwilderness users	2.83 (0.37)	1.57 (0.3)	0.43 (0.37)	-1.11 (0.37)	-2.03 (0.34)
t-value	0.23	0.71	0.42	0.30	0.73
p-value	0.82	0.48	0.68	0.77	0.46

Means on a scale of -4 = very unacceptable to +4 = very acceptable

Table 2 – Summary of the mean acceptability for encounter rate per hour for wilderness and nonwilderness users

		BAOT				**Encounter Rate Per Hour**		
		Today's experience	Management should take action	Conditions would cause displacement	Use should be limited[2]	Today's experience	Management should take action	Conditions would cause displacement
Wilderness	Photo number (M)*	2.34	4.18	4.44	3.62	2.56	4.44	5.14
	# of BAOT/People	8.05	19.06	20.61	15.73	31.12	68.82	82.78
	No Condition[1]		21%	30%	8.4%			
Non-wilderness	Photo number (M)*	1.62	3.92	4.37	3.56	1.93	4.50	5.02
	# of BAOT/People	3.74	17.54	20.23	15.38	18.54	69.93	80.4
	No Condition[1]		20.6%	31%	12.9%			
	t-value	4.26	1.41	0.89	0.24	8.76	0.62	0.55
	p-value	< 0.01	0.16	0.37	0.95	< 0.01	0.54	0.58

[1]"No Condition" refers to the percent of respondents who chose the survey response "None of the conditions in the photographs are so unacceptable that I would no longer use the area."
[2]16.3% of wilderness users and 14.8% of nonwilderness users reported that use should never be limited.
***means scores based on the viewing of 5 photos representing different conditions on the river – see Figure 2**

Table 3 – Summary of the evaluative dimensions for BAOT and visitor encounter rate per hour for wilderness and non-wilderness users

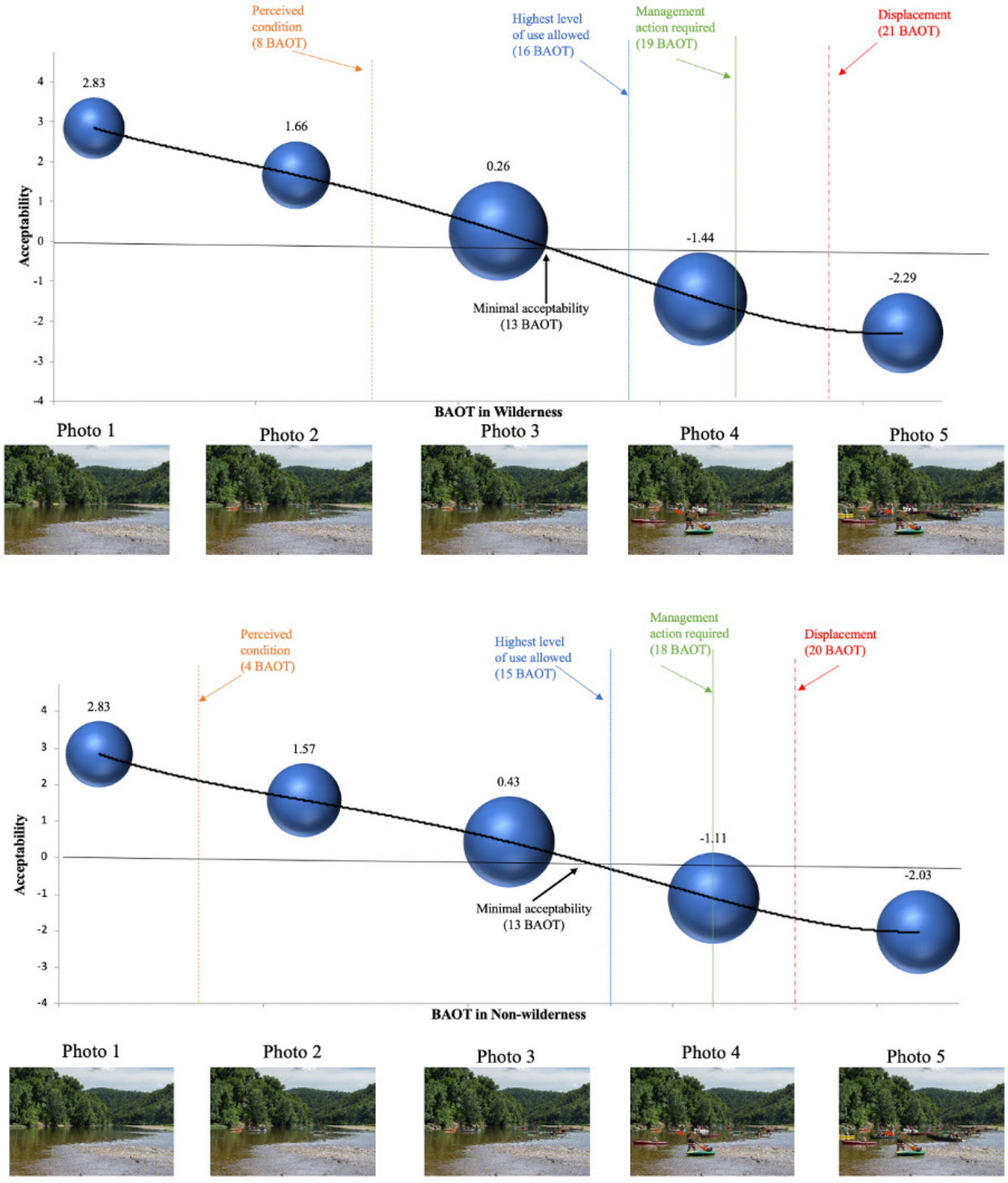


Figure 3 – PCI2 Social Norm Curves (with accompanying means) for BAOT in both Wilderness and Non-Wilderness

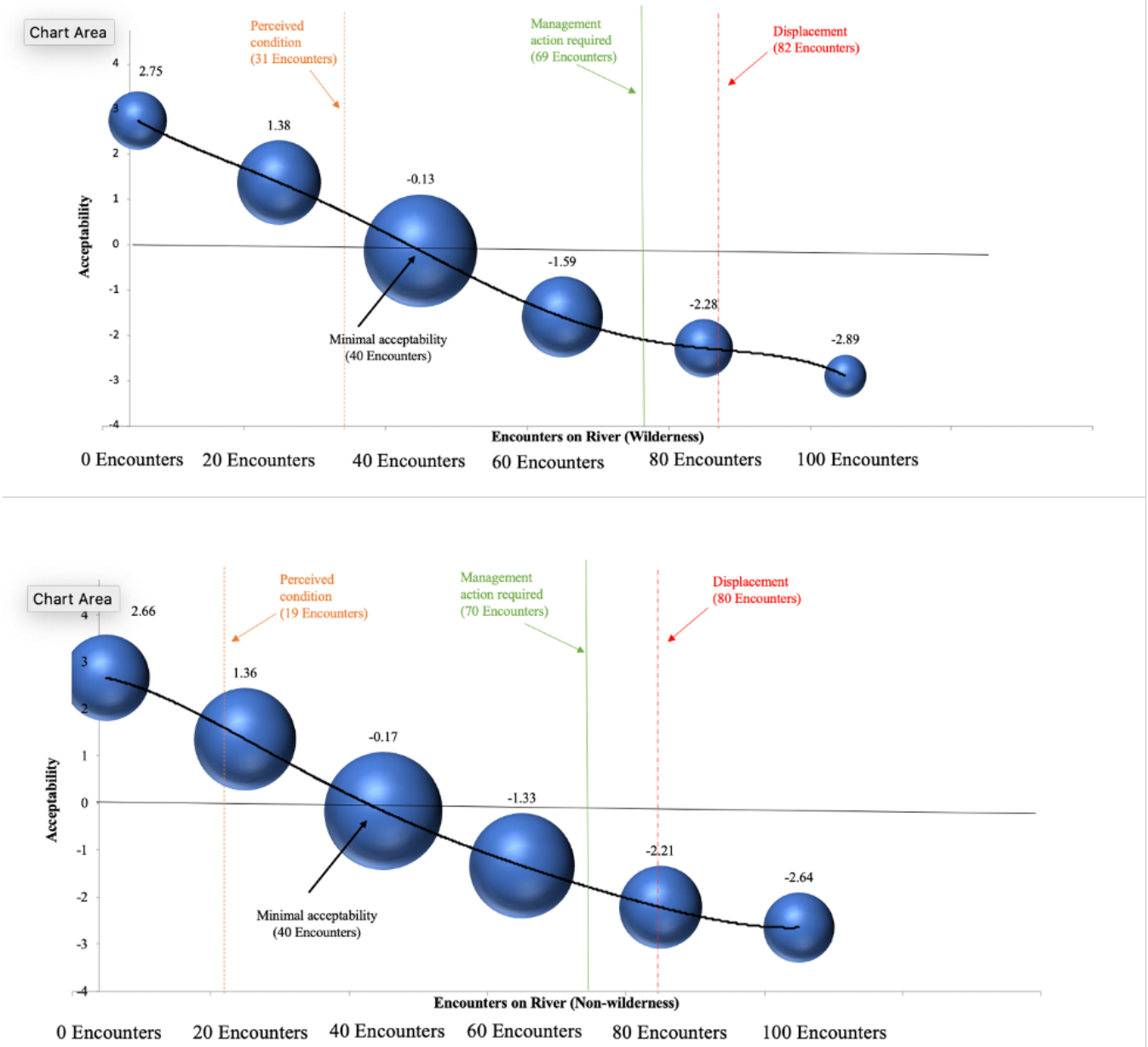
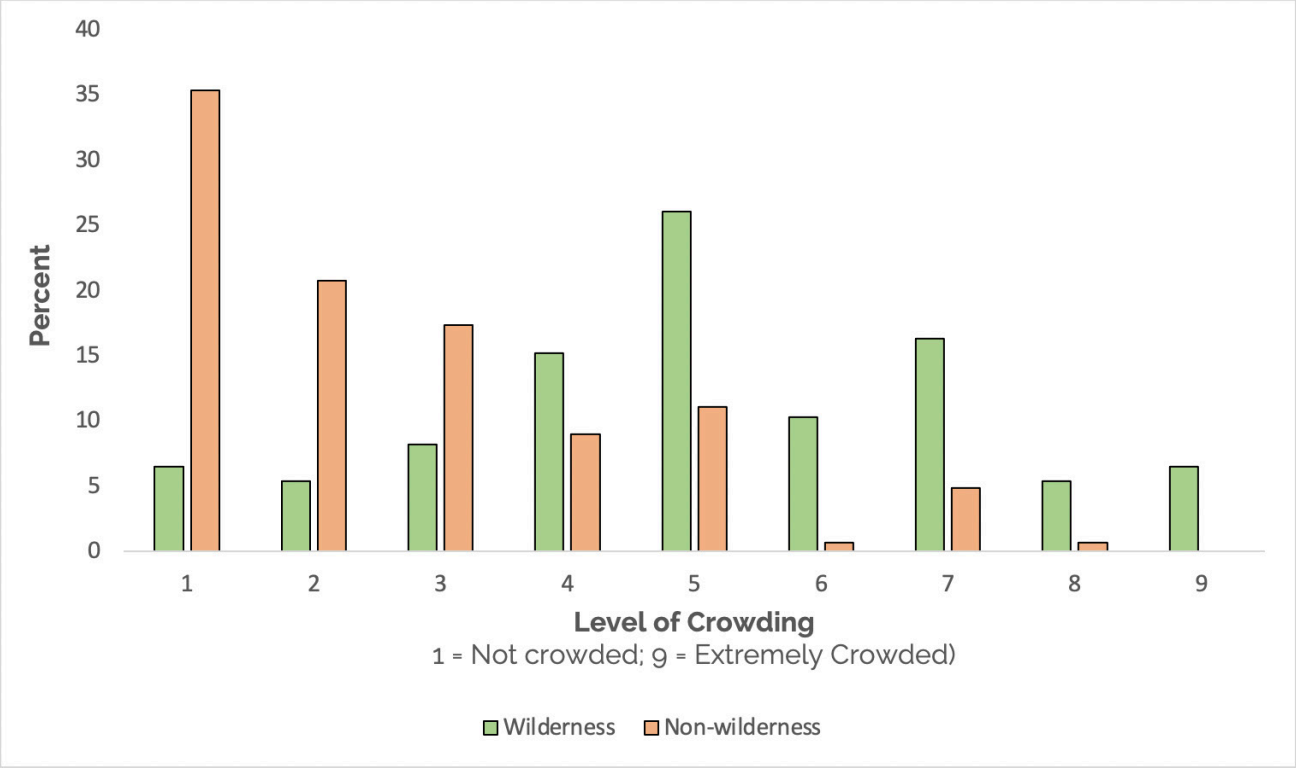


