



A Research Strategy for Enhancing Sustainable Recreation and Tourism on Public Lands



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Cover (clockwise from upper left): Snowmobiling on the Mount Hood National Forest, Oregon; photo by USDA Forest Service; backpackers in the Eagle Cap Wilderness, Oregon; photo by Keith Routman; children hiking on the Gifford Pinchot National Forest, Washington; photo by Jason Blake; campers at the John Day Wild and Scenic River, Oregon; photo by Greg Shine.

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Igniting the Science of Outdoor Recreation (ISOR) Working Group

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About the ISOR Initiative

The “Igniting the Science of Outdoor Recreation” (ISOR) initiative, led by the U.S. Forest Service, is composed of federal and state agencies, universities, nongovernmental organizations, and industry groups. ISOR participants seek to generate new energy, focus, and working relationships, resulting in interdisciplinary research that addresses pressing recreation planning, land management, and community development challenges. This effort is committed to upholding principles of sustainability in the provision of recreation and tourism programs and services. The ISOR team welcomes new ways to work across agencies and in productive partnerships to support recreation and tourism that benefits the environment, creates jobs, improves communities, enhances culture and human health, and is supported by effective governance.

Abstract

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Recreation and tourism on public lands benefit visitors through improved health, enjoyable experiences, and enrichment from our natural and cultural heritage. Public land managers play a critical role by providing opportunities for high-quality outdoor experiences while protecting ecosystems, recognizing cultural and historical connections, sustaining local economies, and promoting resilient communities. The challenge of stewarding public lands and meeting increasing public demands in an era of decreasing fiscal resources, conflicting public values, and significant environmental changes has overwhelmed our existing recreation management model. Public land management agencies can benefit from consideration of the entire social-ecological system, stepping outside the public land boundary to create a resilient socioecological community. Such work can be guided by research, data, and science-based tools and planning frameworks that have been tested in the field. As demographics, technologies, and consumer preferences shift, there is a need for relevant and timely information and forward-thinking research to help managers anticipate change and manage sustainable visitor use across public lands.

In 2018, a collaborative initiative called Igniting the Science of Outdoor Recreation (ISOR) convened researchers, managers, industry leaders, and other practitioners across multiple agencies and sectors to discuss management concerns and identify research needs for the management of outdoor recreation and tourism on public lands. This national research strategy for outdoor recreation and tourism, focusing on public lands, is a product of ISOR's work. The strategy serves as an organizing and synthesizing document and is the first step toward a reinvigorated national recreation and tourism research program for public lands. Its aim is to shape future scientific inquiry related to outdoor recreation and tourism and to create a robust, relevant, and timely body of information and tools to inform the work of public land managers. This report outlines the vision, objectives, and scope of the research strategy and presents eight research focus areas and three implementation strategies to guide future research. These proposals by government and academic researchers, public land managers, nonprofit organizations, private industry groups, outdoor recreation user groups, and other strategic partnerships were designed to leverage collective knowledge, resources, and energies around sustainable approaches to managing recreation and tourism on public lands.

Keywords: Recreation, tourism, sustainability, public land management, applied research.

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Executive Summary

Our nation's vast system of public lands and waters—its forests, parks, grasslands, monuments, rivers, lakes, seashores, and refuges—are important destinations for outdoor recreation and tourism. Public lands and waters provide recreation opportunities across the urban to wildland gradient, benefiting visitors through improved health, enjoyable experiences, and enrichment by our rich natural and cultural heritage. Visitation to public lands generates employment opportunities for tourism providers and brings vitality to gateway communities. Public land managers play an important role by providing opportunities for high-quality outdoor experiences while protecting important ecosystems. Our land management agencies are guided by well-trained professionals who use planning frameworks and tools developed by scientists and tested in the field. Yet, demographics, technologies, and consumer preferences are constantly shifting, putting many managers in a position of reacting to, rather than anticipating, changing visitor use patterns. Recreation and tourism research has lagged in the past few decades, and management applications have not fully incorporated new technologies and data science advances that make it possible to learn and understand more about potential, current, and future visitors and their destinations, routes, activities, and effects on natural resources. To help improve the stewardship of public lands worldwide, we are proposing a much-needed research strategy that will shape the future direction of scientific inquiry related to outdoor recreation and tourism by creating a robust, relevant, and timely body of information and tools to inform the work of public land managers. This report presents that strategy.

In 2017, a multiagency working group of researchers, managers, industry leaders, and partners embarked upon an initiative known as “Igniting the Science of Outdoor Recreation” (ISOR) to identify and develop research directions that address management needs. As part of a 26-month-long process, we conducted an online survey of U.S. and international recreation and tourism professionals and researchers and hosted a 3-day workshop attended by 88 recreation and tourism researchers, practitioners, and policymakers from across the United States. Following the workshop, participants volunteered to serve as writers and reviewers for the ISOR research strategy described in this report.

This strategy is the first step toward a reinvigorated national recreation and tourism research program for public lands, and this report serves as an organizing and synthesizing document. Our intent is to expand our collective capacity and refine our focus for public lands recreation and tourism research and management. We seek to integrate scientific knowledge with policymaking and management action to guide sustainable outdoor recreation practice on public lands. We aim to synthesize management needs and suggest research and development roles in

addressing these needs. Through this work, we direct attention to promising interdisciplinary partnerships for knowledge co-production, and encourage researchers to identify high-impact applied research projects.

Research Focus Areas

The ISOR team developed eight research focus areas (RFAs) that guide future research directions for outdoor recreation and tourism on public lands.

RFA 1: Integrating outdoor recreation planning into a social-ecological planning framework—

Outdoor recreation is central to the missions of many land management agencies yet it is often left out of planning and management processes. Research is needed to identify opportunities for better integration within social-ecological frameworks and to develop new tools and approaches.



Jason Blake

Family fun on the Gifford Pinchot National Forest, Washington.

RFA 2: Examining recreation-ecosystem interactions at multiple scales—

Outdoor recreationists are part of public land ecosystems. A deeper understanding is needed of their interactions with the environment at multiple spatial and temporal scales in the context of broad environmental change.

RFA 3: Assessing new drivers and characteristics of demand for outdoor experiences—

Understanding factors that influence people to visit and value public lands is essential to their long-term management. Research is needed to improve our understanding of demographic, socioeconomic, technological, and other visitation drivers, and our ability to create responsive management practices.

RFA 4: Measuring, monitoring, and forecasting visitor use—

The availability of up-to-date, accurate visitation data allows resource managers to predict, plan, and compare visitation across jurisdictions. Research and the development of science-based models, technologies, and approaches is needed to better quantify, predict, and analyze public lands visitation over time and space.

RFA 5: Exploring connections among people, nature, and public lands—

Institutional, cultural, economic, geographic, and physical barriers may prevent or limit people from connecting to natural environments. New approaches are needed to expand opportunities for human interactions with natural and cultural heritage and to equitably share ecosystem benefits with people of all backgrounds.

RFA 6: Integrating culture and place into land management and outdoor recreation experiences—

Connections to place and biocultural heritage are integral components of people's relationships to public lands. Research is needed to develop and test methods that understand connections to place—past, present, and future—and integrate these connections with land use planning and management.

RFA 7: Investigating the health and well-being benefits of outdoor experiences—

Outdoor experiences on public lands provide a wide range of health benefits to many, but these benefits are not accessible to all. Research is needed to examine and measure the health benefits of outdoor experiences to inform the development and management of health-promoting and equitable recreation programs, facilities, and resources.

RFA 8: Understanding tourism economies and systems for public lands planning—

Public land management influences the number, characteristics, and interests of visitors, yet is often not coordinated with broader tourism systems. Research is needed on processes for landscape and destination management that consider tourism

sector actors and delivery systems and that account for the sociocultural, economic, and environmental impacts of public lands visitation.

These eight RFAs reveal inherent tensions in public lands recreation and tourism. Themes explored in this report include the need for more interdisciplinary interactions among researchers and managers; more consideration and coordination of scales, contexts, and systems in planning; and a more inclusive concept of recreation that reflects the many ways that humans connect with natural environments.

Scientists, managers, and partners are part of a continual process of learning and discovery. Co-production of knowledge refers to the contribution of multiple knowledge sources and capacities from various stakeholders and partners with the goal of co-creating knowledge to inform decisions. Harnessing diverse knowledge forms within the process of discovery and learning enhances our collective capacity to develop shared understanding and to make informed decisions. Three implementation strategies aim to enhance knowledge of co-production efforts:

- **Implementation strategy 1:** Transform agency culture in land management to enhance sustainable recreation.
- **Implementation strategy 2:** Establish new structures and processes for recreation science co-production and exchange.
- **Implementation strategy 3:** Establish partnerships across organizational jurisdictions, economic sectors, and disciplinary silos.

The ISOR Research Strategy recommends an unprecedented coordination of government and academic researchers, public land managers, nonprofit organizations, private industry groups, outdoor recreation user groups, and other strategic partners to leverage our collective knowledge, resources, and energies around sustainable approaches to managing recreation and tourism on public lands. The strategy calls for reinvestment in research and development for outdoor recreation and tourism; stronger bonds among scientists, managers, and practitioners; and new working relationships that allow us to co-produce knowledge and generate information of immediate use to land managers and practitioners. We seek to stimulate new knowledge and information by encouraging researcher-manager teams to develop new tools, frameworks, and approaches that encourage sustainable practices and model innovative approaches in pilot projects across land ownerships. The strategy challenges employees across agencies, organizations, and industry to embrace a fundamentally different way of working together to sustain local economies, support ecosystem health, and promote social equity. Collaboration is critical to achieving our mutual goals. Through thoughtful and informed planning at multiple spatial and temporal scales, outdoor opportunities can be extended to more people and can include an increasing diversity of settings, activities, and experiences while protecting natural and cultural resources.

Introduction

Our nation's vast system of public lands and waters—its forests, parks, grasslands, monuments, rivers, lakes, seashores, and refuges—are important destinations for outdoor recreation and tourism. Sustaining the relevancy of public lands can be challenging amidst shifting social values and national priorities. Making outdoor recreation and tourism sustainable is not simply about providing opportunities; it also requires an understanding of the social, economic, and ecological effects of recreation and tourism; the managerial capacity to sustain tourism opportunities; and the conservation of landscapes on which natural-resource-based recreation and tourism depend. Decisions of what activities and uses to sustain, where these activities should occur, and whose values should be prioritized (e.g., bear hunting or bear viewing), all require an assessment of difficult tradeoffs and value judgments by land managers. Managers benefit from access to consistent and reliable data to help evaluate their options and inform decisions. However, research support for recreation decisionmaking has diminished in recent decades.

Visitation to public lands is expected to rise as the U.S. population continues to grow. We can also expect more variety in the ways that people will seek outdoor experiences as the population becomes more ethnically diverse and as international tourism to the United States grows. This suggests the need for new management approaches for changing visitor needs and interests. Furthermore, national initiatives launched by public land management agencies aim to connect a wider variety of people with the outdoors and create a more equitable distribution in the benefits of outdoor experiences. Meanwhile, some managers struggle to meet the new demands of changing recreation preferences and resource uses that are tied to new technologies, urbanization, and other societal trends.

New data sources and innovative analytic techniques have the potential to enhance our understanding of outdoor recreation use, ecosystem benefits, economic impacts, and social values. Corporate databases, social media and crowdsourced data, geospatial mapping, and programs that help analyze public perceptions are more accessible and can be tailored for agency use. These emerging technologies could revolutionize how agencies count visitors, estimate economic value, understand motivations and outcomes of visitor experiences, and address conflicts. We need research that serves as a catalyst for change and that informs the creation of new and updated conceptual frameworks, methods, and management tools to guide agency decisionmakers as they grapple with the outdoor recreation management challenges of today and tomorrow.

Vision and Scope

This document is the product of extensive dialogue, analysis, and inquiry. Through it, we seek to expand our collective capacity and refine our focus for outdoor recreation and tourism research and management. We aspire to deepen our understanding of the complex social-ecological systems that support sustainable outdoor recreation and tourism management on public lands. In keeping with sustainability science traditions, we seek to integrate scientific knowledge with policymaking and management action to guide sustainable outdoor recreation practices on public lands. In the short term, our research strategy (1) synthesizes management needs and suggests research and development roles in addressing these needs; (2) suggests promising interdisciplinary partnerships and expands the reach of outdoor experiences to new participants; and (3) encourages researchers to identify high-impact applied research projects.

Historical Background

The current management and planning approach to traditional recreational activities dates back to the mid 20th century. During the so-called “recreation boom” after World War II, state and national parks, forests, wildlife refuges, and other resource lands all saw dramatic increases in recreation visits (Clawson 1985). The United States saw burgeoning growth in outing clubs, university outdoor programs, and organizations providing training in outdoor leadership and skills (Watters 1986). In 1962, the Outdoor Recreation Resources Review Commission, established by Congress in 1958, published a watershed report that led to creation that year of the Department of the Interior’s Bureau of Outdoor Recreation and laid the foundation for professionalism in recreation management. Universities and public agencies worked together to develop a curriculum that would train the first generation of recreation professionals and academics. In the 1970s and 1980s, hundreds of studies of outdoor recreation participation, experience expectations, economic value, and ecological impacts were conducted. Recreation scientists worked closely with recreation

ISOR Research Strategy Vision

We envision a future in which recreation management needs and research priorities are in alignment and research entities work closely with public agencies to co-design research; co-develop innovative planning frameworks, models, and decision tools; and co-produce actionable science. Our goal is to improve the efficiency, effectiveness, sustainability, and quality of public land recreation and tourism programs, and lead to a future when beneficial public land experiences are accessible to all.



Francisco Valenzuela

Sightseers at Grand Canyon National Park, Arizona.

managers to develop planning tools and frameworks to assist managers in linking recreation settings and experiences, such as the Recreation Opportunity Spectrum, Limits of Acceptable Change, Visitor Experience and Resource Protection, Visitor Impact Management, and many others. The knowledge generated by this research was used to develop recreation planning and management strategies that prevail today. The recreation activities these tools addressed have come to define our image of what constitutes outdoor recreation, namely sporting and leisure activities.

Since then, many demographic, behavioral, sociocultural, and economic changes have transformed the recreational landscape of the 21st century. Urbanization and racial and ethnic diversification are the dominant demographic changes of the past two decades in the United States. Leisure-time activity patterns have also changed. Compared to the 1970s, today's trips tend to be shorter in duration and closer to home, or they are visits to highly visible or iconic destinations, with a greater focus on tour packages and guided trips. Many rural economies have shifted from resource production to service- and recreation-oriented economies. As a result, the corresponding meanings and values of public lands have also changed for some

residents of these communities. Dialogues about tribal treaty rights are shifting the conversation about public land management and co-management and are highlighting the protection of sacred or culturally significant sites. The digital era, including smartphones, global positioning devices, social media, and other personal technologies, has changed activity patterns as well as how people actually experience nature (including “virtual” experiences). We need new investments in recreation and tourism research and development to improve our ability to respond to and predict changes in how visitors evaluate, envision, and attach meaning to public lands.

Many management concepts and tools used today reflect the “recreation boom” mentality of the 1970s, when a surge of new recreationists posed a challenge to managers, and when visitor use levels, user conflicts, resource impacts, and crowding became predominant management concerns. Contemporary agency policies and leadership priorities emphasize expanding visitor use and access, diversifying the visitor base, enhancing experiences, sharing stewardship, and expanding collaboration in land management. Moreover, it is becoming clear that our understanding of recreation and its management is not enough to help us solve the problems we face today. Concepts such as visitor satisfaction, specialization, and carrying capacity may not be appropriate to address today’s challenges. As we embrace a social-ecological perspective that sees people as integral to nature, we see new research questions, management practices, and even mental models forming. We need research that informs agency policies and practices to expand the recreation paradigm and account for a diversity of uses and values.



Bob Wick, Bureau of Land Management

Visitors enjoy flower season at Santa Rosa and San Jacinto Mountains National Monument, California.

Sustainable Recreation

Why is managing outdoor recreation and tourism sustainably so important for public lands? We believe that people's outdoor experiences are important for cultural, social, health, spiritual, ecological, and economic reasons, many of which are related to people's values, identity, well-being, and livelihoods. Recreation and tourism can be harnessed to protect valuable ecosystems by creating greater public appreciation and value for public lands and the agencies that manage them. Recreation and tourism, when managed well, contribute significant benefits—particularly to rural communities—that enhance the social, cultural, and economic well-being of these communities. Making outdoor recreation and tourism sustainable also hinges on institutional and managerial efficacy. For the public in the long term, the quality of planning and management can enhance all of these dimensions of meaningful experiences and outcomes or it can detract from them.

What should recreation and tourism management sustain, and for whom?

A simple answer is that we seek to sustain quality recreation experiences for a diverse range of visitors in ever increasing numbers. A fuller response goes well beyond provision of outdoor experiences. In the “Brundtland Report,” the United Nations (UN) World Commission on Environment and Development (Brundtland et al. 1987) identified three essential pillars of sustainable development: economic growth, environmental protection, and social equity. Applying these to sustainable recreation highlights the importance of sustaining the integrity of ecological systems, clean air and water, and wildlife and fish habitat; of protecting cultural sites, traditions, and tribal connections to important lands; of promoting the economic health and well-being of communities and livelihoods; encouraging local histories, enduring identities, and working forests; and of ensuring the relevance of public agencies and their history of stewardship. In practice, however, planning processes often elevate the importance of system-condition data, skipping over the first and most important questions about what **should** be sustained. Promoting sustainability requires active collaboration, citizen participation, inclusion, integrated management systems, capacity building, and both efficient and effective governance (app. 1 provides a glossary of terms used throughout this strategy).

Our research strategy builds on this foundation of sustainability in the context of outdoor recreation and nature-based tourism. The concept of sustainable tourism has been well defined and widely deployed by international organizations, which have sought to develop indicators and metrics for measurement. For consistency, we use the definition espoused by the UN World Tourism Organization, which describes **sustainable tourism** as “tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the

environment and host communities.” This definition emphasizes the “three-legged stool” approach of ecological, economic, and sociocultural elements. When applied to public lands or protected areas, it implies a scale that extends beyond the public land boundary to communities and society at large. Use of the term “sustainable recreation” is less common. In the United States, some public land management agencies have developed sustainable recreation strategies, programs, or offices, yet there has been less agreement about what sustainable recreation management constitutes and less clarification about what is to be sustained and for whom (McCool et al. 2001, Selin 2017). Building on the Brundtland Report concept, we propose an original definition of **sustainable recreation management** to be “the provision of desirable outdoor opportunities for all people, in a way that supports ecosystems, contributes to healthy communities, promotes equitable economies, respects culture and traditions, and develops stewardship values now and for future generations.” We see these definitions as “schematic” definitions that identify broad areas of importance that communities can use as a starting point to help identify, plan for, and work toward sustainability through particular issues and indicators that are valuable and relevant.

Monika M. Derrien



Canoeists enjoying Beebe Lake in Ithaca, New York.

Our definition of sustainable recreation is motivated by challenges brought by definitions of outdoor recreation more generally, which suggest a concept of discrete divisions of work and play. This bifurcated view is replicated in public land management agencies in which programmatic silos that manage play (recreation) are separate from management areas related to other modes of public uses (e.g., permitting for nontimber forest products, roads planning, or cultural resources management). Furthermore, our definitions recognize the shared leadership roles for agencies, communities, and partners for sustainable recreation and tourism and the important roles for recreation and tourism in developing those stewardship values among the public.

Over the past decade, public land management agencies in the United States have explored ways to promote sustainable recreation and tourism. In 2010, the Forest Service released its National Framework for Sustainable Recreation (USDA FS 2010), which stressed the importance of providing quality recreation opportunities while enhancing natural and cultural resources and communities. In 2012, the National Park Service's Green Parks Plan (USDI NPS 2016) set out to reduce environmental impacts, mitigate the effects of climate change, and integrate sustainable practices into its operations. In 2014, the Bureau of Land Management developed its Environmental Management System Policy (USDI BLM 2014) to elevate the importance of sustainability principles. Meanwhile, many states have developed state offices of outdoor recreation to guide future development of this important industry. A key element in these initiatives is partnerships with research institutions to align research initiatives and management needs. We aim to build our strategy for future recreation and tourism science from this foundation of sustainability, while providing more clarity, conscientious thinking, and conceptual development that may advance the field.

Crafting the ISOR Research Strategy

We developed the strategy in multiple phases over 26 months and involved hundreds of outdoor recreation and tourism professionals, including resource managers, researchers, and practitioners from many agencies and sectors. Our group hosted a series of information-gathering events in 2017 and 2018—two workshops and a needs assessment survey—that produced an abundance of ideas and information.

In October 2017, 15 practitioners and scholars gathered in Seattle, Washington, to discuss the state of outdoor recreation on public lands in the United States. During a 3-day session, the group wrestled with the challenges associated with knowledge creation, synthesis, and dissemination; identified the need for updated recreation and tourism planning tools; and outlined a path to reinvigorate the science of outdoor recreation. The group also identified pressing management challenges and issues facing contemporary recreation managers. We captured the core elements of this

research strategy in notes from this meeting and initiated a process for gathering more information. The following initiatives generated critical information.

1. **Needs assessment survey.** In 2017 and 2018, an online survey was distributed widely to recreation managers in multiple natural resource agencies (federal, state, local) as well as researchers in universities and public agencies worldwide. In their responses, 244 people identified their priority management challenges and information needs (see app. 2).
2. **Working papers.** A compendium of working papers was drafted by leading voices in outdoor recreation and tourism, with contributions from 28 authors. Papers identified current issues, challenges, and dilemmas and presented new opportunities, topics, and paradigms in outdoor recreation. Papers were circulated among dozens of readers and reviewers for feedback. Their final versions were published in 2020 as a Forest Service general technical report (Selin et al. 2020).
3. **Golden workshop.** In April 2018, we convened a 3-day workshop in Golden, Colorado, attended by 88 outdoor recreation researchers, practitioners, policymakers, promoters, and advocates (see app. 3 for a list of attendees). We used a community reference system to select participants based on the need for (1) an even representation of resource managers, academics, and agency scientists; (2) a set of participants respected for their knowledge of recreation research and management issues; and (3) a willingness to engage in the workshop and follow-up activities. The group posed management challenges and identified information needs and priority research areas, then framed a number of research questions, planning tools, capacity needs, and potential partnerships. See appendix 4 for a summary of this meeting.
4. **Synthesis of research focus areas.** In August 2018, our team reflected on and synthesized themes from the above sources and considered these findings alongside other published sources. This work framed the eight RFAs described in this report.
5. **Writing and review teams.** In October and November 2018, eight multidisciplinary writing teams comprised of representatives from multiple agencies and universities formed to develop the RFAs. Workshop participants with relevant expertise were recruited to be lead RFA writers, writing team members, and reviewers, and additional contacts were recruited for teams needing additional expertise. Writing teams referenced existing resources and brought in new information to further hone each focus area. Once drafted, we sent the RFAs to review teams for further insight and editing. Writing teams then synthesized reviewer suggestions for further refinement.

6. **Coordinating team.** After receiving submissions from the writing teams, the coordinating team streamlined the RFAs to reduce redundancies and ensure that each area captured a distinct body of work. In the process, a gap was identified by the coordinating team and an additional RFA was added. The team adopted a final template and edited for consistency and tone. We also developed the strategy’s guiding principles and crosscutting themes. The revised draft was reviewed by an independent reviewer, who recommended that one RFA be recast as an “implementation strategy.” The original writing teams responded to final RFA drafts in August 2019, and edits were integrated into the final draft, reflecting a truly collaborative and iterative process (fig. 1).

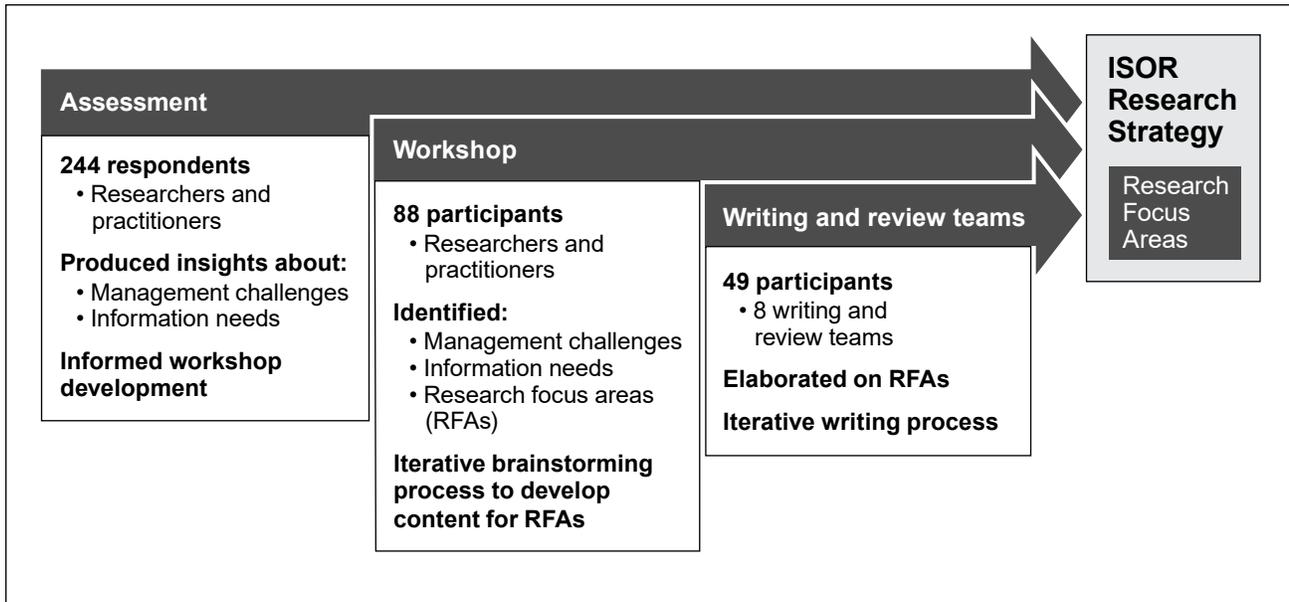


Figure 1—Process of research focus area development.

The authors of this report represent the collective voices of all who contributed to this research strategy (see app. 3). Although we share the vision articulated here, there inevitably have been disagreements about some topics. Those conversations have strengthened our respective understanding of important philosophical and practical issues in recreation management. Where professional differences of opinion have persisted, ultimately the voices of the coordinating team and editors have the strongest representation in this research strategy.

Considering research as an element of change—

The ISOR Research Strategy was developed loosely around the “Theory of Change” approach to issue framing (Taplin and Clark 2012). This methodological approach to planning, participation, and evaluation is widely used in public, private, and nonprofit sectors, where institutions work together to decide where they want to go, how they will get there, and how success will be measured. Its framework emphasizes defining long-term goals and mapping out a series of interlinked short-term and long-term outcomes toward desired objectives. Theory of Change models also outline the need for interventions (individual or coordinated actions) that help bring about these outcomes. In this framework, an important question to ask is: “What conditions must be in place for us to reach this goal?” Once shared goals and outcomes are outlined, each organization develops its own strategies and tactics

toward achieving the goals of the broader movement. As part of this approach, monitoring data are used to measure progress and periodically adjust the framework.

Our ISOR change effort involves defining a desired goal of sustainably managed outdoor recreation on public lands. We think our eight RFAs for knowledge co-production will generate outcomes that collectively will move us closer to this goal. In developing each RFA, we explicitly state the rationale for this work and the underlying assumptions behind the need for it. We also identify and prioritize strategic actions needed for each research effort to occur. We point out existing data and information sources that can be used to achieve these outcomes under the RFAs. And, we explicate the conditions needed for these goals to be achieved. In the “What needs to happen” section of each RFA, we outline specific interventions that could be undertaken collectively or individually to change the broader operating environment, allow the generation of knowledge, and move toward long-term change. We also describe mechanisms for measuring success.

Krista Dooley



Hikers in Swan Creek Park, Tacoma, Washington.

We view the ISOR Research Strategy as a living document and intend for others to review and revisit what we have set out to achieve. Deliberating change requires dialogue, feedback, critical reflection, and time. Our process has recognized that research is one contributor to change, accompanied by stakeholder behaviors, political agendas, and contextual and environmental conditions. Research is likely to have its greatest potential for influence on the knowledge, attitudes, behaviors, political agendas, and relationships among key stakeholders. These changes may then indirectly influence change on larger scales. By creating this strategy and suggesting future research directions, we hope to promote positive change through scientific inquiry and discovery. Although our approach is not a direct adherent to the Theory of Change model, our efforts have been inspired by a desire to determine the directions and forces of change and suggest how we can orchestrate a plan for achieving our goals.

Organization of Report and Use of Terms

In the “Guiding Principles” section, we describe principles that have guided our thinking, process, and approach to developing this research strategy. The following section presents the strategy’s eight RFAs, which direct future inquiry; guide investment in outdoor recreation research; and identify capacity needs, challenges, gaps, and opportunities to strengthen the alliance of research and management. The strategy also identifies the need for new conceptual lenses and in some cases suggests a change in thinking about who or what is being managed, and what experiences and conditions we seek to sustain. Each RFA includes 11 components:

1. **Overview:** Justifies why this set of issues is important.
2. **Vision:** Describes the vision for future recreation management in this area.
3. **Management needs:** Describes recreation management issues identified primarily by managers.
4. **Understanding the problem:** Provides context and background on past research and management approaches.
5. **Research goals:** Articulates high-level goals for research within the RFA.
6. **Research topics:** Outlines a non-exhaustive list of priority topics for future study within the RFA.
7. **Intended outcomes:** Describes expected deliverables from research within the RFA.
8. **Strategic partnerships:** Presents a non-exhaustive list of potential partners with whom to pursue innovative and progressive research programs within the RFA.