Figure 4 – Social norm curves (with accompanying means) for encounter rate per hour.



Mean: Wilderness = 5.11 (sd = 2.08), Non-wilderness = 2.65 (sd = 1.75); ***t***-value=11.43, ***p***-value < 0.01

Figure 5 – Visitor responses to "Using the scale below, please rate the level of crowding you experienced at … today."

Perceived Crowding

When asked "Please rate the level of crowding you experienced today," wilderness visitors had a larger mean score than did nonwilderness visitors (Figure 5). Ultimately, while wilderness visitors reported higher encounter rates and higher BAOT than nonwilderness users, they also reported feeling more crowded by 2.46 points on a 9-point scale (1=not crowded; 9=extremely crowded), which is statistically significant (t-value=11.43, p-value < 0.01).

Conclusions

This study sought to begin addressing a large question: What are the social conditions desired by the public in designated wilderness? Although we offer the results of only one focused case study, the results did not generally align with previous literature or common assumptions about wilderness visitors. Specifically, wilderness users reported experiencing significantly higher BAOT and encounter rates than did nonwilderness visitors, and wilderness visitors also expressed feeling more crowded. However, there were limited statistical differences between these two groups for acceptability ratings of BAOT and hourly encounter rates. This finding suggests that wilderness visitors did not have markedly different thresholds for use levels than nonwilderness visitors. Similarly, these two groups did not differ in their evaluation of the conditions that warrant

management action, would contribute to displacement, or necessitate limiting use.

These results reflect a different narrative about wilderness users than previously developed through empirical studies using normative approaches. Consequently, four surprising conclusions pertaining to the study's hypotheses can be made. Our first hypothesis "Wilderness users will have lower acceptability ratings for high use conditions than nonwilderness users" was not supported because no substantial differences in acceptability ratings of use conditions or associated thresholds between user groups was found. The second hypothesis, "Wilderness users will report experiencing fewer encounters than no-wilderness users" was also not supported because wilderness users did in fact, experience a higher BAOT and encounter-rate compared to nonwilderness users. The third hypothesis, "Wilderness users will report experiencing less crowding" was also not supported because wilderness users reported feeling more crowded than nonwilderness users. Our findings did, however, support the fourth hypothesis that "Experienced conditions will not influence reported norms." In conclusion, although wilderness and nonwilderness visitors experienced different conditions during their visit, the survey results for acceptability of varying conditions for entire visiting population were largely the same with limited statistical differences between the two visitor groups.

These unsupported hypotheses raise several questions about the users of this river and similar rivers with designated wilderness and nonwilderness sections: (1) Do visitors recognize that portions of the river are wilderness and nonwilderness? (2) Do visitors understand the difference between wilderness and nonwilderness? and (3) What do the unsupported hypotheses mean for wilderness management? This study did not ask if visitors knew if they were in a federally designated wilderness area. However, the visitors' desired conditions or demographics did not differ between user groups, which potentially means that boaters were accessing the river at points of convenience as opposed to seeking a paddle through designated wilderness. Many of the results might be quite important to managers because the legislative mandate for wilderness areas is unique and may require a reduction in use to meet certain criteria of the Wilderness Act (e.g., opportunities for solitude).

Implications

As noted, the results of this study revealed unexpected findings. However, it is difficult to determine if these results are representative of a trend that may be occurring at other protected areas and waterways. During the last decade, participation in outdoor recreation, particularly paddle sports (canoeing and kayaking) has increased (Outdoor Foundation 2018), along with an overall increase in visitation to parks and protected areas, including designated wilderness (Manning 2013). With more visitors participating in paddle sports, there is a need for a clear management strategy for these users. The legislative mandate that requires wilderness areas to provide for solitude is likely not being met in the case of this national river. When designated wilderness is a part of the recreation area in an open system consisting of many access points, it may

lead to increased management challenges. One of the core missions of most protected areas is to provide opportunities for visitor experiences, but the Wilderness Act mandates for providing concurrent "outstanding opportunities for solitude" and "preservation and use in an unimpaired condition" (The Wilderness Act of 1964, US Public Law 88–577).

In conclusion, we ponder if the intended setting and associated experiences in designated wilderness are important to all wilderness users. If there are no differences in the expectations and preferences between wilderness and nonwilderness river users, and if visitor thresholds are not being violated, do visitors desire management action to maintain Wilderness Act values? The results of this study reflect that in this case, protected area managers may be managing use levels that potentially exceed the federally designated purpose of the resource (i.e., wilderness values). If this is to change, a dramatic shift in visitation and river use must be made to reinstate the values of wilderness that have potentially been jeopardized. Direct management actions, in the form of permits or limiting the number of boat rentals by local concessionaires for visitors intending to use the wilderness sections, could decrease use levels or spatially distribute use to other sections of the river. Management may also need to consider scheduled launch times to temporally distribute use to maintain the values of wilderness.

If there are no differences in the expectations and preferences between wilderness and nonwilderness river users, and if visitor thresholds are not being violated, do visitors desire management action to maintain Wilderness Act values?

This study highlights that the expectations wilderness visitors have for solitude in designated wilderness river sections may be migrating into a new channel. In an era of increasing wilderness visitation, this information can assist researchers in mapping if and how the undercurrents of wilderness values flow through today's visitors' expectations and correspondingly help managers in navigating these channel migrations. ijw

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"Alone with others in the wilderness." **Photo credit** © Kensey Amerson.

The Increasingly Social World of Long-Distance Hiking

by DANIEL DUSTIN, JEFF ROSE, KENSEY AMERSON, and ANDREW LEPP

Daniel Dustin

Jeff Rose

Kensey Amerson

Andrew Lepp

The quintessential image of long-distance hiking takes us back to the 19th-century naturalist, John Muir, and his solitary forays into California's Range of Light. "Climb the mountains and get their good tidings," Muir extolled. "Nature's peace will flow into you as sunshine flows into trees. The winds will blow their own freshness into you, and the storms their energy, while cares will drop away from you like the leaves of Autumn" (Muir 1894). For Muir, solitary encounters with nature were not the least bit lonely (Figure 1). On the contrary, he found companionship in nature itself. "The deeper the solitude," he wrote, "the less the sense of loneliness, and the nearer our friends" (Muir 1911).

In this article, we contrast the solitary character of Muir's wanderings in nature with the increasingly social character of today's long-distance hikes. Our intent is not to advocate for one kind of long-distance adventure over another but rather to raise questions about the new norms in long-distance hiking. Readers can judge for themselves how they think "John of the Mountains" would have responded to the current state of affairs.