9. **What needs to happen?** Describes policy, management, and coordination needs for implementing research within the RFA.
10. **Measuring success:** Poses questions to help gauge the success of research in meeting the research goals and vision for the RFA.
11. **Toolbox—management applications:** Highlights the tools, models, and frameworks that will be developed through research within the RFA.

Collectively, the RFAs reveal inherent tensions that drive research on public lands recreation and tourism. In the “Crosscutting Themes” section, we describe these tensions and how they suggest needed cultural changes for implementation of the research strategy. We then identify three “Implementation Strategies” to enhance knowledge co-production and outline priority actions for each. These strategies help harness the contributions of multiple knowledge sources and will facilitate adoption of the research outlined in the RFAs. In the “Measuring Success” section, we suggest ways in which we can gauge our progress in implementing the research strategy. Finally, the “Call to Action” section challenges employees across agencies, organizations, and industry to embrace a fundamentally different approach to working together.

Note that when we refer to recreation or tourism in this report, we are referring to these activities when they occur on U.S. public lands. This includes outdoor recreation as well as nature-based, cultural, and heritage forms of tourism. We recognize that many activities occurring on these lands are not traditionally classified as recreation—that people also interact with and value public lands to meet traditional, educational, cultural, religious, spiritual, sustenance, or well-being goals. In many cases, this diversity of human connections with public lands is an important aspect of the research we propose.

In this report, we use the Interagency Visitor Use Management Council’s definition of visitor use to refer to “human presence in an area for recreational purposes, including education, interpretation, inspiration, and physical and mental health” (Interagency Visitor Use Management Council 2016). We also consider the terms visitor use management and recreation management to be synonymous, as well as the terms visitor and recreationist.

When we refer to public lands, we are primarily referring to lands and waters managed by federal, state, and local governments in the United States that are open to recreational use. Land managers who manage wildlands for recreation, or who are interested in building management connections across the urban-wildland gradient, will find opportunities for new research and management partnerships in this research strategy, especially as we envision recreation management in terms of interconnected and nested systems across jurisdictions. Many of the ideas presented

will be applicable—with appropriate adjustments for other historical, political, and cultural norms—to other nations facing similar challenges, and to recreation on private lands in the United States.

Guiding Principles

The ISOR Research Strategy is guided by eight principles that philosophically and scientifically underpin our approach:

- Experiences of nature matter
- Thinking in terms of systems is critical
- We are part of nature and the ecological system
- Recreation can produce important economic benefits
- We should plan for sustainability and resilience
- Inclusivity, justice, equity, and access are important to sustainability
- We need cultural change to grow recreation science
- Collaboration will lead to meaningful outcomes

Experiences of nature matter—

Our public lands provide a multitude of benefits to people who seek outdoor experiences and connections to nature, and who directly rely on natural resources for everyday needs. Our connections to the natural world and our biophysical responses to nature are critical for our survival as a species. There is growing recognition that our parks, forests, monuments, refuges, and water bodies are more than just a place to engage in outdoor leisure activities. Community and tribal use of public lands and waters is essential for maintaining livelihoods, lifestyles, traditions, and cultural practices. Visitors to public lands generate economic benefits and employment opportunities for host communities. Visitors who engage with natural and cultural heritage protected by public lands can be transformed by their direct sensory contact with natural ecosystems and cultural landscapes, and through their experiences may adopt a concern and love for these special places and be empowered to become stewards. In this strategy, we encourage considerations of how public land connections enhance the mental and physical health of visitors and the vitality of nearby communities.

Thinking in terms of systems is critical—

The management of natural and cultural resources to achieve multiple goals is an inherently complex undertaking. Yet, our standard ways of organizing information and implementing decisions are sometimes overly simplistic or reductionist—occurring without full awareness of the factors that influence system outputs or consideration of the alliances that uphold the system. Systems thinking is an

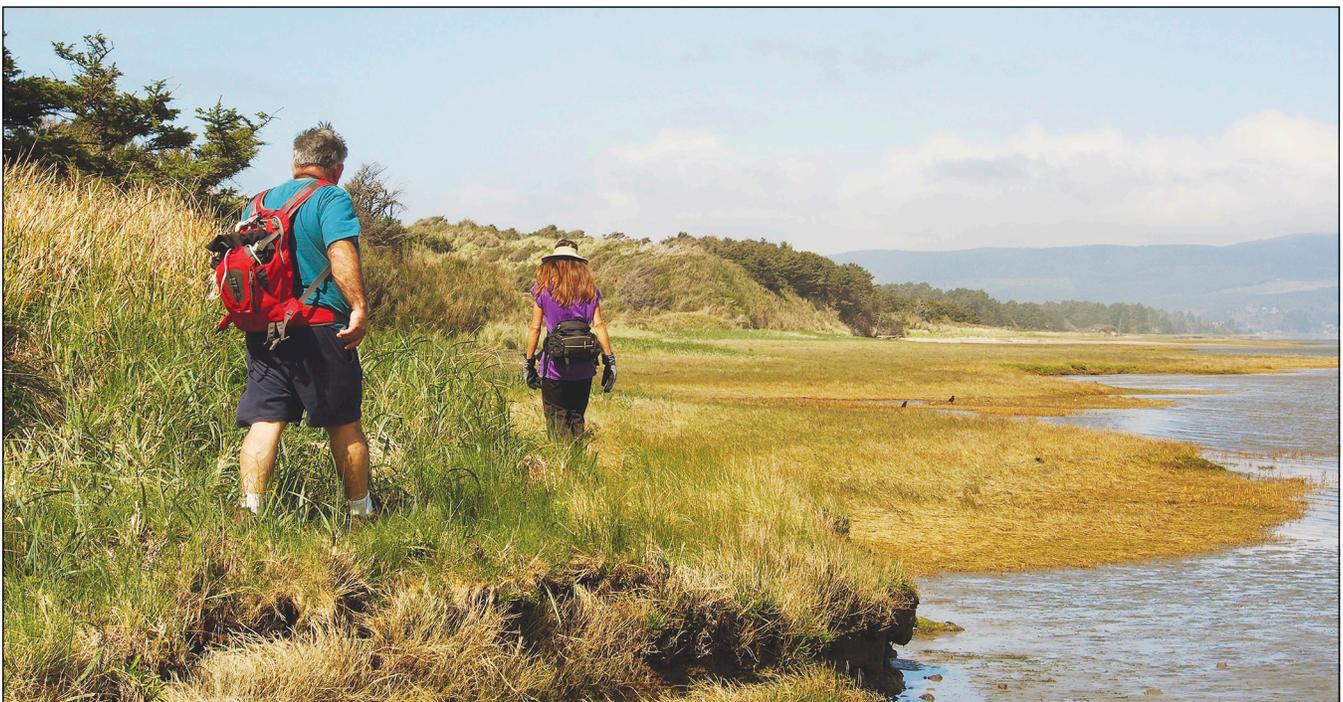
interdisciplinary approach that focuses on (1) conceptualizing the broad array of institutions or elements that shape the domain, (2) understanding system parts and their roles, (3) assessing underlying relationships between the parts of a system and the whole, (4) recognizing mutually modifying interactions between parts, and (5) identifying external and internal forces that reinforce the system or induce change to the system. A systems approach builds mental models to visualize public land management as a complex system and understand the components of the system, how they are connected, and how they work together, as well as the internal and external elements that reinforce or work against the system. Research can help us focus on key components of systems that can inform key management and policy questions/issues, and help identify where empirical data will be most helpful in informing management judgments. Future research that informs sustainable management of outdoor recreation and tourism may benefit from systems approaches to recognize the complex factors and forces already engaged, as well as identifying new opportunities for connection. Systems thinking, as a paradigm change, may lead to improved analysis and decisionmaking through an improved understanding of how public land systems work. Implementing systems thinking approaches in natural resource management contexts has challenges, but guidelines for implementing such approaches are emerging. In this research strategy, we encourage systems thinking at all levels of research and management.

We are part of nature and the ecological system—

People are part of nature, not separate from it. Traditional resource management has tended to view humans as separate from nature and as a disturbance factor rather than a participant in the social-ecological system. Social-ecological systems thinking explicitly recognizes reciprocal connections and relationships between people and the landscapes they visit, occupy, and use. Through the coordinated efforts of managers and partners, these landscapes provide recreational opportunities to people. Outdoor recreation research has investigated relationships among recreational activity, ecological resilience, and visitor management in the context of nature connections and stewardship, with the aim of developing practices that minimize negative effects and maximize positive effects to ecosystems. Traditional approaches to knowledge discovery rely on discrete silos of knowledge housed within particular academic disciplines or functional areas within agencies (wildlife biology, landscape architecture, hydrology). An integrated approach that blends social and biophysical sciences will result in new types of questions and research directions. In this strategy, we encourage approaching research through a social-ecological systems lens to develop novel management methods that support both sustainable ecosystems and human visitors.

Recreation can produce important economic benefits—

The economic contributions of outdoor recreation are significant. According to the U.S. Bureau of Economic Analysis’s Outdoor Recreation Satellite Account, the outdoor recreation economy accounted for 2.2 percent of U.S. gross domestic product in 2016 (USDC BEA 2017). Since 2013, 17 states have established offices, commissions, or policy advisors who serve to promote outdoor recreation as a means of economic development, and more states are following suit. Sustainable outdoor recreation planning has long had a strong economic focus, especially in terms of the ability of land management agencies to adequately maintain existing recreation facilities, sites, and other resources. Planning considerations have often included public-private funding models and other conservation finance approaches; decommissioning sites or prioritizing services such as trash receptacles and toilets; and determining appropriate fee structures. Although these are important, the economic dimensions of sustainable outdoor recreation reach farther than agency capacity. As a guiding principle for this strategy, important economic dimensions also include the multiple ways of valuing and displaying recreation benefits and economic interactions between public land recreation and nearby communities. These include sustainable tourism planning; shared financial investments among partners that yield mutually beneficial effects; and reduced health care costs resulting from the healthful effects of outdoor recreation. By considering outdoor recreation within the context of broader tourism systems and



Keith Routman

Hikers exploring Netarts Spit on the Oregon coast.

thinking broadly about the economic dimensions of recreation systems, sustainable outdoor recreation and tourism research and planning can help identify high-impact ways to more efficiently and effectively serve varied communities and populations.

We should plan for sustainability and resilience—

The use of the terms “sustainability” and “resilience” has increased since the 1990s, to the point that some have suggested the diminishment of their meaning. We note, however, their continued importance and utility in the conceptual framework underpinning this research strategy. The UN’s definition of sustainable development emphasizes “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development 1987). **Sustainability** refers to “a paradigm for thinking about the future in which environmental, societal, and economic considerations are balanced in the pursuit of an improved quality of life” (UNESCO 2019). This term emphasizes the need to plan and manage for outdoor recreation and tourism in ways that minimize harm to biophysical and cultural resources, while enhancing economic opportunity, encouraging community engagement, and acknowledging indigenous ties to the land. It includes, but is not limited to, developing an infrastructure of sustainable trails and recreation sites in locations that will accommodate traffic levels while limiting the “footprint” of human impact. The notion of sustainability also includes the need to plan for visitor use in ways that do not exceed management capacity. **Resilience** refers to the ability of interconnected social-ecological systems to bounce back or respond to and recover from disturbance. The increase in severity and frequency of extreme weather events, changing fire regimes, and the increase in and changing distribution of human populations suggest that systems are being exposed to new and different disturbances. Under these conditions, resilience becomes more challenging and more important. Research informing sustainable outdoor recreation and tourism practices is increasingly important to build resilience in institutions and practices. We see the concepts of sustainability and resilience as being integral to the foundations of this research strategy.

Inclusivity, justice, equity, and access are important to sustainability—

As the U.S. population becomes more diverse, public land management agencies need to consider different management strategies to meet the interests and needs of all users. Lack of access to public or private transportation, insufficient financial resources, and lack of outdoor experience are often cited as top reasons for under-represented groups to not visit the outdoors. Barriers to outdoor recreation participation for minorities are also associated with perceived or real discrimination, personal safety concerns, and weak attachment to outdoor attractions. Social equity is directly related to the democratic principle of justice. In sustainability science, intergenerational



Greg Shine

Family prepares for a day of fishing the John Day Wild and Scenic River, Oregon.

equity, issues of social exclusion, and the need to reconcile social justice with environmental sustainability are important issues that must be addressed to achieve social resiliency. Cultural biases may frame our understanding of how recreation and tourism are defined or socially constructed, how we value recreation and tourism, and what we choose to know and study about recreation and tourism. Public land management agencies are staffed by committed professionals, yet workforce demographics suggest that these agencies are less diverse than the labor force. The implication is that cultural blinders exist and agencies may not be sensitive to the needs of diverse American publics. Issues of poverty may create barriers to participation that are difficult for public land managers to address. Furthermore, the limited public green space available in cities is often not accessible to minority or poor populations, making it more difficult for underrepresented groups to participate in local outdoor activities. Recreation managers are increasingly developing approaches that engage with urban populations where they live, as well as connecting them to wildland destinations. Focusing on empowering and building social capital in these communities ensures that their priorities for outdoor recreation and public land use are acknowledged and encouraged.

We need cultural change to grow recreation science—

Public sector organizations are under increasing pressure to continually adapt to a complex world characterized by rapid social and ecological change, financial austerity measures, and a more pluralistic and connected public. Implementing organizational change is especially challenging for federal and state government bureaucracies with established top-down command and control systems of organizational management. Public managers and organizational scholars alike are experimenting with strategies designed to help public sector organizations become learning organizations—ever more nimble, responsive, and adaptive to changing societal conditions. However, public sector organizations must overcome many organizational barriers to navigate this transition. A “we know best” attitude can often create a resistance to organizational change. Integrating sustainability science, analytic tools, and management best practices into large public sector organizations is challenging. Some of the organizational barriers to integrating sustainability include lack of clarity in definitions of sustainability concepts and outcomes, entrenched organizational culture, resistance to change, and lack of systems thinking. Given these significant barriers to organizational change, it is essential that strategies designed to foster organizational change be included in any strategic initiatives to integrate sustainability into public-sector organizations.

Keith Routman



Visitors take in the view from Cascade Head Preserve on the Oregon coast.

Collaboration will lead to meaningful outcomes—

Relationships are essential. People expect to have opportunities for meaningful engagement in public lands planning and decisionmaking. Moreover, early engagement by a variety of stakeholders and partners is associated with better outcomes and decisions and is recognized as a core element of sustainable social-ecological systems. Collaboration is the dynamic process in which multiple parties pool resources to solve a problem or create an opportunity that they cannot solve individually. Collaboration can be a dynamic, adaptive, and flexible process, and implies a joint decisionmaking approach in which power is shared and stakeholders take collective responsibility for their actions. The benefits of collaboration have been well documented and include building trust, strengthening social capital, leveraging scarce resources, managing conflict, and accomplishing work on the ground. Most recent public land management recreation planning initiatives have emphasized collaboration as a means to implement sustainable practices on the ground. Collaborative approaches can help leverage personnel, equipment, and funds to help agency staff address their challenges. Collaboration among managers, practitioners, and scientists in the process of knowledge production will ensure that the appropriate questions are being asked, studied, answered, and addressed. Known barriers and challenges to collaboration include capacity constraints, limited resources, staff turnover, lack of skills, the absence of formal structures, and concerns about sharing control. We encourage the regular consideration of best practices, capacity building approaches, shared learning, and the monitoring of collaboration dynamics and outcomes to sustain recreation management.

Research Focus Areas

The eight RFAs reflect a strong alignment between management and research needs and identify a set of national research priorities to be modified and adapted by public land management agencies. Each RFA encompasses a related area of inquiry and is connected to other RFAs conceptually and in terms of management challenges and research methods. We intend them to evolve and interact with each other as they direct future knowledge development, innovative tools, information dissemination, and dialogue for the next 7 to 10 years. As such, they will be revisited and discussed regularly. Our hope is that they will energize our collective capacity and provide much-needed focus to research programs around sustainable outdoor recreation management.

Research Focus Areas

1. Integrating outdoor recreation planning into a social-ecological planning framework
2. Examining recreation-ecosystem interactions at multiple scales
3. Assessing new drivers and characteristics of demand for outdoor experiences
4. Measuring, monitoring, and forecasting visitor use
5. Exploring connections among people, nature, and public lands
6. Integrating culture and place into land management and outdoor recreation experiences
7. Investigating the health and well-being benefits of outdoor experiences
8. Understanding tourism economies and systems for public lands planning

Research Focus Area 1: Integrating Outdoor Recreation Planning into a Social-Ecological Planning Framework

Outdoor recreation is central to the missions of many public land management agencies and is a top priority for the public, yet it is often left out of planning and management processes. Research is needed to identify opportunities for better integration within social-ecological frameworks and to develop new tools and approaches.

Overview—

A social-ecological approach views people and ecosystems as one interactive system in which human activities (e.g., recreation) affect ecological processes, and in which dynamic ecosystem processes (e.g., fire, climate change, invasive species) and socioeconomic trends (e.g., economic or population shifts) affect how people relate to their environment. Although much work on social-ecological systems has been conducted since the 1990s, recreation research has played an ancillary rather than an integral role. Yet in many industrialized countries, recreation is the primary way most people interact with nature. Moreover, the fundamental goal of sustainable recreation is to integrate social, ecological, and economic elements.

By integrating public lands planning and management into a social-ecological systems framework, we can better plan for ways that people interact with the environment, encourage outdoor experiences and their physical and mental benefits, and prevent avoidable harm to natural resources. Likewise, the costs and benefits to visitors and surrounding communities can be addressed only by integrating

Vision

Recreation is fully integrated with other natural resource management areas through a social-ecological systems approach. Research and development advances our understanding of barriers to integrating social and natural science in public lands planning. To overcome these barriers, recreation practitioners engage in planning at multiple scales and in diverse contexts. Recreation settings, opportunities, values, and benefits are integral to planning processes and decisions that contribute to sustainable landscapes.

management into a social-ecological systems framework. This RFA addresses how agency managers and scientists identify, collect, and integrate social, economic, and ecological knowledge, and how to link that work to broader social-ecological frameworks, in practical and relevant ways, to address specific sustainable recreation management needs.

Public land management units typically maintain discrete program areas based on function and manage their programs and services accordingly (e.g., wildlife, aquatics, fire, and recreation). These functional areas, informed by academic disciplines that historically have been separate, often occupy silos among which information, concepts, and knowledge are not well integrated. This approach often does not serve complex issues well, especially those involving multiple interactions that transcend disciplinary and jurisdictional boundaries. This problem often plays out in planning processes, when interdisciplinary (ID) teams struggle to integrate insights from different disciplines in a meaningful way. A common result is that many individual reports contain extensive specialized information that has not been merged into a form that can easily inform decisions. Most units do not have the technical expertise or funding to conduct recreation ecology studies that integrate knowledge of soils, vegetation, water quality, and wildlife with geography, ecology, recreation management, and social sciences. New methods will help managers integrate social and biophysical dimensions and values to inform sustainable and adaptive public land management decisions.

Management needs—

Managers observe that recreation information rarely meaningfully supports decisionmaking about other resource uses and values (e.g., timber, fire, wildlife habitat). Planners and resource managers would benefit from using social-ecological planning frameworks that serve multiple scales and work across jurisdictional boundaries. Applying these frameworks from the inception of planning will help managers

Carl Zitsman, U.S. Fish and Wildlife Service



Family enjoys a day of fishing for rainbow trout.

identify the key interactions between recreation and other uses and values and will establish recreation values as integral to proposed actions. Further, it will help inform decisions that leverage recreation to contribute to the sustainability of the whole landscape. This will help practitioners use data and tools to evaluate alternatives, inform decisions, and monitor outcomes.

Understanding the problem—

Most staff in public land agencies are trained in biophysical sciences, forestry, and natural resources management, with fewer specializing in recreation, social sciences, or interdisciplinary approaches. Historically, planning approaches have adhered to rational planning models, which break problems into discrete (segregated) areas of specialization. Existing planning tools are not used effectively to account for interactions between disciplines. In this model, disciplinary specialists may make different assumptions about what constitutes a problem and the desired outcomes of different strategies. Yet, natural resource problems are inherently complex and require a systems approach that integrates wildlife ecology, hydrology, aquatic ecology, engineering, soil science, recreation, and other specialty areas.

What are lacking are the decision processes, common language, and landscape conservation frameworks in which recreation is an integral component.

Agency planning processes aim to collect large amounts of primary data about environmental systems, yet default to existing social and economic data, largely from secondary sources. This discipline-specific approach to collect exhaustive data can lead to “analysis paralysis” and inefficiencies because it is sometimes difficult to gauge how much data are enough to support a decision. Rather than emphasize a vast quantity of data, a social-ecological systems framework focuses instead on identifying **key** data needs and analytic integration of data to address questions of social, ecological, and economic sustainability. This focus better allows for consideration of the inherent complexity of management decisions and the specificity of decision outcomes.

Existing tools that do integrate recreation use and resource protection tend to be site specific, data dependent, and too onerous for landscape-scale applications or monitoring. Larger scale tools that link visitor preferences to landscape characteristics, such as the Recreation Opportunity Spectrum (ROS) and Scenery Management System (SMS), are very broad and highly descriptive. They do not address place-specific needs and tend to be used as inventory tools rather than applied decision tools. Nor are they viewed as integral components of larger social-ecological landscape frameworks. Some of these limitations are recognized in the recent Interagency Visitor Use Management Framework, which outlines an interdisciplinary approach to recreation planning based on a “sliding scale” of analysis to ensure that the scale of planning efforts is commensurate with recreation issues being addressed.

Research goals—

- Develop our understanding of barriers to successful integration of recreation into land management planning and actions through social-ecological systems approaches.
- Develop frameworks to integrate recreation planning and management into larger connected systems by employing the principles of social-ecological systems analysis and ecological, economic, and social sustainability. Equip recreation practitioners with practical and useful tools to effectively participate in planning efforts as integrators and problem solvers at multiple scales, jurisdictions, and in diverse contexts (e.g., watershed restoration, fire planning).
- Integrate socioeconomic data into established biophysical and ecological models and tools to evaluate positive and negative interactions in coupled social-ecological systems and integrate human desires, values, and uses across multiple scales and jurisdictional boundaries.

- Understand how interdisciplinary planning processes identify, collect, and integrate multidisciplinary knowledge for problem solving, as well as the institutional, disciplinary, and interpersonal forces that shape the planning process.
- Develop metrics and evaluation criteria that measure the sustainability of recreation settings, values, and opportunities—and related conditions, experiences, and trends—to inform adaptive management.

Research topics—

- Analyze previous management initiatives that emphasized integrated planning to better understand what factors facilitated or inhibited their adoption by land management agencies (e.g., new forestry, ecosystem management, adaptive management, and ecosystem services). Examine the various levels of agency hierarchy and stages of decisionmaking, from information inputs to decision outcomes.
- Develop new models, approaches, tools, guidelines, and best practices for integrated issue-based planning at multiple scales. Analyze case studies of issue-based planning programs to help understand elements that lead to successful integration, adoption, and implementation.
- Assess how interdisciplinary data sources are incorporated into planning and decision processes, and assess whether and how ID team outputs are integrated products.
- Explore the use of existing recreation planning tools in ID team efforts (e.g., ROS, SMS, Limits of Acceptable Change, Visitor Impact Management, Visitor Experience and Resource Protection, National Visitor Use Monitoring, recreation carrying capacity, place-based and participatory mapping), to understand the practical uses of these tools and their improved integration into planning processes.
- Analyze planning processes within ID teams to understand how recreation and public uses are weighted and considered in relation to other resource and disciplinary areas in final decisions. For example, consider how the detriments and benefits of recreation and other public uses of lands are incorporated, and the effect of recreation zoning on agency decisions.

Intended outcomes—

The development and use of place- and issue-based planning tools and concepts will allow mapping and synthesis of interdisciplinary data for analyzing sustainable recreation principles in the context of broader agency project and unit plans, impact analyses, and decisionmaking. It will incorporate into research a range of different conceptual approaches to integration, such as traditional ecological knowledge, values mapping, organizational and leadership behavior, decisionmaking and decision support, and case study analysis. Recreation practitioners will use, and line officers will support,

research-informed approaches and tools to integrate recreation settings, opportunities, benefits, and values with planning efforts that span multiple scales, contexts, and jurisdictions. They will use updated tools to address contemporary issues and opportunities that transcend management silos. These integrated planning efforts will inform decisions, facilitate adaptive management, and result in sustainable outcomes across multiple scales and jurisdictions.

Strategic partnerships—

Successful implementation of this research focus area will require strategic partnerships that leverage the expertise of diverse communities, disciplines, and networks. Table 1 identifies some critical current and potential partners to advance this work.

Table 1—Strategic partnerships for recreation professionals: integrating outdoor recreation planning into a social-ecological planning framework

Partners	To help with understanding of
Conservation nongovernmental organizations	Current initiatives for integrating sustainable recreation data with various data platforms, dashboards, and tools
Federal and state agencies	The policies and tools that managers need to manage “keystone” recreation opportunities across agency jurisdictions, at the landscape level
Ecological and biophysical researchers and managers	Interdisciplinary potential of integrated data collection and planning tools
Decision science and organizational behavior researchers	How to transform organizational planning processes to better link and model social-science considerations with ecological and physical science processes
Technology transfer scientists	How to best synthesize and present interdisciplinary information and develop trainings that translate science into management applications
Academic administrators and faculty	Opportunities for new curricular models and classroom resources that encourage an integrated social-ecological system management approach
Interdisciplinary and interagency planning and management programs (e.g., Interagency Visitor Use Management Council)	The policies and other mechanisms that have led to the successful programmatic integration of social and natural sciences, including those from wildfire, landscape conservation planning, watershed restoration, river management plans, and climate change adaptation

What needs to happen?—

Successful application of research within this RFA will require developing and implementing policies and guidelines that promote and systematize the use of new frameworks, tools, and concepts. This will result in the collection and synthesis of relevant issue- and context-based social, ecological, and economic data that is necessary to make informed decisions. Applications of the research will create efficiencies in planning and decisionmaking and will equip agency workforces with needed tools and skills. Implementation will require robust public engagement processes and the use of adaptive management approaches, and will help anticipate opportunities and choices for future generations.

Toolbox: Management Applications

- Place- and issue-based tools that integrate socioeconomic data into established biophysical and ecological models and tools will be used to evaluate positive and negative interactions in coupled social-ecological systems and integrate human desires, values, and uses across multiple scales and jurisdictional boundaries.
- Frameworks that integrate recreation planning and management into larger connected systems, employing the principles of social-ecological systems analysis and ecological, economic, and social sustainability.
- Policies and tools that aid in managing keystone recreation opportunities across agency jurisdictions, at the landscape level.
- Curricular models and classroom resources that encourage an integrated social-ecological systems management approach.

Measuring success—

- What percentage of National Environmental Policy Act planning documents include recreation as part of their “Purpose and Need” statement?
- What percentage of ID teams use planning tools and frameworks that integrate meaningful assessments of social, economic, and biophysical conditions?
- What percentage of planning processes have considered the benefits and detriments of recreation in the evaluation of alternatives and incorporated both in monitoring strategies?

Research Focus Area 2: Examining Recreation-Ecosystem Interactions at Multiple Scales

Outdoor recreationists are part of public land ecosystems. A deeper understanding is needed of their interactions with the environment at multiple spatial and temporal scales in the context of broad environmental change to inform public land management.

Overview—

People are an important part of the ecosystem on U.S. public lands and other protected areas globally. These lands provide many ecosystem services, including opportunities for outdoor recreation. Outdoor recreation is encouraged on many of our public lands, which can benefit from funding or political support gained through

recreational uses. However, human-environment interactions can also be detrimental to ecosystem function and processes, creating problems for both humans and ecosystems, and compromising managers' abilities to achieve conservation goals. Furthermore, changing environmental conditions affect where and when recreation takes place across the landscape. These shifts in recreationist behaviors and use patterns can have cascading effects, altering the distribution and intensity of human impacts.

Understanding how people and protected ecosystems interact is crucial to promoting the benefits of recreation on public lands and avoiding detrimental interactions and undesirable impacts. Research in recreation ecology and recreation behavior have contributed to our current understanding of recreation-ecosystem interactions, such as the importance of integrating social, environmental, and managerial components of sustainability into visitor use management decisionmaking. We need a synthesis of these two existing research themes with a deeper understanding of large-scale environmental change and its interactions at multiple spatial and temporal scales. We also seek to improve our understanding of recreationist behavioral responses to these changes. Research in this focus area will elucidate where the outcomes of interactions between recreation and natural areas are most consequential. This research will also contribute to a social-ecological systems framework through which recreation planning and management on public lands will be more resilient to environmental and social changes across multiple spatial and temporal scales.

Vision

Humans are considered integral to public land ecosystems, and interactions between outdoor recreationists and other parts of the ecosystem result in acceptable levels of environmental change. Recreation activities occur in resistant and durable spaces with infrastructure designed to sustain resource conditions and quality visitor connections, given forecasted visitation levels.

Management needs—

Land management professionals are concerned about minimizing the negative effects and maximizing the positive effects of outdoor recreation, while providing for increased demand. Although trends in the effects of recreation on biophysical features (e.g., soil erosion and vegetation trampling) have been well studied in some ecosystems, effects on wildlife and water are less understood. Managers would benefit from a better understanding of how changes in the conditions of biophysical resources affect recreation choices made by visitors and how their

behaviors relate to the type, level, and extent of recreation-related impacts. Frameworks for characterizing recreation-ecosystem interactions and science-based tools to support decisions would ultimately improve the state of ecosystems and outdoor recreation experiences.