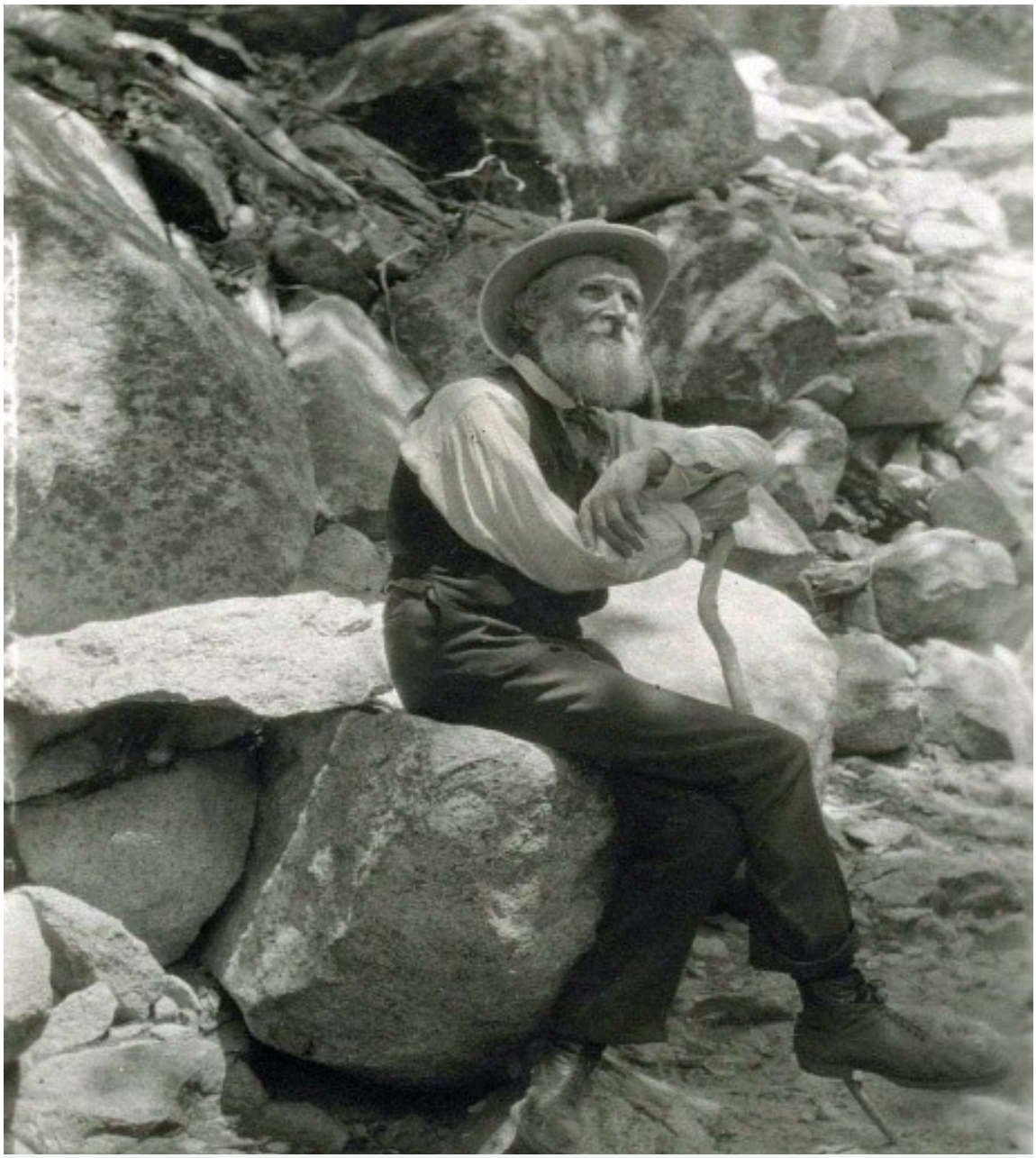

Figure 1 – John Muir. 1907. Photo courtesy of the Bancroft Library. University of California, Berkeley.

Alone with Others

Our point of departure is the first article published in the first issue of Leisure Sciences in 1977. Robert Lee, a sociologist by training, challenged conventional thinking that wildlands are places where the individual, in Muir-like fashion, "withdraws from social interaction, seeking privacy and solitude" (Lee 1977, p. 4). In his study, Lee observed that many wilderness enthusiasts welcome social interaction, and, furthermore, that social interaction does not compromise their experience of solitude. They merely see themselves as being "alone with others" (Lee, p. 3) in the wilderness (Figure 2).

Figure 2 – "Wilderness recreation is increasingly a social experience." Photo courtesy of Kensey Amerson.

Lee's findings countered the prevailing notion that wildland experiences are best defined by their solitary nature, and he further cautioned that wilderness planners, policy makers, and managers should not base their decision-making on a priori assumptions regarding what people want in wildland recreation. Venturing alone into the wilderness may have befit John Muir, but it does not follow that venturing into today's wilderness in groups, or having solitary adventurers form groups during their long-distance treks, necessarily compromise the core values for which wilderness traditionally has been managed – a sense of primitiveness and solitude. Lee's counterintuitive conclusion prods those of us who assume wildlands are places best suited for solitary quests to revisit our assumptions. Wildland outings in the company of others may not jeopardize a feeling of solitude after all. Indeed, Lee's findings prompt us to wonder whether exploring wildlands in groups may enhance, rather than detract from, the quality of the overall experience.

The Increasingly Social World of Long-Distance Hiking

The latest trends in long-distance hiking provide an interesting window through which to consider the ways in which growing numbers of people may differentially impact the quality of their wildland experiences (see, for example, Amerson, Rose, Lepp, and Dustin 2019; Dustin, Beck, and Rose 2017; Fondren and Brinkman 2019). An upsurge in interest in hiking the Appalachian Trail, the Pacific Crest Trail, and the Continental Divide Trail, the "Triple Crown" of the nation's long-distance hiking trails, has been attributed to the influence of Bill Bryson's A Walk in the Woods: Rediscovering America on the Appalachian Trail (1999), Cheryl Strayed's Wild: From Lost to Found on the Pacific Crest Trail (2013), and well-attended movies by the same names. Indeed, the number of thru-hiking permits obtained for the Pacific Crest Trail almost quadrupled from 1,879 in 2013 to 7,313 in 2018 (PCTA 2018). Clearly, long-distance hiking is growing in popularity as attested to by a special issue of this journal devoted to long-distance trails in August 2020.

Recent academic studies focusing on the social dimensions of long-distance hiking (e.g., Goldenberg and Soule 2014; Lum, Keith, and Scott 2019) have even begun to refer to the community of long-distance hikers as "the herd." Herds refer to waves of hikers on the nation's long-distance hiking trails who begin their treks about the same time. Herds sometimes evolve into a "traveling community" over the course of the journey as hikers catch up to, pass, and then rejoin one another again and again.

Researchers also tell us that herds are populated by two distinct subcultures, "Purists" and "Social Hikers" (Lum et al. 2019). Purists are "motivated primarily by the actual hiking of the trail, whereas the Social Hiker is motivated primarily by social interaction with his or her fellow hikers" (Lum et al. 2019, p. 172). The Purist subculture can further be divided into Muir-like "Romantic Purists" and more practical "Utilitarian Purists," both of whom prefer to walk alone, stay on the trail, and avoid as much as possible the need to leave the trail to resupply in nearby towns. Romantic Purists are motivated by the experiential and existential benefits associated with long-distance hiking, while Utilitarian Purists are primarily concerned with hiking every inch of the official trail from beginning to end (Lum et al. 2019).

Social Hikers can also be divided into two additional subcultures, "Gregarious Hikers" and "Party Hikers." Gregarious Hikers are interested in forming relationships with other hikers and building a sense of community along the trail, while Party Hikers see the trail largely as a backdrop for other pursuits, including drugs and alcohol. Indeed, Party Hikers are sometimes referred to derisively by other long-distance hikers as "pub crawlers" (Lum et al. 2019, p. 176).

Long-distance hiking, in sum, not only fulfills needs for solitude, it fulfills needs for social interaction as well. This gives planners, policy makers, and managers something else to think about as they ponder the future stewardship of recreational wildlands. Is it possible, for example, that Muir-like treks focused on a quest for solitude may be harder and harder to come by in the future as more social forms of long-distance hiking gain momentum (Dustin 2018; Dustin, Beck, and Rose 2017)? Will the Romantic Purists be forced to look elsewhere to fulfill their needs? This is

reminiscent of the visitor "invasion and succession" problem described so many years ago (Dustin and McAvoy 1982), when new waves of outdoor recreationists drive out old waves due to their fundamental differences in goal orientation.

At the same time, an increasingly diverse population of hikers on long-distance trails raises several new gender-related issues (Botta and Fitzgerald 2020; Howard and Goldenberg 2020). Stereotypes about what men and women are able and unable to do in the backcountry problematize wildland recreation management. Ceurvorst et al. (2018), for example, found that although women and men have similar interests in outdoor recreation, women reported more concerns about fitness, confidence, cost, and fear of getting hurt. Women also appear to be constrained by socialized gender roles in Western culture (Warren 2016; Whittington 2006), as well as being burdened by other factors, including motherhood and family obligations, financial priorities, lack of time, sexual harassment, and lack of an outdoor companion (Joyce 2016; Warren 2016). As Weatherby and Vidon (2018) conclude, "Historically, American wilderness has been conceived as a profoundly masculine landscape and a threat to femininity" (p. 332). Western notions of masculinity and femininity thus confound representations of wilderness and male and female perceived roles within wilderness.

In similar fashion, the multicultural world from which long-distance hikers come is made up of increasingly diverse views about how people should conduct themselves in the out-of-doors. A long tradition of highly educated white male wilderness enthusiasts is gradually giving way to a multiplicity of ethnically and racially diverse wilderness enthusiasts, who carry with them different ethnic, racial, and cultural heritages and different ways of viewing their relationship with the natural world (see, for example, Lugo 2019). Indeed, it is expected that by 2050, minorities will be the majority in the United States (Passel and Cohn 2008). Consequently, the nation, and its long-distance backpacking community, is bound to change dramatically in the coming years.

Long-distance hiking, then, is destined to be less and less the purview of rugged Muir-like males and more and more the purview of multiracial, multicultural, and multigendered members of a worldwide society. For these wilderness travelers, advancing down the trail in groups may simply better suit the times in which we live.

Anticipating, appreciating, and supporting the increasing multidimensionality of the motivational determinants underlying long-distance hiking is a daunting managerial challenge. Indeed "alone with others" may no longer capture the full meaning of the increasingly social world of long-distance hiking. Burgeoning smartphone use and accompanying hiking apps encourage hikers to create virtual social networks along the nation's trails, making it possible for them to be neither "alone" nor "with others" on their wilderness sojourns (Cole and Thomsen 2020; Rogers and Leung 2020; Sutcliffe 2020). Advancing technology allows them to stay connected "with others" even when hiking "alone" (Amerson, Rose, Dustin, and Lepp 2019; Dustin, Beck, and Rose 2017).

It is no longer a matter of walking alone or

with others, of experiencing solitude or not experiencing solitude, of staying on the trail or going off-trail, of finishing or not finishing the hike. Indeed, a popular refrain among long-distance hikers to "hike your own hike" illustrates the common sense of recognizing human beings for what we are – highly unique individuals with diverse motivations and aspirations. In this regard, there may be no "right" or "wrong" way to enjoy a long-distance hike. There may only be different ways. Having said that, we are still obliged to hike our own hike in a manner that reduces our collective footprint on the ground of our being (Rolston 1996). On this point, at least, Romantic Purists, Utilitarian Purists, Gregarious Hikers, and Party Hikers should all be able to agree.

The lasting benefit of the increasingly social world of long-distance hiking is the opportunity to continue building communities of support for the environments long-distance hikers pass through, much in the same way John Muir did when leading groups of Sierra Clubbers into his beloved Sierra Nevada at the turn of the 20th century (Figure 3). Researchers tell us that people who are exposed to nature take an increasing interest in protecting nature (Chawla 1998, 1988). Long-distance hikers, as well as the "trail angels" who support them (see Schwab, Goldenberg, and Dustin 2019), constitute an especially promising category of budding environmental advocates.

The overarching question for wilderness planners, policy makers, and managers is whether they

Figure 3 – "Recreating together builds community support for wilderness preservation." Photo courtesy of Jeff Rose.

should base their decision-making on long-accepted "inviolate" principles that equate primitiveness and solitude with solitary Muir-like saunters in nature, or whether they should amend those principles to accommodate an increasingly diverse population of wildland recreation enthusiasts (Dustin, Beck, and Rose 2018). We believe today's managers of recreational wildlands should be tolerant of diverse forms of expression. "Different is not necessarily better or worse than the customary or traditional. It simply may be different, and when that is the case, difference should be treated with deference" (Dustin, McAvoy, and Rankin 1991, p. 26). While increasingly diverse numbers of wildland enthusiasts might tarnish the Romantic and Utilitarian Purists' images of the "right" way to experience nature, welcoming new members into the fold is preferable to excluding them, especially at a time when recreational wildlands need all the support they can get.

John Muir may have found his community in nature's flora and fauna, but increasing numbers of contemporary long-distance hikers are finding their community in each other. Purists may find this shift in focus disheartening, but if the enduring effect of either form of community building is a greater commitment to preserving and protecting nature, then the type of community building may not matter that much.

Conclusion

John Muir may have found his community in nature's flora and fauna, but increasing numbers of contemporary long-distance hikers are finding their community in each other. Purists may find this shift in focus disheartening, but if the enduring effect of either form of community building is a greater commitment to preserving and protecting nature, then the type of community building may not matter that much. In this regard, when Colin Fletcher (1968), "the man who walked through time," reflected ruefully on his solo trek through the Grand Canyon back in the 1960s with "the woods are overrun, and sons of bitches like me are half the problem," he might just as well have added, "and half the solution." ijw

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Rafter on Lake Malbena, near Halls Island. **Photo credit** © Loic Auderset.

Wilderness Tourism:
A Cautionary Tale from the Tasmanian Highlands

by GRANT DIXON

Grant Dixon

The word "wilderness" is generally associated with extensive areas of land that remain in a largely natural and undeveloped condition, but, beyond this broad consensus, there is currently no general agreement on a how wilderness should be defined (Hawes et al. 2018). After considering the range of definitions and issues, Hawes et al. (2018) propose it can be succinctly described as land that is natural, remote, and primitive (i.e., largely free of evidence of modern technological society).

Following the emergence of wilderness as a major focus of conservation debate in Australia during the 1960s, wilderness conservation became a significant motive behind the expansion of the reserve system (Mendel 2002). Tasmania, Australia's island state, suffered a major loss of wilderness during the 20th century, despite a major increase in the area of national parks and reserves (Mendel 2002). Most of this loss related to hydroelectric development or extractive industries such as forestry and mining.

Nature-based tourism has often been promoted as assisting conservation outcomes or as a mechanism to achieve them, but tourism enterprises and wilderness are, at best, uneasy companions (Wolf et al. 2019; Kirkpatrick 2019). "Scenery mining," as Kirkpatrick (2019) has characterized the style of modern tourism, has now emerged as a significant current threat.

A proposal for a helicopter-based luxury tourism develop-

ment in a remote part of the Tasmanian Wilderness World Heritage Area (TWWHA) attracted widespread public opposition, particularly from wilderness enthusiasts and recreational users of the area. The controversy highlighted a range of issues relating to wilderness protection and management, including concerns about the lack of transparency in the development-proposal assessment process; the impacts of such developments on the area's primitive and remote character; the risk of ongoing, incremental loss of wilderness values; the commercialisation of public assets; and access equity issues.

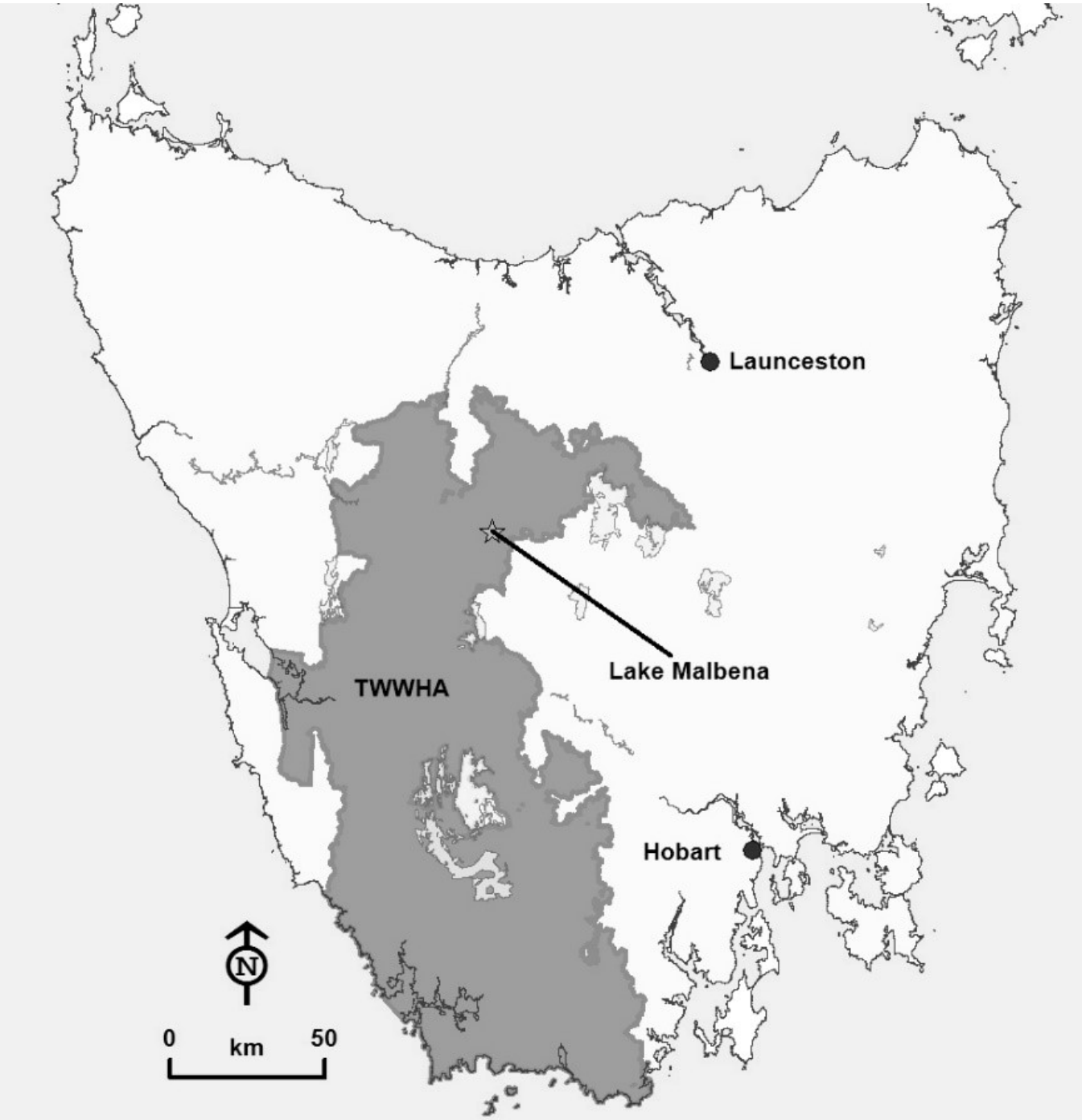

Figure 1 – Australian state of Tasmania showing the Tasmanian Wilderness World Heritage Area and the location of Lake Malbena.

Tasmanian Wilderness World Heritage Area (TWWHA)

The TWWHA encompasses nearly 1.6 million hectares (almost 4 acres) of mountainous, largely natural country in Tasmania (Figure 1) and includes extensive areas of temperate wilderness. The reservation and creation of the TWWHA has largely come as a result of more than four decades of environmental advocacy beginning in the 1970s, and "wilderness" has been at the heart of these campaigns.