Understanding the problem—

Recreation ecology research has historically focused on how recreational activities and infrastructure alter ecosystems, such as the influential variables that lead to undesirable biophysical impacts. Much of this work has been conducted at local scales, such as studies of the effects of trampling by recreationists on campsites, trails, and specific vegetation types. Results from numerous studies in recreation ecology indicate that negative impacts to vegetation and soils reach a threshold after a certain level of human use, indicating an asymptotic relationship between use and impact. Although this relationship has been found to apply to some ecosystems and resources, it has also been applied to biophysical resources for which other relationships are more accurate.

Many ecological processes occur at large spatial scales and within long time frames, but our collective understanding of how recreation affects many biophysical resources is still deficient at these scales, perhaps because of a mismatch between research and management time frames and ecological processes. It will be important to match the spatiotemporal scale of future studies and management/policy decisions with the scale of the ecological process in question, so that meaningful conclusions on the interactions between recreation and ecosystems can be drawn. For example, the effects of certain types of recreation on wildlife are poorly understood, especially regarding long-term effects to populations, owing in part to the complexity of human-wildlife-environment systems. We do know, however, that wildlife-oriented recreation remains an important draw for visitors, with more than 103 million Americans participating annually, contributing nearly 1 percent of the U.S. gross domestic product, according to a national survey conducted by the U.S. Fish and Wildlife Service.

With changing environmental conditions (e.g., climate change), we need research to better sustain shifting visitation use patterns while avoiding and minimizing the associated impacts to natural and cultural resources at relevant spatial scales. Peoples' needs and desires are a critical component of sustainable public land management: constructing a highly sustainable trail or campsite that visitors do not want to use represents a failure in visitor use management. Likewise, management and policy changes, like visitor behavior, influence resources at multiple scales. Although past research in the fields of recreation ecology and behavior has contributed to improved understanding and management of recreation-ecosystem



Monika M. Derrien

Hikers in North Cascades National Park, Washington.

interactions, integrating these two highly related fields has not always been achieved successfully. We need research to improve our understanding of recreation and protected environments as a social-ecological-managerial system.

Research goals—

- Investigate interactions between recreationists and the environment at spatial and temporal scales relevant to the social-ecological system in question.
- Identify general trends regarding how recreation affects ecosystem components (e.g., vegetation, soil, water, soundscapes) and wildlife at the population level.
- Understand the social, environmental, and managerial factors that most influence negative recreation-associated impacts of concern to public land managers, and that can be most effectively manipulated to increase the sustainability of recreation infrastructure.
- Determine how environmental quality and environmental changes such as climate change, altered wildfire regimes, spread of invasive species, drought, and flooding affect recreation activities.
- Develop decision-support tools that help managers integrate recreation considerations into natural resource management and improve adaptive management.



Skiers at Mount Baker Ski Area, Mount Baker–Snoqualmie National Forest, Washington.

Research topics—

- Develop a framework for understanding human-wildlife interactions in the recreation context; apply past research to this framework to test hypotheses regarding human-wildlife interaction patterns.
- Investigate the role of the natural environment in recreation decisions that people make and the benefits they attain from their participation. This will include studies that combine environmental attributes (e.g., ecosystem health, wildlife presence, scenery, and settings) or natural events (e.g., fire, smoke, landslides, droughts, floods, and spread of invasive species) with factors such as recreationist goals, motivations, behaviors, outcomes, and past experiences.
- Improve understanding of how people respond or adapt to environmental change (e.g., climate change, altered fire regimes, spread of invasive species, and recreation-induced disturbance) by changing their outdoor recreation location, timing, or activity, or by not participating at all.
- Investigate the effects of recreational activities on a range of biophysical ecosystem components that have not yet been widely studied. Conduct landscape-scale research to improve understanding of recreation effects on species that move long distances and on those that use a variety of habitats seasonally or throughout their life cycle.

- Expand existing research on the ecosystem services provided to people by public lands, and how other natural ecosystems could be conserved so they continue to provide ecosystem services to both onsite and offsite users.
- Research the efficacy of visitor management policies and practices intended to minimize or mitigate visitor impacts while continuing to provide high-quality outdoor experiences. Highlight high-priority gaps through a synthesis of existing research.

Outcomes—

A well-developed and dynamic understanding of the interactions between humans and public land ecosystems will help managers reach desired environmental conditions in these areas. Research within this focus area will update our knowledge of how people use different landscapes based on the ecological conditions of those landscapes, the effects that different types of activities and infrastructure can have on ecosystem components, and how short-term effects translate to long-term shifts across landscapes and wildlife populations. New management tools will be developed that include recreation as an integral part of the public land ecosystem, including decision-support tools that help managers incorporate the latest relevant science to manage adaptively, using tools for managing visitation levels, increasing the sustainability of recreation infrastructure, shifting visitor activities to the most durable locations, encouraging low-impact visitor behaviors, and remove components deemed unnecessary, less sustainable, or subject to unacceptable impacts.

Strategic partnerships—

Successful implementation of this RFA will require strategic partnerships that leverage the expertise of diverse communities, disciplines, and networks. Table 2 identifies some critical current and potential partners to advance this work.

What needs to happen?—

Implementation of this RFA will require efforts to overcome existing institutional barriers and biases to embrace a social-ecological systems framework. It will require an integrated approach that brings together specialists in natural resource professions, including biologists, geologists, ecologists, social scientists, recreation ecologists, and planners, who will need to develop common terms of understanding. These research partnerships will be critical to initiating research projects, developing and testing new tools, and eventually to championing the adaptation and adoption of new approaches within agency guidelines and practices. Incorporating social-ecological systems thinking and interdisciplinary approaches to problem solving into educational materials for the next generation of natural resource managers and researchers will be an important component of managing all aspects of public lands more sustainably for people and ecosystems.

Table 2—Strategic partnerships for recreation professionals: examining recreation-ecosystem interactions at multiple scales

Partners	To help with understanding of
Recreation affinity groups	Management issues, user challenges, and successes in collaborative processes with land managers
Wildlife scientists and managers	Human-wildlife interactions, wildlife management issues, and concerns of wildlife scientists and managers. These partnerships will help develop research approaches that address wildlife issues within the context of sustainable recreation
Vegetation scientists and managers	Invasive species introductions by recreationists and reduction methods
Climate change researchers	The projected effects of climate change to inform research on behavioral adaptations
Fire scientists	Altered fire regimes, the incidence of accidental human-caused wildfire, and opportunities for interventions
Restoration ecologists	How landscape-scale restoration programs affect the benefits that people gain from the landscape
Communities with strong recreation connections	How rural communities might be affected by changes in recreation use and patterns related to environmental changes
Tourism planners	How people and tourism companies discover, plan for, and interact with public land destinations
Social media data analysts	How environmental change, both long term and short term, broad scale and local, correspond with altered visitation levels and experiences
Landscape ecologists	The ways that biophysical properties of landscapes interact and how people interact with broad and local landscapes
Environmental psychologists	How recreationists respond to environmental change

Toolbox: Management Applications

- Frameworks for characterizing recreation-ecosystem interactions at multiple spatial scales and science-based tools to support decisions.
- Decision-support tools that help managers overcome institutional barriers and biases, make decisions based on the latest relevant science, integrate recreation considerations into natural resource management, and improve adaptive management.
- Tools for managing visitation levels, shifting visitor activities to the most accommodating and durable locations, and encouraging low-impact visitor behaviors.
- Tools that increase the sustainability of recreation infrastructure components and remove components deemed unnecessary, less sustainable, or subject to unacceptable impacts.

Measuring success—

- Have new frameworks been developed and used to characterize recreation-ecosystem interactions?
 - Have new science-informed decision-support tools been applied, and have they resulted in decisions that have intended outcomes?
 - How has the health of wildlife and plant communities in popular recreation areas changed?
-

Research Focus Area 3: Assessing New Drivers and Characteristics of Demand for Outdoor Experiences

Understanding factors that influence people to visit and value public lands is essential to their long-term management. Research is needed to improve our understanding of demographic, socioeconomic, technological, and other visitation drivers, and our ability to establish responsive management practices.

Overview—

Land management agencies provide programs, facilities, and services to meet public demand for outdoor experiences and resource uses, and to protect cultural and natural resources. Central to this work is a robust understanding of demographics, consumer trends, motivations, climate and environmental conditions, and transportation and residential patterns that shape the volume and character of visitation to public lands. Demand for outdoor recreation experiences is changing as more people seek shorter, more diverse, year-round recreation opportunities close to home. Changes in recreation participation trends create challenges in integrating resource protection with people's desired uses. Land managers are struggling to understand the types, causes, and intensity of changes, as well as unmet demands and visitation barriers for non-users. They perceive that demand for outdoor experiences is being driven by rapid changes in technology and equipment, population increases, the information supply chain, and resource conditions. These changes often occur faster than land managers are able to adapt to or gauge potential outcomes at regional or local scales.

Previous research has improved our knowledge of the effects of changing demographics, technologies, and socioeconomic factors on visitation and outdoor experiences. However, results have not been widely communicated and applied in meaningful ways for public land managers. Additionally, the data needed for long-term monitoring of drivers for recreation demand are collected inconsistently across agencies and scales. Resource managers addressing recreation challenges would benefit from synthesized research and new tools that apply this research in public land management.

Vision

Managers and policymakers are equipped with robust, real-time information about changing demands for outdoor recreation in the near and long term. This information includes user trends, the scope of unmet demands, and barriers that impede visitation. Stakeholders understand the cumulative and likely effects that changes in populations, technology, and resource conditions will have on recreation demand at local, regional, and national scales.

Management needs—

To better anticipate changes, land managers seek up-to-date information about people's expectations and needs regarding public lands. This knowledge will help them expend resources efficiently, allocate personnel and funding, conduct planning and policy efforts, and provide a diverse array of recreation opportunities to individuals and groups with varied preferences for social, managerial, and environmental conditions. Especially useful is an understanding of the relative influence of drivers within the control of land managers and their partners (e.g., market promotion, programming, development) and those outside their control (e.g., population and demographic shifts, fuel prices). To better serve the public, land managers seek information about prospective visitors as well as people who do not have strong connections to public lands. Understanding more about non-visitors will help policymakers and planners identify future opportunities to make public lands more relevant to more people.

Understanding the problem—

American ideas about nature and outdoor recreation are perpetually changing, based on myriad factors, including changes in demographics, economic well-being, public safety concerns, consumer and technology trends, and marketing. Changes in social norms and practices play out on public lands; each season, new recreation practices and patterns emerge, sometimes catching land managers by surprise. This puts public agencies into a reactive rather than proactive mindset.

Research on outdoor recreation demand has historically focused on understanding motivations and expectations for recreation experiences. Although motivations provide important insights into why people participate in outdoor recreation, they generally have not been studied in ways that help predict when or where recreation will occur on the landscape or how motivations might change over time. Moreover, it may not be clear how motivation data are interpreted or extrapolated to other spatial scales or as part of social-ecological systems. Motivations for outdoor recreation



Keith Routman

Warming up with a hot meal while snow camping at Lower Twin Lake, Oregon.

participation remain an important component of the social-ecological system for recreation, and improved approaches to studying and interpreting these data would benefit our understanding of recreation demand.

A large body of research has also focused on how changing demographics and socioeconomic factors affect visitation and recreation demand on public lands. We need a synthesis of existing research to inform the development of new tools that apply this research. Managers need increased access to easily interpreted data and research to help them anticipate and respond to new and emerging public uses and visitor types. The ability to link relevant real-time data to planning frameworks would dramatically improve sustainable recreation planning and management processes.

Finally, we need new research that explores how visitors interact with public lands, seek and share information and make plans to recreate, and use technology and equipment as part of their outdoor experiences. It should examine the demographics and desires of potential recreation users as well as others not currently

drawn to public lands. Focusing research efforts toward these areas, which are likely to be dynamic in the future, will help planners and managers adapt to changing managerial demands. This research could also help managers identify potential visitors and public lands stakeholders and facilitate opportunities to make new connections.

Research goals—

- Develop a framework or predictive model that links changes in population, technology, information, and resource conditions to recreation demand and participation at local, regional, and national scales.
- Design decision-support tools that help managers adapt to changes in market forces, such as new recreation uses and technologies.
- Contribute to databases and knowledge systems that systematically collect, manage, and package real-time data on outdoor recreation consumer trends and interests both regionally and nationally. Connect databases to decision-support tools that inform management decisions by identifying likely outcomes within the dynamic landscape of recreation demands.

Research topics—

- Synthesize how demographics, technologies, and socioeconomic factors, as well as residential, commuter, work, and life patterns, affect preferences and participation trends for outdoor recreation use, including the systemic drivers of these patterns. This includes identifying current users, non-users, and future users of public lands and determining their needs.
- Analyze the role of industry and technology in shaping patterns of visitor use and behavior. This includes examining how advertising, marketing, and product development affect how outdoor experiences are imagined, commoditized, and consumed.
- Understand effective practices for using social media and agency websites to share and exchange information with recreation consumers and public lands visitors. This includes exploring the use of social networking and crowdsourcing applications for exchanging information about recreation opportunities and conditions; examining the role of social media and available recreation information in influencing visitors' spatial distribution in public lands; and understanding how messaging can be used to direct visitors to locations where their use can be managed sustainably.
- Integrate knowledge and information systems about visitors (and non-visitors) with management and planning frameworks to help managers develop science-based strategies to accommodate new and evolving visitor uses.

Outcomes—

The knowledge generated from research within this focus area will help managers better understand and plan for increased and diversifying recreation uses resulting from population growth, demographic changes, urbanization, regional population shifts, evolving information sources, access to new technologies and equipment, and changing resource conditions. Land managers will have the tools and knowledge they need to anticipate the outcomes of their decisions at local, regional, and national scales, and how they relate to other parts of social-ecological systems. As a result, recreational access to public lands by new and long-time visitors will be enhanced while resources are protected, and communities will continue to glean the benefits of recreation, including a robust recreation and tourism industry that boosts their economies and supports a vibrant and sustainable way of life.

Strategic partnerships—

Successful implementation of this RFA will require strategic partnerships that leverage the expertise of diverse communities, disciplines, and networks. Table 3 identifies some critical current and potential partners to advance this work.

Table 3—Strategic partnerships for recreation professionals: assessing new drivers and characteristics of demand for outdoor experiences

Partners	To help with understanding of
Natural resource and recreation managers	The cross-boundary impacts of new and increased forms of recreation and develop methods for mitigating those impacts
Healthcare providers and health researchers	The implementation of health-promotion programs, such as ParksRx, and how they may drive demand for outdoor activities
Community and urban planners and researchers	Drivers of demand related to changing community demographics and infrastructure
Transportation managers, planners, and researchers	How the location and quality of roads, public transportation, and other transportation infrastructure shapes demand for outdoor experiences, and vice versa
Marketing and tourism-promotion organizations	The intended and actual effects of marketing on landscape-scale public lands visitation trends
Trade and industry associations	How consumer and technology trends, such as social media platforms, shape outdoor recreation demand
State offices of outdoor recreation	Drivers of the larger tourism system and the role of outdoor recreation in state economies

What needs to happen?—

Strong interdisciplinary collaborations will be important to progressive research that reveals the drivers of demand for outdoor experiences. Communication and collaboration between researchers and managers will be needed to identify management issues, carry out relevant research projects, and develop new knowledge into methods, tools, and policies that can be applied in public lands planning and management. Research will provide managers with the best available data to aid in planning and management decisions, budget decisions, and development of adaptable policies and regulations at state, regional, and national levels.