The attribute of wilderness has been recognized as part of the Outstanding Universal Value (OUV) of the TWWHA since its inscription on the World Heritage List (Law and Bayley 2018). Its 1981 nomination described it as "one of the last remaining temperate wilderness areas in the world" (Australia 1981). The 1989 proposal for extension noted "it is this wilderness quality which underpins the success of the area in meeting all four criteria as a natural property and which is the foundation for the maintenance of the integrity of both the natural and cultural values which are displayed" (Australia 1989). Evaluations by the International Union of Conservation for Nature (IUCN) affirmed the importance of wilderness (IUCN 1982, 1989). The World Heritage Committee has implicitly recognized the importance of wilderness to the character of the property by approving its name – the "Tasmanian Wilderness" (Law and Bayley 2018). The 2016 TWWHA Management Plan (DPIPWE 2016) appears to concur, describing wilderness as "fundamental to the integrity of the TWWHA."

Law and Bayley (2018) note the World Heritage Committee has expressed concern about how wilderness is to be maintained within the Tasmanian Wilderness property. In 2015, it called for "recognition of the wilderness character of the property as one of its key values and as being fundamental for its management" and asked Australia to establish "strict criteria for new tourism development within the property which would be in line with the primary goal of protecting the property's OUV, including its wilderness character and cultural attributes" (UNESCO 2015).

Statutory Responsibilities

The TWWHA is composed of several national parks and other reserved lands. Most Australian "national parks" are established and managed under state (provincial) legislation. In Tasmania, this comprises the National Parks and Reserves Management Act (2002). Schedule 1 of this act lists the objectives for the management of national parks, including "to preserve the natural, primitive and remote character of wilderness areas."

The Environment Protection and Biodiversity Conservation (EPBC) Act (1999) forms the basis of Australia's national commitment to manage and protect World Heritage properties. It identifies World Heritage as a trigger for active involvement by the Australian government in the treatment of sites that would otherwise be managed exclusively by states such as Tasmania (Law and Bayley 2018). In addition, under the Tasmanian Land Use Planning and Approvals Act (1993), local government (councils) can have a role in approving particular development proposals in the context of their respective Planning Schemes.

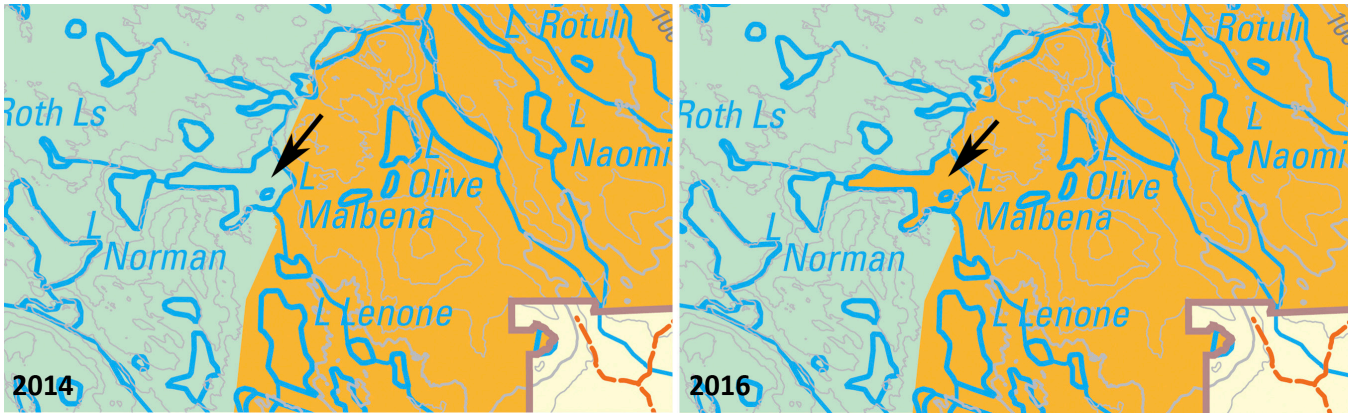

Figure 2 – Change in management zoning in vicinity of Lake Malbena, indicated by arrow; 1999–2016 (left) vs. final 2016 TWWHA Management Plan (right). Green = Wilderness zone, orange = Self-Reliant Recreation zone, yellow = private land outside the TWWHA. Halls Island is the prominent island in the southeast corner of Lake Malbena, (arrowed). Field of view is approximately 15 kilometers (9.3 miles) wide.

2016 TWWHA Management Plan

The TWWHA Management Plan is the primary guiding document for the region's management, and, as a statutory plan, the Tasmania Parks and Wildlife Service (PWS) is required to manage the areas concerned in accord with it. The Management Plan was formally reviewed from 2014 to 2016. The 2014 draft plan embodied a major political policy-driven downgrading of both the concept and management of wilderness. This attracted more than 7,000 critical public submissions, and "wilderness" was partly reinstated in the 2016 final plan.

Compared to its 1999 predecessor (PWS 1999), the provisions for the protection of wilderness in the 2016 Management Plan (Department of Primary Industries, Parks, Water and Environment [DPIPWE] 2016) have clearly been weakened. The 2016 plan lacks a long-standing, overarching management objective to "maintain or enhance wilderness quality" (contained in the 1999 plan; PWS 1999). A Key Desired Outcome (KDO) that "wilderness is managed for the protection of the integrity and the natural and cultural values of the TWWHA and the quality of the recreational experience it provides" is articulated in the 2016 Management Plan (p. 175), but there are no stated actions or strategies to be employed to achieve the KDO.

In the 1999 Management Plan (PWS 1999), the Lake Malbena area was zoned "Wilderness," which effectively ruled out any possibility of development. However, it was changed to "Self-Reliant Recreation" in the 2016 plan, not just in the Lake Malbena area (Figure 2) but also two other localities. This allows the consideration of "standing camps" but not huts (cabins) and facilitates development at the site. Of note is the timing of this change, after completion of public consultation and the final Director's Report (which summarizes responses to said consultation). ENGOs (environmental nongovernmental organizations) believe the 2016 Management Plan was finalized with weakened protection provisions so that preexisting and subsequently proposed commercial tourism developments could be statutorily approved.

Nevertheless, some clauses remain in the 2016 plan that provide a basis on which

to argue for wilderness protection. For example, the plan allows for certain activities to be undertaken, but this does not mean they are automatically permitted. They are still subject to other approval processes. Also, the management objectives of national parks and other reserves from the National Parks and Reserves Management Act (Schedule 1) are reproduced in the 2016 Management Plan and hence form part of the statutory plan, and section 1.5 of the plan makes it clear that Schedule 1 of the act applies to all areas of national park in the TWWHA. Hence, the objective "to preserve the natural, primitive and remote character of wilderness areas" not only applies under, but is unequivocally embodied in, the 2016 TWWHA Management Plan.

Tourism Master Plan

A Tourism Master Plan (TMP) for the TWWHA was requested by the ICOMOS/IUCN Reactive Monitoring Mission following its 2015 visit (Jaeger and Sand 2015). The World Heritage Committee concurred, identifying new commercial tourism development as a threat to the World Heritage values, including the wilderness character, of the TWWHA and calling for "the development of the Tourism Master Plan in order to ensure a strategic approach to tourism development … in line with the primary goal of protecting its Outstanding Universal Value" (UNESCO 2018, p. 135).

The process to develop a TMP finally commenced in 2019, and a draft was released in March 2020 (DPIPWE 2020). The TMP has arguably been preempted by the aforementioned changes to the 2016 Management Plan – changes that weaken protection and provide for the statutory approval of proposed private commercial tourism developments, such as the Lake Malbena development, and the government's refusal to pause or review their Expressions of Interest (EOI) process while a TMP is prepared.

The EOI Process

Since 2014 the Tasmanian government has been inviting "Expressions of Interest (EOI) for Tourism Investment Opportunities" from private investors and tourism operators to "develop sensitive and appropriate tourism experiences and associated infrastructure" on reserved land across the state, with no clear requirement to comply with existing management plans. The documentation provided to proponents noted they were "not excluded from lodging an EOI Submission for a proposed development that is not fully compatible with the current statutory and regulatory framework, for consideration and assessment by the Minister" (DPIPWE 2014).

This process ran in parallel to the 2014–2016 process of reviewing the statutory TWWHA Management Plan. The assessment of EOIs was and is opaque, with a group making recommendations to the minister with no public scrutiny. Minister-sanctioned proposals were then forwarded to the PWS for further assessment and consideration for lease and licensing. But by this stage there is arguably a de facto expectation that projects will proceed.

Proposed Tourist Development at Lake Malbena

In response to the EOI invitation, a proposal was submitted in 2015 by Wild Drake Pty Ltd, a private commercial developer, for a helicopter-based luxury tourism development at Halls Island, in a remote part of the TWWHA. The proposal has drawn outrage from a wide range of people for a range of reasons, including the alienation of public land within a national park for the benefit of a private developer, but the most common theme is the impact of both the development itself and the associated helicopter access on the wilderness experience of existing users of the area (Tasmanian National Parks Association [TNPA] 2020).

Figure 3a – Aerial view of Halls Island and Lake Malbena, surrounded by high-quality wilderness within the Walls of Jerusalem National Park. Photo: Rob Blakers.

Figure 3b – The existing small hut (cabin) on Halls Island, built in the 1950s. Nearby is the site for the proposed luxury helicopter-accessed development. Photo: Grant Dixon.

The mostly forested, 10-hectare (25-acre) Halls Island is in Lake Malbena, on Tasmania's Central Plateau (Figure 3a). The area has high wilderness quality. It is remote; there are no formal walking tracks in the vicinity, and the easiest access route requires up to a day's cross-country walking from the nearest rough road. It is also primitive and undeveloped except for a rudimentary small hut (cabin) on the island, built privately in the 1950s (Figure 3b). When this hut was constructed, the island was Unallocated Crown Land, but it has subsequently become part of the Walls of Jerusalem National Park and was incorporated into the TWWHA in 1989. The area and old hut have been enjoyed and freely used by bushwalkers (hikers) and fly-fishers for more than 70 years.

The proposed development would involve the construction of four buildings and four auxiliary structures, on a site of total area 800m2 (8,611 ft2). The accommodation buildings may be small but are arguably huts given their rigid structure, and there can be no doubt that the main communal building qualifies as a hut. The Management Plan (DPIPWE 2016, p.76) states that "standing (commercial) camps only" are permitted in the Self-Reliant Recreation zone (see Figure 2) and that huts are prohibited. Equally controversial, access to the proposed development would be by helicopter, with maintenance and client needs requiring several hundred flights annually.

In October 2018 it was revealed that the Tasmanian government had secretly granted the proponent an exclusive lease and associated business license over Halls Island, effectively privatizing part of the TWWHA (Denholm 2018). The main lease and business license were signed in January 2018, several months before any of the three main assessment and approval processes (see below) were finished. It might be justifiable to "enter lease and license negotiations" (the official line) before assessments are completed, but actually issuing a lease and business license prior to finalization makes a mockery of undertaking any assessment. Furthermore, a business license is the main vehicle for PWS to apply conditions to the operation of said business, so to issue it prior to finalization of the assessment of the business's impacts is absurd.

The Approval Process

After the opaque EOI process assessment, the Lake Malbena proposal was invited by the minister to progress to lease and license negotiation with the Tasmania PWS in 2016. The development proposal required approval from all three tiers of government: state approval through the Parks and Wildlife Service's Reserve Activity Assessment (RAA), a decision from the federal government about whether approval was required under the EPBC Act, and a final Development Application (DA) to local government, the Central Highlands Council (CHC).

The RAA process is the environmental impact assessment system the PWS uses to assess whether activities proposed on reserved land could have an impact on reserve values (DPIPWE 2016, p. 81). The PWS carried out this in-house assessment devoid of public input or external expert advice and, in March 2018, issued a "draft final determination" to approve the Lake Malbena proposal

subject to conditions, pending the outcome of a referral for assessment under federal law (EPBC Act; see below).

The RAA was undertaken as a "level 3," which does not provide for public comment. The RAA process is not defined in law (only a PWS policy document) so there are no appeal rights and no possibility of legal challenge. The document only became available after it was leaked in June 2018. The inadequacy of the RAA was then apparent; in particular, the remarkably superficial treatment of wilderness. Through a range of vague and demonstrably incorrect considerations, the RAA concluded there would be a "low level" impact on wilderness. Despite this, the RAA was then relied upon for subsequent approval under the federal EPBC Act.

The Lake Malbena proposal was referred to the federal Minister for Environment and Energy for a decision as to whether it required his approval under the EPBC Act. On August 31, 2018, a delegate of the minister decided the Lake Malbena project was not a "controlled action" and therefore it did not require detailed assessment or an approval under the EPBC Act (Department of Energy and Environment 2018). This decision was made despite a submission from a state government statutory advisory body, the National Parks and Wildlife Advisory Council (NPWAC), and more than 900 other public submissions, opposing the proposal. The Tasmanian Aboriginal Heritage Council and Australian Heritage Council also opposed approval.

NPWAC stated: "The proponent does not appear to address the fundamental concern that the proposal is for a development with several buildings, not a 'standing camp.'" (The original intention of a "standing camp" was a temporary commercial bush camp, but the PWS "definition" has evolved over time to include structures that amount to huts (cabins) by any common sense definition. Indeed the proponent refers to them as "huts" at several places in the documentation of the proposal.)

NPWAC also stated: "[Re. helicopter access], NPWAC is concerned that without adequate consideration, precedents will be set that will degrade the World Heritage Values of the TWWHA…. NPWAC does not support this project progressing at this time and reiterates that contentious projects such as this should not be considered until there is an agreed framework to guide assessment."

When the CHC advertised the DA for the Lake Malbena proposal, it received 1,346 submissions; only 3 supported the proposal. The CHC was required to determine if, under the Central Highlands Interim Planning Scheme 2015, the Lake Malbena development was "in accordance" with the TWWHA Management Plan. On February 26, 2019, the CHC decided to refuse the DA. A common theme of comments by the mayor and councillors was the inadequacy of the RAA and the failure of process; the state and federal governments had shirked their responsibilities (TNPA 2020). The proponent, Wild Drake Pty Ltd, appealed the CHC's decision to refuse a permit to the Tasmanian Resource Management and Planning Appeals Tribunal (RMPAT).

Legal Challenges

The (Australian) Wilderness Society (TWS) sought a judicial review of the decision that the Lake Malbena development is "not a controlled action" under the federal EPBC Act. The merit of a decision cannot be challenged under judicial review; only the process by which a decision is made is open to review. TWS's case questioned whether a legal error was made in concluding that no further assessment was required, and in not imposing any conditions to ensure significant impacts on wilderness values were avoided (TWS 2019).

The judgement (Federal Court of Australia 2019), handed down on November 12, 2019, did not provide for the total reassessment of the Halls Island proposal that was hoped for. It ordered the approval notice for development be set aside, to be reissued with enforceable conditions negotiated between the federal government and TWS. At the time of writing, this is pending. The judgment also contained strong criticism of the "de facto assessment process conducted by the [Tasmanian] Department [PWS], in negotiation with a proponent and out of public view."

Two ENGOs, the TNPA and TWS (Tasmania), and two individuals made the expensive commitment of joining the RMPAT appeal to defend the CHC's decision to refuse Wild Drake Pty Ltd a development permit. The case, involving many expert witnesses, was heard over seven days in June and August 2019. One of the major issues under consideration during the appeal was the proposal's impact on wilderness; specifically, compliance with the relevant requirements of the 2016 TWWHA Management Plan (TNPA 2020).

The RMPAT released their disappointing final decision on December 18, 2019 (RMPAT 2019). The tribunal decided all that was required was for a Management Plan to exist and that an RAA had been completed by the PWS up to stage seven. This means that the tribunal did not believe it needed to assess compliance with the Management Plan, specifically the impacts on wilderness, and instead deferred to the RAA process entirely. This narrow view means wilderness impacts would not be considered by an independent body. French (2018) noted, "The decision was entirely legalistic, and in no way endorsed the specifics of the development."

In January 2020, TWS, TNPA, and others filed an appeal to the Supreme Court of Tasmania against the RMPAT decision to grant a permit to Wild Drake Pty Ltd. They challenged the tribunal's ruling that it could rely on the RAA to determine whether the Lake Malbena proposal is in accordance with the 2016 Management Plan, and that RMPAT should not have relied on the RAA decision because that decision was also defective. The court's decision was handed down on July 13, 2020 (Supreme Court of Tasmania 2020), with neither of the grounds of appeal successful. This decision was disappointing not only for the future of Halls Island but also because it did not fully explain the court's reasoning court and hence it is of limited use in clarifying the process for assessing future development proposals on reserved land. The court's findings related only to this legal point, not the merits of the proposal itself.

The parties decided to challenge this deci-

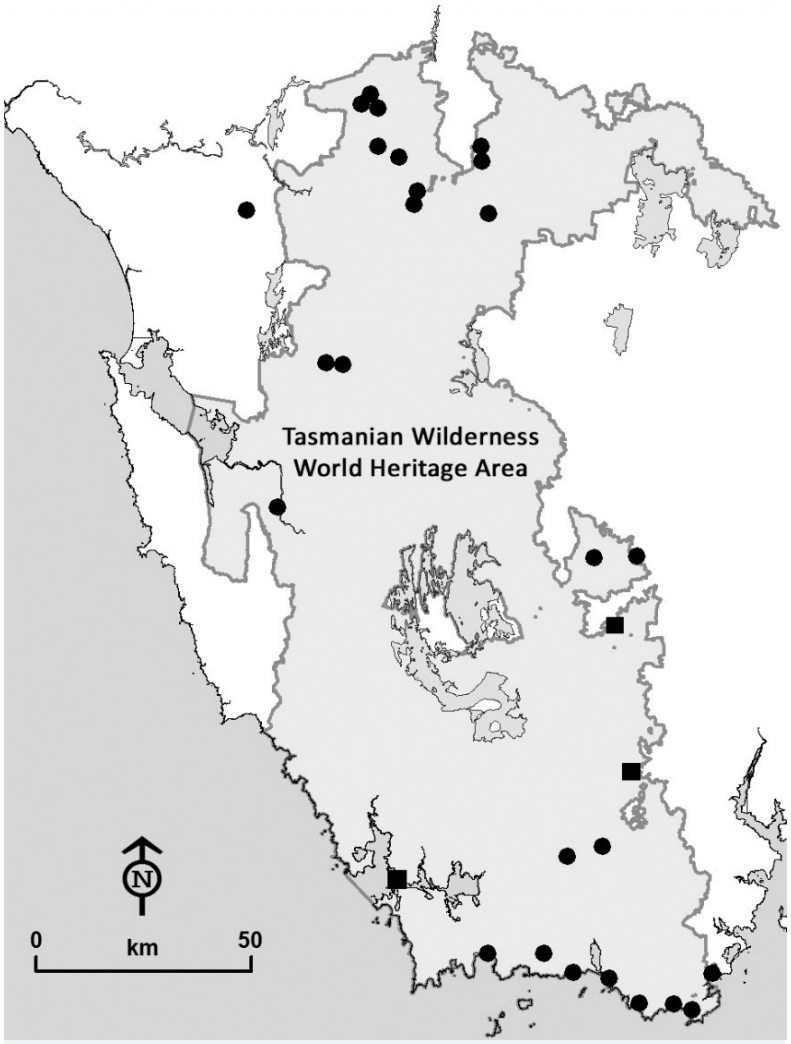

Figure 4 – Extant proposals for tourist accommodation and other development across the TWWHA. Black squares indicate proposals that were operational by early 2020.

sion and filed an appeal to the Full Court on July 27, 2020, arguing that the Supreme Court made several legal errors in reaching its decision. At the time of writing, the outcome of this appeal was still pending. If the appeal is upheld, it is hoped the Full Court will order that the RMPAT decision be set aside, and that the tribunal make a fresh decision in consideration of the extensive evidence relating to the merits of the proposal, including its adverse impacts on wilderness.