Toolbox: Management Applications

- Tools that model the effects of changing demographics, technologies, and socioeconomic factors on visitation and outdoor experiences at local, regional, and national scales.
- Tools that enable long-term monitoring of drivers for recreation demand, providing data and information about changing demands for outdoor recreation in the near and long term.
- Tools that integrate real-time data on outdoor recreation demand into planning frameworks at multiple scales.

Keith Routman



Dawn at a mountaineering base camp, Mount Adams, Washington.

Measuring Success—

- Are new datasets and visitation models available to help managers track trends at relevant management scales?
 - Do land managers feel equipped with tools and information they need to anticipate and adapt to new and emergent public land uses?
-

Research Focus Area 4: Measuring, Monitoring, and Forecasting Visitor Use

The availability of up-to-date, accurate visitation data allows resource managers to predict, plan, and compare visitation across jurisdictions. Research and the development of science-based models, technologies, and approaches are needed to better quantify, predict, and analyze public lands visitation over time and space.

Overview—

The systematic measurement of recreational visitation to public lands has been conducted by federal, state, and local agencies at multiple scales, each using methods that are related but slightly different. Data interpretation is possible at some scales but provides little information at the site level or means of comparing or aggregating data across agencies. Long-term consistent datasets are needed that track visitation to public lands, as well as potential visitors, displaced users, and non-visitors. Challenges with the methods used to collect these datasets are numerous. Response rates to surveys are declining. Inconsistencies across survey questions, designs, and metrics limit their integration. Onsite surveys and monitoring provide the most accurate information, but the operational cost and challenge of counting visitors at sites with porous boundaries limits spatial and temporal coverage. In response to these challenges, new approaches are being tested that build on, improve, and complement traditional monitoring data, including Web- and global positioning system (GPS)-based technology and sociospatial data gathering approaches. This RFA champions the need for these approaches to continue to be developed and integrated across management jurisdictions.

Vision

Effective, consistent, and long-term approaches by the outdoor recreation community to assess, monitor, and forecast visitor use result in actionable information for decisionmaking. New technologies and approaches are continually tested and integrated alongside traditional techniques.

Francisco Valenzuela



Cosmic Campground International Dark Sky Sanctuary, Gila National Forest, New Mexico.

Research on improved methods for measuring and monitoring visitor use contributes to the foundation for recreation planning. Many management strategies that aim to influence the volume, distribution, or flow of public land visitation depend on a numerical estimation of use. Growth or decline in visitation across large areas, as revealed by visitor-use monitoring, may trigger formal planning processes. These trends may highlight the need for new recreation management policies, such as providing a framework for emerging activities or technologies, or building adaptive capacity into policy. Research within this RFA will improve science-based recreation planning and management, addressing the needs of resource managers or planners who are instituting visitor monitoring programs or interpreting existing results.

Management needs—

Resource managers need up-to-date visitation data that are reliable and at relevant scales, and that allow them to monitor current visitor use and predict future use so they can respond to changing visitor needs and socioeconomic and environmental

conditions. These data will inform the development of management actions and infrastructure investments. A nationwide interagency visitation monitoring protocol and database will enhance visitor management across jurisdictions. Partnering with international entities will help produce data that contribute toward the understanding of global protected-area visitation.

Understanding the problem—

Establishing accurate, statistically sound systems for measuring, monitoring, and forecasting public lands visitation is important for management across agency jurisdictions at multiple spatial and temporal scales. Managers and policymakers do not have long-term, consistent datasets to analyze trends, including those that track potential use, displaced visitors, or uses that take place outside of agency jurisdictions.

Longstanding methods are limited in their ability to collect visitation data that allow interpretation at different scales. For example, the U.S. Fish and Wildlife Service National Survey of Fishing, Hunting, and Wildlife-Associated Recreation provides thorough economic data on these activities at the state and national level to understand macro trends and economic impacts. But it does not offer insights for specific sites or whether activities happen on public or private lands. Sampling and estimates for the Forest Service National Visitor Use Monitoring (NVUM) survey are stratified by land-use types and allow for nationally consistent estimates to be made at the forest, regional, and national levels, but do not allow for reliable estimates at the site or district level. Although the NVUM survey provides information across national forests, it provides little information about how these federal lands fit within the broader recreation system.

In addition, some of the existing data collection methods have become problematic. Response rates to surveys continue to decline, and inconsistencies across questionnaire designs limit their integration. The extent of public land and the cost of implementing such programs limit the range of coverage by traditional onsite surveys and monitoring. Furthermore, current methods gather little information on site-specific economic impacts, sociocultural impacts, or the sustainability of natural resources. Emerging technologies and methods are limited by the efficacy, reliability, and validity of data. New approaches are being tested that complement traditional monitoring data, focusing on the use of technology (e.g., social media, cellphone GPS tagging, and other geospatial applications) and sociospatial data-gathering approaches (e.g., participatory GIS, human ecology mapping, citizen science, and volunteered geographic information).

Research goals—

- Identify the level of spatial and temporal granularity of visitation data needed to address key management objectives.
- Examine the relative merits (efficacy, reliability, validity, cost, and utility) of different types of visitation monitoring methods.
- Develop methods to forecast future visitation at spatial and temporal scales relevant to different management needs.
- Determine how visitation affects social (e.g., visitor experience) and bio-physical (e.g., erosion, wildlife habitat) resources across different user groups.
- Design a universal interagency visitation monitoring protocol, best practices, and accessible database structure.

Research topics—

- Characterize the utility and tradeoffs of visitor monitoring methods that operate at different spatial and temporal scales, considering a variety of management objectives, time frames, and costs required to produce results with varying levels of reliability and validity.

USDA Forest Service



Snowmobiling on the Mount Hood National Forest, Oregon.

- Develop visitation forecasting approaches for trends in visitor activities, motivations, and benefits at relevant spatial resolutions and time scales.
- Develop and test emerging technologies, such as social media data, cell-phone GPS data, and other geospatial applications, as tools for estimating public lands visitation.
- Investigate and estimate the response of visitation to natural disasters and broad-scale environmental changes, and the development of innovative approaches that integrate recreation monitoring with disaster recovery efforts and climate change adaptation programs.
- Advance understanding of the relationship between visitation rates and visitor experiences, wildlife habitat conditions, and ecological processes, to inform innovative management and planning that minimizes resource impacts and enhances benefits across multiple user groups and natural resources.
- Develop tools or processes that incorporate visitation data into spatial planning activities intended to balance benefits across multiple recreation types.

Outcomes—

Consistent, readily available visitor data at relevant spatial and temporal scales will better inform planning, management, and user outreach. Real-time data collection will enable responsive management in which managers anticipate and react to short- and long-term trends, enabling proactive planning rather than reactive management. New research and development in this area will increase the efficiency and effectiveness of visitor monitoring and result in more robust, useful, representative, and reliable data to inform the development of diverse management actions. Relevant visitation data gathered at the appropriate spatial scale will inform management strategies to minimize resource impacts and enhance visitor experiences. Better understanding of recreation trends may inform the need for new recreation management policies, such as providing a framework for emerging activities or technologies. Moreover, information about diverse public land visitors will allow for better understanding of visitor use patterns, leading to a greater sense of stewardship. Development of “best practices” guidance for data collection and visitor use monitoring under various conditions will help provide a more unified approach across land management agencies, so that managers can better understand visitor activities, the desires of displaced visitors and non-visitors, and how they move through the landscape and across management jurisdictions.

Strategic partnerships—

Successful implementation of this RFA will require strategic partnerships that leverage the expertise of diverse communities, disciplines, and networks. Table 4 identifies some critical current and potential partners to advance this work.

Table 4—Strategic partnerships for recreation professionals: measuring, monitoring, and forecasting visitor use

Partners	To help with understanding of
Statewide Comprehensive Outdoor Recreation Plan (SCORP) planners	How to improve SCORP data collection so that state responses could be scaled up to regional and national level planning and integrated with other data collection efforts
Interagency Visitor Use Management Council	How we can strengthen our understanding of public lands visitation through coordination and communication at the federal agency level
International Conference on Managing and Monitoring of Visitors in Recreational & Protected Areas	Advances in visitor monitoring and management in European parks and protected areas
International Union for Conservation of Nature—Tourism and Protected Areas Specialist Group	Opportunities for linking monitoring and management processes in the U.S. with global efforts
World Tourism Organization	The connections among global tourism statistics and national, regional, and local trends
Economic and rural development organizations	Opportunities to integrate visitation data gathered at the county, state, and regional scale with public lands visitation data
Tourism destination and marketing organizations	Regional trends and tourism systems, and how to integrate tourism agency data with public agency data
Private industrial landowners	Visitation data collected through industrial landowners’ permits, and how it could be aggregated and integrated with other visitation data
Tribal governments and Native corporations	Visitation or other recreation data collected by tribal governments, and how it could be integrated with other visitation data
Content aggregators, producers, and social media platforms	Recreation patterns observed through information collected using social media and GPS on mobile phones, and its potential for integration with other data

Toolbox: Management Applications

- An interagency visitation monitoring protocol that tracks visitors to public lands and estimates numbers of potential visitors, displaced users, and non-visitors.
- Tools or processes that incorporate visitation data into spatial planning activities that balance benefits across multiple recreation types.
- An interagency compilation of best practices for visitor management and accessible database on visitor use and non-use.
- Cost-effective and timely methods that forecast future visitation at spatial and temporal scales relevant to management needs. This will include testing emerging technologies, such as information from social media, GPS tracking of cellphones, and other geospatial applications, as tools for estimating public lands visitation. Such tools and methods should integrate results of research investigating the response of visitation to environmental change and natural disasters.

What needs to happen?—

We need a concerted and coordinated effort to maximize the potential of existing visitor measurement and monitoring systems and to design and build innovative approaches that address changing needs. Coordination between public land agencies and strategic partners (such as content producers and aggregators, and destination managers) will help recreation and tourism communities become more successful in understanding their unique role within a regional recreation and tourism system. In addition, we need to synthesize approaches used worldwide in protected areas, to better understand how visitation rates and trends can be compared on a broader scale. New research and development partnerships with data scientists, social media practitioners, and geospatial experts will help promote these innovations and expand opportunities.

Research Focus Area 5: Exploring Connections Among People, Nature, and Public Lands

Institutional, cultural, economic, geographic, and physical barriers may prevent or limit people from connecting to natural environments. New approaches are needed to expand opportunities for human interactions with natural and cultural heritage and to equitably share ecosystem benefits with people of all backgrounds.

Overview—

Access to outdoor recreation opportunities on public lands is not easy or possible for everyone. Public land agencies are working with partners to create more inclusive and accessible environments so that the benefits of public lands can be shared broadly. We need research and management approaches to address disparities of access and to welcome people of all backgrounds and abilities to our public lands. Land managers need more information about desired recreation experiences, program needs and services, communication and engagement approaches, and barriers. Efforts to expand diversity of visitors and staff have occurred for decades, but culturally appropriate approaches are needed that recognize the diversity of motivations, meanings, and experiences associated with the outdoors.

New management approaches seek to encourage access for underrepresented groups, and we need information to support those engagement efforts. Institutional and structural barriers remain engrained in our resource management models, which reinforce dominant cultural norms about “appropriate” outdoor activities and practices. This RFA recognizes the need to shift the existing paradigm through which land management agencies provide recreation opportunities, to better

Vision

Research deepens our understanding of changing demographics, cultural and generational differences, different abilities, and diverse benefits of nature and outdoor recreation. This results in tangible and proactive approaches that encourage all people to connect to outdoor places. Information and tools are available for managers to evaluate and assess management actions that address competing and emerging demands.

emphasize diverse human connections to public lands. New research will help managers understand how and why agency reward systems encourage or discourage increasing or diversifying use and enjoyment on public lands.

Management needs—

Managers aim to be responsive to the historical and cultural factors that continue to influence public lands and resource use patterns by underrepresented populations. Agencies have implemented some policies and management strategies to improve diversity, inclusion, and access, but face challenges in management culture and its ability to adapt to changing public interests and demands. Managers seek updated and adaptable tools to manage for diverse public land uses. Managers feel a need to demonstrate to current and future visitors, and to agency leadership, a need to improve the way we address relevancy and inclusion. New engagement methods require training investments, and may seem daunting and risky, as they break from organizational norms. Moreover, a common perspective that our parks, forests, and refuges already experience enough or too much visitation discourages accommodating more and different uses.

Understanding the problem—

The existing research and management paradigms of outdoor recreation tend to view recreation use primarily through two Euro-centric lenses: (1) recreation ecology, which focuses on the human impacts on natural conditions, and (2) recreation behavior, which focuses on the expectations and satisfaction of **existing** visitors. These paradigms are perpetuated through current outdoor recreation planning methods, which focus heavily on natural areas and opportunities to experience solitude. Although this reflects an important legacy of recreation management in the United States, it partially explains why public land visitation represents a narrow slice of White, middle- to upper-class Americans. Furthermore, existing integrative planning tools focus narrowly on site-specific, impact-oriented methods. These models have led to a focus on understanding current uses and topics such



Francisco Valenzuela

Tourists at Námafjall Geothermal Area, Iceland.

as visitation numbers, impacts, conflicts, crowding, and changing visitor behavior rather than topics related to understanding needs of nontraditional and under-resourced groups, encouraging diverse uses and visitation, and linking ecosystem and community resilience to countless mental, physical, social, and community health benefits of outdoor recreation.

As the U.S. population continues to diversify, and international tourism flows and characteristics change, public land management agencies would benefit from understanding how new generations of visitors from diverse backgrounds might visit public lands to seek outdoor experiences that may have spiritual, cultural, health, and other dimensions. Newer research approaches have been developed to better understand these uses, such as human ecology mapping, and integration of local and traditional ecological knowledge into planning and engagement. These approaches may be important for integrating the goals of increased connections and diversity with existing measurements of visitor satisfaction, ecological impacts, and landscape protection at larger scales of analysis.

The multiple benefits of nature contact is an increasingly prominent topic of research and management. Many have affirmed that it is a moral imperative for

land managers to expand access, use, and diversity in outdoor recreation settings and experiences so that benefits are more equitably distributed. Research can help managers understand how recreationist behaviors, preferences, patterns, and traditions change over time. Furthermore, research can help model how changing demographics might influence social-ecological systems, with changing recreation activities, patterns, preferences, stewardship, and a sense of belonging in natural landscapes. This includes cultural and generational differences that affect awareness, understanding, and ultimately use and participation.