Discussion

The Lake Malbena proposal is the first of many proposed new private commercial developments for the TWWHA (Figure 4) to reach the final stage of approvals, and the first test of a weakened statutory management plan, so-called criteria for assessment of new commercial tourism developments and the ability of federal environment law to protect World Heritage properties and values such as wilderness (TWS 2019). Given the supposed success of the Tasmanian government's policy of "unlocking our national parks," often quoted by other Australian state governments seeking to follow suit, the outcome may set a national precedent. Meanwhile,

while the Lake Malbena issue has been playing out, since 2014, the number of commercial leases over reserved land issued by the Tasmanian government has more than doubled, and commercial licenses to operate on or use public land have increased even more dramatically (Baker 2020).

Impacts of the Lake Malbena Development

The nature and quality of the self-reliant recreational experience provided by the Lake Malbena area will clearly be negatively impacted by the loss of primitiveness associated with the proposed development. The extent of public opposition to the proposal and media rhetoric around it demonstrate that the developer has no "social license" to proceed. The effective privatization of an entire island within a World Heritage national park, especially as it was done prior to the finalization of any development approvals, clearly riles many. And the "equity of access" argument articulated by the developer hardly applies when one is talking about exclusive helicopter access to a luxury camp.

The luxury huts and associated buildings on Halls Island and a new point of commercial helicopter access will degrade wilderness values and impact on the experience of existing users of the region. It will substantially compromise the remoteness and isolation of the Lake Malbena area, its condition as a "largely unmodified natural setting," and therefore the protection of the integrity and natural and cultural values of the TWWHA, and (as noted above) the opportunities that it provides for a challenging and self-reliant recreational experience.

The Lake Malbena area is mapped as high-value wilderness in the TWWHA Management Plan (DPIPWE 2016 p.176); despite this, the RAA for the proposed development only superficially addressed wilderness impacts. Hence, The Wilderness Society commissioned an independent desktop study of the impact on WC of the proposed Halls Island development (Hawes 2018) for campaigning purposes, using the same mapping technique utilized by the Tasmanian government's previous wilderness assessments of the TWWHA (Hawes et al. 2015; DPIPWE 2016, p. 176).

Hawes (2018) demonstrates that the introduction of private, commercial helicopter access to Lake Malbena would degrade the WC of the surrounding areas. The fact that the development would be located outside the Wilderness zone would not prevent it from negatively impacting WC in the area. Losses would occur both inside and outside the Wilderness zone and the Walls of Jerusalem National Park. Indeed, the heaviest losses would occur inside the Wilderness zone (Figure 5). This loss is due to the reduction in access-time remoteness associated with allowing commercial helicopter access to the lake.

The established WC mapping technique is incapable of distinguishing the impact of the existing rudimentary hut (cabin) at Lake Malbena from that of the proposed new huts and associated infrastructure. But a more refined WC mapping technique (Hawes et al. 2018) would undoubtedly show the proposed new structures would have a significant additional negative impact.

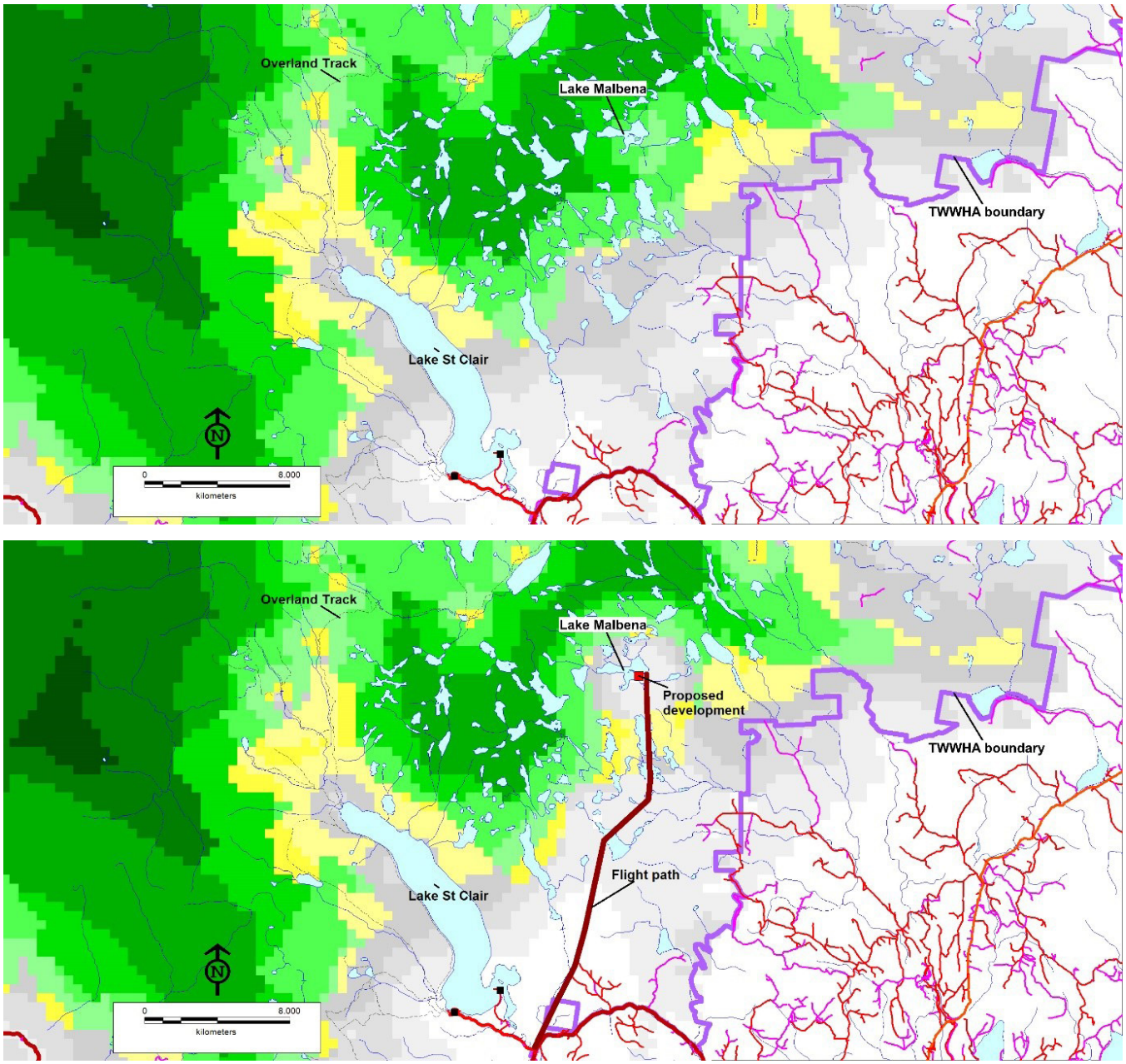

Figure 5a&b – Wilderness Character (WC) mapping of the Lake Malbena region showing (a) the current situation (top), and (b) modeling the impact of the proposed tourist development and helicopter access (bottom) (from Hawes 2018). Darker green WC categories indicate higher quality wilderness.

Plans and Process

The 2016 TWWHA Management Plan (DPIPWE 2016) was finalized with "additional assessment criteria" for commercial tourism development. The criteria do not set thresholds or standards that new commercial tourism developments must meet. Instead, they simply dictate that a RAA must "consider" or "identify" certain things, offering no requirement that values will be protected. The Lake Malbena proposal is the first real test of these criteria and highlights their inadequacies.

The effectiveness of the plan's wilderness protection provisions (or lack thereof) have also been found wanting. The 2016 plan lacks an up-front objective regarding wilderness management, although it does incorporate Schedule 1 of the National Parks and Reserves Management Act and so the objective "to preserve the natural, primitive and remote character of wilderness areas" is embodied in the Management Plan, albeit well-hidden.

The Management Plan (DPIWE 2016) contains entrenched confusion between the Wilderness zone, a management designation, and Wilderness Value (WV), the metric measuring wilderness quality or character (Hawes et al. 2015), and contains the implication that zoning is the main mechanism for protecting wilderness (Hawes et al. 2015, p. 177). Specifically, the plan asserts that Wilderness Value was used in the delineation of the Wilderness zone boundaries, despite poor spatial correlation between the Wilderness zone and areas of high Wilderness Value. Hence the plan obscures the reality that the impacts on Wilderness Value by development proposals can only be assessed by modeling them directly, and that Wilderness Value cannot necessarily be protected by management prescriptions based on zoning. Despite the fact that the infrastructure and access point associated with the proposed Lake Malbena development will be located outside the Wilderness zone boundary, Hawes's (2108) analysis has demonstrated the development will have an adverse impact on Wilderness Value (or Wilderness Character, WC, as he terms it) and the uses that the Wilderness zone is intended to protect.

Effective assessment of impacts on primitive and wild character – for individual development proposals and to monitor incremental erosion of Wilderness Character over time – are crucial.

The Management Plan (DPIPWE 2016, p. 34) acknowledges the TWWHA is at risk of "cumulative impact over time," and this is particularly relevant to its wilderness. Managers might reason that a particular development was acceptable because it only caused a small loss of WC, but a succession of such developments over time could cause a substantial loss of WC, and hence of the essential values for which the region was listed as World Heritage. Effective assessment of impacts on primitive and wild character – for individual development proposals and to monitor incremental erosion of Wilderness Character over time – are crucial. The plan contains no undertaking to model or monitor such incremental changes, let alone prevent them.