Research goals—

- Understand how cultural traditions and personal experiences contribute to the meanings that people derive from their outdoor experiences, and how managers can better incorporate an understanding of these meanings into their practices.
- Understand the institutional, cultural, economic, and physical barriers that prevent or limit people from connecting to certain natural environments, and develop new approaches to reduce or overcome these barriers while developing relationships with communities of interest.

Chris Zuidema



Winter hikers in Vermont.

- Develop and evaluate innovative research tools to improve agency understanding, engagement, and encouragement of the diversity of human values, conditions, and world views related to connections with nature and the outdoors.
- Understand how and why agency reward systems encourage or discourage increasing use and diversity of visitation on public lands, and help managers identify opportunities to emphasize diverse human connections to public lands.

Research topics—

- Develop assessment tools to help managers understand changing preferences and use patterns, and the meanings people ascribe to their outdoor experiences.
- Develop and share culturally relevant and responsive management approaches to improve access and nature connections. Develop methods for **proactively** reaching out to underrepresented and under-resourced populations.
- Build on research about the needs of different groups to update and develop planning tools and decisionmaking aids that prompt considerations of a broad spectrum of connections to the land.
- Identify real and perceived institutional and cultural barriers that reinforce existing agency practices that may directly or indirectly limit participation by some groups, and evaluate approaches to address these barriers.
- Evaluate management actions that address specific objectives for addressing competing outdoor recreation demands. This includes monitoring patterns of use over time as related to objectives for increasing visitation and visitor diversity.

Outcomes—

Knowledge generated by this focus area will help managers to better involve diverse stakeholders in public land management, and better provide for outdoor experiences and benefits across the general population and historically underserved communities. Human health and well-being will be improved through more inclusive and equitable management and programming that responds to the needs and interests of diverse groups. Landscapes, recreational facilities, and outdoor programs that are better designed to promote those benefits will help contribute to healthier, happier, and a more socially connected public.

The research resulting from this RFA will provide managers, planners, and policymakers with proven tools and methods to strengthen and foster new connections to the outdoors among current and potential users across demographic variables (e.g., race/ethnicity, age/generations, gender, socioeconomics) as well as ability

types and special-status populations (e.g., veterans). Data and research findings will inform budget decisions on where and how much to invest, as well as opportunities for strategic partnerships that directly benefit agencies and diverse groups.

Research within this RFA can also be used directly to improve recreation-use zoning, facility design, access, and heritage/cultural conservation programming to attract a wider diversity of visitors. It will identify specific management practices that are less likely to be steeped in a singular Euro-centric interpretation of outdoor experiences. Results from research within this focus area can provide specific guidance on expanding planning tools to better incorporate goals of increasing use and visitor diversity, incorporating community goals, and expanding the regional scale and applicability of these tools.

Strategic partnerships—

Successful implementation of this research focus area will require strategic partnerships that leverage the expertise of diverse communities, disciplines, and networks. Table 5 identifies some critical current and potential partners to advance this work.

Table 5—Strategic partnerships for recreation professionals: exploring connections among people, nature, and public lands

Partners	To help with understanding of
Ability organizations	Opportunities for research on ability that will support improved access and quality of experiences
Veteran organizations	Opportunities to serve needs through public-lands-based programs during re-entry and for ongoing wellness
Big data and social media analytics specialists	The ways different cultural, ethnic, and generational groups experience and communicate the benefits and values of outdoor experiences through social media and other forums
Communication science and social marketing researchers	Effective communication and marketing strategies to reach diverse audiences about the health opportunities and risks associated with outdoor activities
Civil rights, environmental justice, and social equity organizations	Equity issues related to outdoor recreation and access to public lands, and develop bottom-up, community-based, participatory research
Specialists in organizational behavior and the decision sciences	Cultural meanings of nature and outdoor experiences using social networking, adoption-diffusion, organizational behavior, decision sciences, and ethnographic methods

What needs to happen?—

Strong partnerships with communities of interest, across federal, state, and local land management agencies, and with nongovernmental organizations, industry, and researchers, are critical in implementing research and development in this area. Research should be highly collaborative, coproduced by the partners involved at different stages of research. Such stages include problem/question identification, identifying research methods, data collection, interpretation of results, and development and implementation of recommendations. Collaborations among people with diverse perspectives and backgrounds will contribute to the development of tools and methods that truly foster diverse connections between people, nature, and public lands.

Toolbox: Management Applications

- Assessment tools to help managers understand changing preferences and use patterns, and the meanings that people ascribe to their outdoor experiences.
- Updated and new planning tools and decisionmaking aids that prompt considerations of a broad spectrum of connections to the land and encourage the diversity of human values, conditions, and worldviews related to connections with nature and the outdoors.
- Planning tools that better incorporate goals of increasing use and visitor diversity, incorporate community goals, and expand the regional scale and applicability of these tools.
- Approaches that integrate the goals of increased visitor diversity with existing measurements of visitor satisfaction, ecological impacts, and landscape protection at larger scales of analysis.

Measuring success—

- Do research and associated management actions include and represent a diversity of perspectives and experiences from community leaders or their constituents?
- Do an increasing percentage of management units have plans that recognize and address barriers and opportunities to recreation participation?
- Do an increasing percentage of management units host visitation that reflects local or national demographics?

Research Focus Area 6: Integrating Culture and Place Into Land Management and Outdoor Recreation Experiences

Place connections and biocultural heritage are integral components of people’s relationships to public lands. Research is needed to develop and test methods that understand people’s connections to place—past, present and future—and to integrate these place connections with land use planning and management.

Overview—

Public lands cater to diverse human connections with landscapes and host places where people celebrate their natural and cultural heritage. Individuals, communities, tribes, and social groups form distinct ties to the land, based on a history of resource use and tenure-relationships, caretaking, shared experiences, stories, and representations. In public land management agencies, cultural connections are not typically considered part of outdoor recreation and natural resource management programs, owing to the persistence of a culture-nature dichotomy as well as regulatory compliance requirements.

In multiple-use agencies, cultural resources typically are identified within management boundaries primarily to protect them from disturbance rather than to actively promote them as critical elements of human-place connections. In agencies



Jason Blake

Camping at Lost Lake on the Mount Hood National Forest, Oregon.

such as the National Park Service, natural areas and historic sites are managed for preservation and tourism, and agencies with this charge increasingly represent multiple voices and historical layers in their interpretative work and other visitor services. Visitors and the public could benefit if more land management agencies emphasized connections to cultural resources and places.

In this RFA, research will address three key knowledge gaps and will support development of management practices that recognize and enhance people's connections to places. To address the first gap, we need to learn how to improve planning networks among outdoor recreation professionals, cultural heritage specialists, and natural resource managers. A second gap to fill is how to assess cultural connections to places, systematize the use of these approaches, and evaluate their efficacy at various scales and contexts. The third gap highlights the need to document best practices that protect different types of cultural resources or practices, especially those that are intangible, such as cultural landscapes and traditional activities. Finally, researchers and practitioners need insights on effective outreach strategies for delivering opportunities for place-based engagements, such as heritage interpretation and stewardship.

Vision

Public land management routinely incorporates into planning the connections that people have with places through co-management with tribes and local communities to increased promotion and representation of heritage sites, traditional activities, stewardship efforts, and other enduring cultural ties. Visitors and stewards understand landscapes as they are seen in communities whose members have connected with these lands for generations, some of whom continue to forge new connections each day.

Management needs—

Outdoor recreation and cultural resource managers will benefit from models for how to better integrate people's place connections into landscape-scale sustainable resource management plans. They need information about how cultural, historical, and contemporary connections to the lands they manage are important for community building, identity, stewardship, and education. Case studies describing the creation and management of interpretive heritage sites could support visitor services. Managers also need research to show how environmental justice considerations can be incorporated into interpreting the histories of marginalized and underrepresented groups.

Moreover, managers need better methods for gathering expert and community input through consultation with tribes, local and traditionally associated communities, and partners, and for engaging in collaborative decisionmaking. Integration of local and traditional ecological knowledge with scientific knowledge is critical to recreation planning. This increased engagement also informs heritage promotion and protection.

Understanding the problem—

Humans have wide-ranging connections with places on public lands that are special to them. Some of these place connections were recently formed, others were cast a generation prior, and still others have existed for centuries. Public land connections are tied to communities’ cultural traditions, while others have personal or family significance. Place attachments may be formed through repeated recreation use, organized stewardship practices, historical harvest events, and through stories, myths, and representations. Regardless of their nature or origins, these deep landscape connections are important to consider when developing sustainable recreation management practices.

Historically, outdoor recreation and natural resource management often prioritize biophysical rather than cultural elements of resources and manage them as separate entities. Cultural heritage is a leading driver of tourism and helps to promote cross-cultural understanding, enrich communal identity and pride, promote a sense of place, and support a host of other social, ecological, and economic benefits.



Chaco Culture National Historical Park, New Mexico.

However, Euro-centric concepts of culture as separate from nature have stifled the integration of culture and place into land management in North America. Cultural resource management on public lands in the United States is primarily guided by historic preservation and regulatory compliance relative to Section 106 of the National Historic Preservation Act. This is a framework based on site protection; as currently practiced, it does not adequately manage for the intimate and diverse connections people have with cultural heritage, nature, and special places. Better integration of heritage with other resource areas would improve place connections among outdoor recreationists and all visitors to public lands.

For instance, teaching the full history of the American outdoors through stories and memorials of underrepresented groups can make the outdoors more inclusive and relatable both to people who have cultural associations to a place and those who do not. Research should investigate innovative ways to better connect people to their cultural and natural heritage as an integrated social-ecological system. Outdoor recreation research could better support heritage programming by applying a collaborative and democratic process that does not exclude marginalized groups.

Research goals—

- Improve understanding of how diverse connections with special places are represented and considered within management frameworks on public lands as part of social-ecological systems. Research will seek to understand the role of place and its implications for public lands planning and management.
- Develop protocols for monitoring social well-being conditions that link lands and culture, traditions, heritage, and the ways people live, work, and play. Identifying such conditions is important for assessing the management condition as part of land use planning processes; to know what places, features, and resources are important to communities; and how those conditions have changed.
- Develop innovative models that integrate cultural and natural resource management policies, making recommendations or modifications based on reframing heritage as a critical element of natural resource conservation, outdoor recreation, and tourism.
- Research and revise the interpretive history of public lands to better represent the experiences of underrepresented groups whose stories can make the outdoors a relatable and inclusive space.

Research topics—

- Develop tools that help managers understand, protect, and manage for place attachments, cultural associations, and the myriad ways that the public

benefits from and connects to public lands. Build on existing methods of documenting cultural and place attachments to create a suite of toolkits that can be systematically implemented to better understand heritage connections on public lands.

- Compile relevant case studies and develop management integration models to investigate ways to integrate cultural resource management with outdoor recreation and natural resource management.
- Pilot engagement approaches for sharing heritage resources on public lands at various scales, such as through interpretive sites, panels, interactive media, stewardship, and educational projects. Develop protocols for monitoring the outcomes of these approaches.
- Examine histories and analyze traditional human-land relationships with regard to shared stewardship of natural, cultural, and recreation resources. Build on existing knowledge about the motivations for environmental stewardship and the perceived benefits of stewardship as well as the connections among stewardship actions, heritage, and place connections. Investigate heritage stewardship programs that benefit multiple stakeholders.
- Critically analyze how cultural-historical narratives are produced for public lands, and how these narratives can be improved to be more inclusive.

Outcomes—

The effort to reignite the science of outdoor recreation is dedicated to a fuller understanding of how people connect to public lands, moving from a recreation-as-leisure paradigm to a recreation-as-human-connections paradigm beneath the umbrella of social-ecological systems. Cultural heritage is at the core of how many people identify with public lands, and serves as a key linkage between natural and human history. The outcomes of research within this RFA deepen our understanding of the connections between heritage, place connections and relationships, and stewardship. The outcomes will improve the ability of agencies to tell engaging and accurate stories about public lands through multiple lenses, to acknowledge historical land uses and ownerships as well as alternate views of contemporary practices. These stories provide compelling reasons for conservation and management and natural and cultural heritage. Research within this RFA may also contribute to improved relationships among land managers, traditionally associated tribes, communities, and stakeholders.

Strategic partnerships—

Successful implementation of this research focus area will require strategic partnerships that leverage the expertise of diverse communities, disciplines, and networks. Table 6 identifies some critical current and potential partners to advance this work.

Table 6—Strategic partnerships for recreation professionals: integrating culture and place into land management and outdoor recreation experiences

Partners	To help with understanding of
Tribes, cultural groups, and indigenous communities	How to better represent these groups in the interpretive history of public lands, and to protect traditional land use practices
Cultural resource departments in land management agencies	Programs that promote cultural heritage and stewardship, and integrate cultural resources with natural resource and recreation programs
Natural and cultural resource practitioners and researchers	Where cultural heritage and place connections can be integrated into new and existing frameworks and concepts
Communication and interpretive specialists	Improved approaches to conveying information about cultural histories and place connections

What needs to happen?—

This work will be primarily implemented through an integrated social-ecological or biocultural resource and outdoor recreation management framework. It will require a paradigm shift in public land management so that both recreation and heritage are emphasized as important human uses of public lands, starting with changes in organizational culture that prioritize people’s experiences on public lands. Successful implementation may also require new budget allocations for studying and managing cultural affiliations and living human-place connections. The research generated in this area will aid in the implementation of existing laws and policies, such as those associated with the National Historic Preservation Act and National Environmental Protection Act, but will also provide insight for new policies related to enhancing and elevating heritage connections on public lands. Scales of study and implementation could range from local historical connections to neighboring public lands, to regional, national, and even global heritage connections for visitors seeking to understand the people associated with the lands they visit.

Toolbox: Management Applications

- Methods and tools that effectively assess people’s place connections and integrate those connections into landscape-scale sustainable resource management plans.
- Methods for gathering expert and community input from consultation with tribes, local and traditionally associated communities, and partners, and how to engage in collaborative decisionmaking.
- Tools and methods that integrate local and traditional ecological knowledge with scientific knowledge for recreation planning.
- Tools that guide considerations of environmental justice in interpreting the histories of marginalized and underrepresented groups.

Research Focus Area 7: Investigating the Health and Well-Being Benefits of Outdoor Experiences

Outdoor experiences on public lands provide a wide range of health benefits to many, but these benefits are not accessible to all. Research is needed that will examine and measure the health benefits of outdoor experiences to inform the development and management of health-promoting and equitable recreation programs, facilities, and resources.

Overview—

Since the early days of outdoor recreation research, the U.S. population has diversified and urbanized, new outdoor activities have emerged, and appreciation has grown for active lifestyles and outdoor experiences across the urban-wildland gradient. Research from many disciplines has documented the broad human health and well-being benefits related to access to green spaces, water bodies, and nature, especially in urban areas. These insights suggest the potential for partnerships to network recreation opportunities, enhancing health benefits for people across jurisdictions by supporting regular close-to-home activities as well as destination activities in wildland settings.