There is a clear lack of independence and transparency in the RAA process. PWS is an agency within a department of the Tasmanian government, and the RAA is nonstatutory, meaning it cannot be legally challenged by a third party. It does not guarantee community scrutiny or consultation, and in the case of the Lake Malbena RAA, the process was not opened for public input.

Under legislation currently being implemented, all development on public land in Tasmania will be assessed under a new Statewide Planning Scheme, and solely via the RAA process. At a minimum, developments on reserved land should be subject to a process that allows for public consultation on compliance with a Management Plan, and that this compliance must be able to be tested in an appeal to RMPAT.

The application of the EPBC Act and other legislative protections appears to depend on the attitude of the federal minister at the time. It is not a reliable means of protecting World Heritage properties in Australia and cannot be relied upon to ensure the protection of Outstanding Universal Values. The events concerning the proposed development at Lake Malbena have shown how inadequate the EPBC Act is when administered by a government that favors development over protection.

Law and Bayley (2018) list a range of bad precedents set by the events described herein:

- *Governments abused due process by changing the Management Plan after the public-comment period in order to accommodate the proposed development.*
- *The Tasmanian government carried out a flawed assessment by deliberately excluding public input and expert opinion.*
- *No meaningful evaluation of the proposal's impact on wilderness was undertaken.*
- *The federal government ignored advice from its own experts, as well as the overwhelming number of public submissions.*
- *The decision by the federal minister to approve the Lake Malbena development debased the EPBC Act.*
- *Both commonwealth and state governments actions have preempted the Tourism Master Plan long promised to the World Heritage Committee.*
- *Both governments have ignored commitments to protect wilderness.*

Furthermore, the Tasmanian government issued a lease over public land and a license for a business to operate there prior to completion of any assessment of the impact of said business.

Law and Bayley (2018) further argue that, if ultimately approved, the moves by the governments prompt fears of additional impacts occurring through further stealthy incremental changes to the development. Such potential includes motorized watercraft on Lake Malbena, proliferating buildings, additional helicopter visits, new tracks, and motorized visits to lakes further afield.

Apart from the potential losses to wilderness, perhaps the biggest loss since 2015 is to the reputation of Tasmanian Parks and Wildlife Service. This agency, entrusted with the conservation management of the TWWHA and Tasmania's other reserves, had a reputation for professionalism and integrity throughout the decades of conservation campaigns leading to the creation of today's TWWHA, but it has now come to be seen as merely facilitating commercial development.

Conclusion

This is not just the story of a lake in the Tasmanian Highlands, a tranquil spot largely free of evidence of modern technological society that has been enjoyed by generations of recreational visitors. It exemplifies a government policy attitude whereby everything (including nature) is seen as merely an economic asset, a failure of process verging on the corrupt, and the sidelining or ignoring of traditional stakeholders' values. It is unfortunately also merely the latest salvo in decades of battles over nature conservation and wilderness in Tasmania.

The Lake Malbena proposal and approval process has raised the ire of broad range of interest groups and stakeholders. This is clear from the number of opposing submissions to the various approval stages (where submissions have been permitted), as well as the financial support offered to ENGOs to fund the various legal challenges. Opponents include recreational users (both hikers and fly-fishers) as well as members of academia and the Aboriginal community. The campaign moniker, "Reclaim Malbena," illustrates the core concern of many of these stakeholders. But the issue must also be seen in the context of broader and growing public concern related to questions of over-tourism, "scenery mining" and "place piracy," and the commercialisation of public resources, as well as increasing public awareness of the need for environmental protection.

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Since the text of this article was finalized, there have been some further developments in the legal challenges described on page 110.

In response to the Federal Court judgment handed down in November 2019, the federal Environment Minister has "remade" an earlier decision and determined the proposed development at Lake Malbena to be a "controlled action", requiring a more thorough assessment under national environmental legislation (the EPBC Act). This is still pending. But, in her detailed Statement of Reasons, released in November 2020, the Minister "found that the impact on the world heritage values of the TWWHA from the use of helicopters is likely to be significant." It is also encouraging that she accepted that wilderness-impact assessments "provide a useful demonstration of the possible extent of the impacts on exceptional natural beauty associated with the relatively undisturbed nature of the property, and the scale of the undisturbed landscapes". These findings have much wider implications than for the Malbena issue alone, and they give additional weight to the credibility and utility of the wilderness-assessment process.

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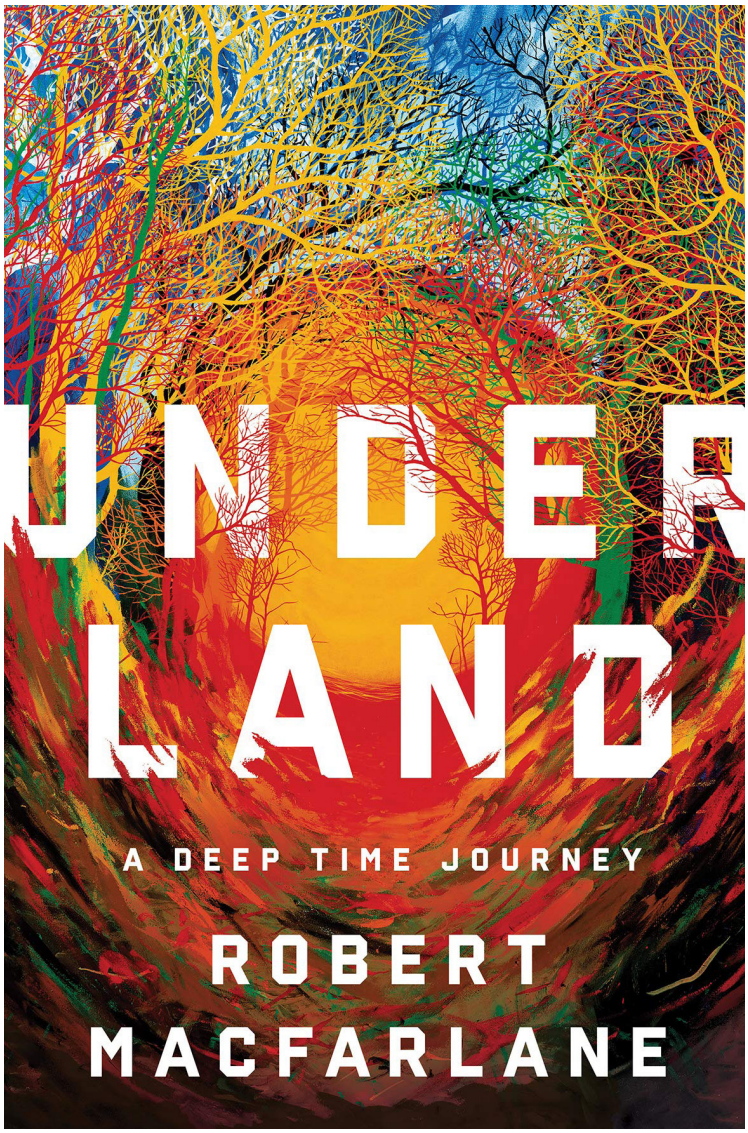
Great Sand Dunes National Park, Denver, United States **Photo credit** © Josh Gordon

Book Review:

Patrick Kelly, Media And Book Review Editor

UNDERLAND: A DEEP TIME JOURNEY

Robert Macfarlane. 2019. W. W. Norton & Company. 496 pp, $20.99 (hc).



In his most recent book, Underland: A Deep Time Journey, British writer Robert MacFarlane ventures into the unseen worlds that exist beneath our feet, weaving claustrophobic narratives while exploring mines, ancient burial chambers, the catacombs under Paris, cenotes, and other subterranean structures, both natural and human-made. While many books explore the impact of civilization on the Earth's surface, sky, and sea, MacFarlane shows us that even the strongest and most hidden components of our planet are not immutable under the ever-increasing pressure of anthropogenic habitat engineering. Through a series of distinct sections, each describing an adventure into remote and cavernous environments ranging from the belly of glaciers to dark matter research labs, MacFarlane explores the themes of entrapment and collapse that are inherent to the narrative, manifesting in the physical but also the introspective. MacFarlane's ideas are as engaging as the adventures, all of it existing in a whirling narrative that pushes the reader through more than 400 pages, poetically rendered and utterly engaging from beginning to end.

As we travel with MacFarlane, perhaps as important as the wild subterranean worlds is the rollicking cast of characters, each with a personality that dances from the pages through quirky and engaging conversations, often amid precarious and even life-threatening situations. The spirit of humanity's intellectual and physical exploration serves to counter the somber reality of our ecological moment as characterized through MacFarlane's prose. The characters each present their unique takes on life – how to best exist in a world that every day feels more claustrophobic due to an ill-fated trajectory toward ecological instability. Despite this, the characters are life-affirming in ways that only those who spend their lives underground could be, as their psychology has been shaped by darkness and inescapable modes of being. And they could not be more affable.

MacFarlane explores the unseen, contemplating vastness as it exists in both space and time. He deftly weaves history, humanities, and sciences, shuffling and crawling through subterranean worlds. The book has the feel of a time-lapse scene put to paper. While it is an exploration of history, geology, and archaeology, it is also a series of well-documented adventures through environments into which few have gone – rich in both detail and excitement. Inside underground geological structures that range from frozen and wet to rocky and dry, MacFarlane meditates on time moving forward through stories told by stone and ice.

At times it feels almost too alien, MacFarlane's adventures too remote. It is inherently difficult to conceptualize themes of deep time and the Anthropocene. In the era of climate change and ecocide, to capture the true scope of ecological loss through the written word is a great challenge. Still, the language of the book is nearly flawless, and the themes come through clearly. Underland ends with a portrait of ravaged subterranean landscapes filled with radioactive waste, reminding us that although the byproducts of civilization can be put into an unseen place, the planet still holds onto them, absorbing the presence of humanity for centuries to come. IJW

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