Many recreation management frameworks still consider visitor experience to be the ultimate outcome of outdoor activities, rather than one of the benefits or outcomes of their visits. Such experiences are often considered only in leisure contexts—how people choose to spend their discretionary time—rather than as integral and necessary parts of people’s everyday lives. When managers have applied outcome- and benefit-based management approaches, it has been challenging for them to meaningfully inform on-the-ground management decisions.

Assessing health benefits comprehensively requires many interdisciplinary methods. The complexities of diverse outdoor spaces and study populations pose challenges for research, and public health or medical investigators have not traditionally collaborated with public land researchers. Outdoor recreation

Vision

Research improves understanding of how a diversity of outdoor experiences in a wide variety of settings yield health and well-being benefits to individuals, groups, and society. This understanding includes the specific benefits of nature contact for all people across all land types, ownerships, and uses, from city centers to wildlands.

researchers need to seek new opportunities to expand or redefine their scope, gain access to funding opportunities, and foster partnerships with practitioners and researchers from the health sciences and other disciplines.

Research in this focus area will provide agencies with insights on designing, developing, and locating facilities, trails, designated areas, programs, and other community connections that promote health benefits. Study results can inform best practices and tools for evaluating or monitoring program effects, and for implementing inclusive and culturally relevant programs that simultaneously address disparities in nature access and health outcomes. Better knowledge will allow consideration of the tradeoffs of health benefits in evaluating programs and policies, and the communication of benefits to decisionmakers to ensure their enhanced and sustained provision.

Management needs—

Land managers struggle to determine how to create suitable places and programs to promote health benefits, assess health outcomes, and reduce barriers and constraints to engagement. Managers need guidance to understand user demand for programming and services, and how visitor areas can be designed, constructed, operated, and maintained to promote health and wellness. Further, public land



Monika M. Derrien

Ice skaters in Ottawa, Ontario.

managers need guidance on implementing inclusive and culturally relevant programs. Finally, public land managers, local leaders, and nongovernmental organizations need guidance on how to better connect their programs and communications across jurisdictions to enable more people to have higher quality and more frequent outdoor experiences.

Understanding the problem—

In recent decades, disciplines from psychology to public health to landscape architecture have developed new research methods to assess the benefits of nature experiences. Although the health benefits of outdoor recreation and nature immersion have long been intuitively acknowledged, scientists are beginning to understand their extent and variety. Benefits include physical benefits (e.g., lower blood pressure, better sleep, improved immune function); mental health benefits (e.g., reduced stress, greater happiness, life satisfaction, reduced depression); and social outcomes (connectedness, reduced aggression and crime). However, populations with some of the greatest health challenges (often related to socioeconomic factors) also tend to be the least served by public lands and greenspaces. Nature- and activity-based treatment for specific populations, such as veterans with post-traumatic stress disorder, has received increasing research attention in recent years.

Health professionals and researchers are increasingly focused on the social determinants of health—the conditions in which people are born, grow, live, play, work, and age—to understand population-level influences on health. Such research is focused on the local environments where people live, including assessment of nature experiences in urban settings. It will be important for future research to examine people’s wide range of motivations and the benefits they receive from outdoor experiences, including research that examines experiences that blur the line between leisure activities and active living (physical activities that are part of everyday life). Better public lands connectivity and management for health benefits will be informed by an improved understanding of the causal mechanisms that promote physical, mental, and social health.

The needs articulated in this RFA will be most directly served by an implementation science approach, or the “study of what works” using small experiments of landscape interventions and program development. These practical studies can be done for different populations and across different environments. Implementation science is critical to policy development; without a conclusive evidence-based rationale, policymakers will not be able to fully leverage funding and support for fostering the benefits of nature and outdoor activities to public health and well-being.



Cecilio Ricardo

A great day to enjoy Sliding Rock, Pisgah National Forest, North Carolina.

Research goals—

- Develop a robust understanding of how the outdoors, recreation experiences, nature contact, and active living can contribute to healthy people and populations by measuring and describing the health and well-being benefits and the mechanisms for these benefits.
- Generate methods and tools that help managers create and assess accessible, desirable outdoor recreation programs and experiences, including the perceived and realized health and well-being benefits of participants.
- Improve understanding of what subpopulations engage in different types of outdoor activities at different sites; the connections between those outdoor activities and associated health objectives; and the features of outdoor activities, neighborhoods, and natural settings that confer these benefits.
- Develop studies that can drive effective planning and policy development, with attention to specific exposures, environments, activities, populations, outcomes, and covariates.

Research topics—

- Synthesize research regarding health and outdoor experiences to summarize current understanding, identify gaps to inform a future research program, and determine effective research models.
- Conduct policy analyses to understand what drives planning and policy development, and effective implementation, to promote public land management practices that improve human health.
- Develop and refine methods to understand how outdoor recreation experiences promote health and well-being. Design research to identify the pathways and causal mechanisms of outdoor recreation and active living benefits, including the dose-response relationship across the type, duration, intensity, and social context of activities, and the environments in which they occur.
- Conduct participatory action research and implementation studies for program pilots in outdoor spaces. Use clinical trials, epidemiological studies, and large-scale databases to determine how to best incorporate new technologies into recreation-oriented health-promotion programs.
- Develop studies to understand disparities in nature access by demographic groups related to income, sociocultural background, gender, and ability. Incorporate metrics that assess the effect of the pro-equity dimensions of programming and infrastructure.
- Generate assessment tools and methods that enable ongoing assessment of outdoor recreation infrastructure and programming and can facilitate the redesign and adaptation of programs to maximize desired benefits.
- Use high-resolution imagery, remote sensing, personal technology such as smartphones, and other tools to better measure and classify nature in outdoor recreation settings and relate it to health outcomes. This includes improving ways that settings and exposures are characterized by using novel environmental metrics.

Outcomes—

Science-based tools will guide land managers in providing relevant opportunities to all people, including diverse populations. Ongoing assessments will help managers adapt approaches through feedback and evaluation of health outcomes. Such data will inform the design of places and experiences that are most conducive to health and well-being, and help delineate environmental characteristics that influence human-environment interactions for health outcomes. Results will be used to demonstrate and communicate the value of public health benefits derived from outdoor

recreation, particularly on public lands. These understandings are critical and could enable policymakers to plan for landscape networks that support recreation, and pursue nontraditional partners in planning and funding, such as health insurance companies, to develop high-impact, cost-effective policies and programs.

Strategic partnerships—

Successful implementation of this RFA will require strategic partnerships that leverage the expertise of diverse communities, disciplines, and networks. Table 7 identifies some critical current and potential partners to advance this work.

Table 7—Strategic partnerships for recreation professionals: investigating the health and well-being benefits of outdoor experiences

Partners	To help with understanding of
Public health, medicine, anthropology, sociology, psychology, and geography researchers	How to best measure and monitor the health and well-being benefits that participants derive from outdoor activities in different biophysical and social environments
Land managers from tribal, federal, state, county, and municipal governments; conservation nongovernmental organizations (NGOs); transportation agencies; and landscape architects and planners	How to plan for and implement locations, facilities, programs, and connectivity to provide networks and systems for recreation and active living
Public health agencies and organizations, community health workers, health insurance companies, and healthcare providers	How outdoor settings and recreational activities can be integrated into health research and promotion frameworks
Public agencies and NGOs that promote “nature connection” tools (ParkRx; Nature Rx)	How to best promote innovation and adoption of “nature connection” tools and gauge the effectiveness of pilot programs
Philanthropic foundations, nonprofits, advocacy groups, businesses, and chambers of commerce	The potential for policy or funding mechanisms for new recreation facilities that enable access to public land networks and green spaces for health and equity
Department of Veterans Affairs, Department of Defense	The role of public lands in nature-based programs for active service members and veterans to promote mental and physical health
Local government, NGOs, and schools	The importance of nature experiences for children and how to enable formal and informal experiences and learning
Departments of transportation and urban planning	The relationship between bike/pedestrian infrastructure for outdoor recreation and active living, and health behaviors and outcomes

What needs to happen?—

This RFA will require robust cross-sector partnerships, leadership, and coordination. Researchers and managers will need to develop new partnerships to adapt frameworks for understanding and valuing public health benefits related to outdoor experiences and spaces, such as ecosystem services and health impact assessment. Research in this focus area will require interagency and intergovernmental

collaboration to facilitate “all lands” partnerships that encourage physical and informational connectivity across jurisdictions and the landscape gradient. These partnerships will help establish linkages across scales from daily and nearby physical activity locations to more distant recreation destinations. Land management policies will need to be updated and funding mechanisms developed to improve access to outdoor spaces. These may improve awareness of health benefits, encourage design of health-focused recreation programs, train providers and managers to implement them, reduce barriers to equitable access, and make permit requirements for providers easier to navigate.

Toolbox: Management Applications

- Methods, tools, programs, and strategies that help managers create accessible, desirable outdoor experiences and encourage outdoor activities that yield health benefits for diverse populations.
- Tools that enable ongoing assessment of the use of outdoor recreation infrastructure and programming, and that guide the interpretation of data to redesign and adapt facilities and programs to maximize desired benefits.
- Methods for pairing established health-tracking methods with technologies such as high-resolution imagery and remote sensing to effectively measure and classify nature and outdoor recreation settings, and relate them to health outcomes.

Research Focus Area 8: Understanding Tourism Economies and Systems for Public Lands Planning

Public land management influences the volume, characteristics, and interests of visitors, yet is often not coordinated with broader tourism systems. Research is needed on processes for landscape and destination management that consider tourism sector actors and delivery systems and that account for the sociocultural, economic, and environmental impacts of public lands visitation.

Overview—

Worldwide, tourism has been developed as an economic driver for natural-amenity-rich communities near protected areas, generating economic opportunities and supporting local livelihoods. However, research about sustainable tourism on public lands in the United States is scarce, with much of this body of research conducted

in the developing world and rural regions outside North America. Models are needed for successful interorganizational coordination for managing sustainable tourism to public lands. Land management agencies often do not consider themselves tourism providers or engage with regional or local tourism planning and management efforts. Public land and waters management of tourism is scattered and inconsistently applied within and across federal, state, local, and tribal agencies and departments. The lack of coordination with regional development agencies and local tourism marketing and promotion entities can lead to diminished visitor experiences, environmental degradation, interorganizational conflict, and an inability to compare visitor spending and other attributes.

Vision

Sustainable tourism planning on public lands considers the economic and social impacts of actions and policy at community, regional, and national levels. Furthermore, planners consider the role of public lands for tourist and resident experiences, coordinate planning and decisionmaking with community and regional partners, and consider sustainable development goals in decisionmaking.

In other parts of the world, protected area managers often consider the links between the promotion of conservation goals, economic development, and sustainable tourism. In the United States, management of public lands typically does not include explicit consideration of these links. Greater recognition of the value of public lands for providing tourism opportunities to diverse visitors, facilitating access to and protection of the country's special places, and improving the quality of life for Americans may help to ensure future institutional support for these activities. New research-informed models and frameworks will make it possible to assess the benefits and costs of tourism at various spatial scales.

Management needs—

Sustainable management of visitation to public lands requires collaboration and coordination with national, regional, and local tourism stakeholders. Managers would benefit from an increased understanding of tourism systems and partnership models, enabling them to better engage with the tourism sector to meet management goals. They also need a better understanding of the social, cultural, and economic implications of management actions related to visitation and use.

Managers would benefit from guidance on how to address cultural and institutional barriers and biases within natural resource agencies regarding tourism. For

Francisco Valenzuela



Mountain bikers start their rides on a trail on the Uinta-Wasatch-Cache National Forest, Utah.

example, tourism’s link to commercial operations (e.g., concessionaires, guiding services) and large groups of visitors offers a different cultural lens than public land management’s traditional focus on single users and small groups. Tourism activities centered on one-time visitors might not be well addressed in traditional management approaches that prioritize enduring and local connections with natural resources. Finally, a better understanding of the economic role public lands play within larger tourism systems would help inform and improve decisionmaking and relationships with adjacent communities.

Understanding the problem—

The United States provides sustainable tourism opportunities on public and private lands and waters from coast to coast, yet it has no consolidated national data source for sustainable tourism activities. Recreationists spend billions of dollars annually on U.S. tourism, and sustainable tourism to natural places is one of the

fastest growing tourism sectors. According to the Federal Interagency Council on Outdoor Recreation, \$51 billion was spent on an estimated 900 million visits per year to national forests, parks, monuments, historic sites, recreation areas, marine sanctuaries, and wildlife refuges in 2012, and outdoor recreation on federal lands and waterways supported 880,000 jobs. And, according to the Outdoor Industry Association, the outdoor recreation industry generated \$887 billion in consumer spending in 2017.

In 2012, the U.S. Government released its first-ever National Travel and Tourism Strategy, with an updated version of the strategy expected in 2020. The strategy mandates land managers to manage sustainable tourism on public lands and waters through enabling and enhancing travel and tourism experiences to and within the United States and coordinating across public and private partners. The strategy also called for research to develop data collection methods that will better capture information on visitors' origins, profiles, activities, motivators, locations visited, length of stay, and spending patterns to improve branding, marketing, and sustainability of the nation as a visitor destination. Although states have successfully engaged in sustainable tourism planning through state destination marketing organizations, federal management agencies have lagged in their coordination with state and private entities for sustainable tourism planning.

We need research to better understand the relationships between the U.S. public lands system and tourism in general, including developing models for landscape-scale tourism planning across jurisdictions. On a local scale, we need research to better understand the complex role of public lands tourism in local and indigenous communities, as has been studied in other parts of the world. These studies have developed and piloted many indicators, metrics, and guidelines. We also need research to explore potential adaptation of global findings to the U.S. context.

Research goals—

- Develop sustainable tourism metrics and indicators and assess their application in the United States to help land managers evaluate the outcomes of their actions and provide a framework for cross-site and cross-agency comparison.
- Develop approaches for measuring the economic effects of tourism on gateway and other affected communities and evaluating the distribution of economic effects among stakeholders. Identify governance and regulatory models that enable more local capture of visitor spending.
- Understand emerging local and regional tourism niches and trends and how they relate to visitor demands on public lands.

- Develop a framework and consistent methods for collecting baseline data about tourism to public lands at the national level and across agencies that contribute to metrics that improve understanding of the social, cultural, ecological, and economic relationships within tourism systems.

Research topics—

- Develop case studies in communities that are shifting to tourism-based economies. Evaluate the distribution of costs and benefits, such as the economic and social effects to communities and concessionaires, including the perception of the changes by local residents.
- Examine organizational needs for accommodating and managing tourism within land management agencies. Model how the revenue generated from tourism could be used to develop and maintain facilities, infrastructure, services, and programs.
- Create best management practices for tourism collaboratives that integrate the needs of different tourism interests, including visitors, providers, and communities.
- Conduct network analyses of connections between federal, state, and regional entities to examine the attributes of successful collaborative models within the tourism supply cluster.
- Compare agency approaches to tourism management, analyzing the supply chains that support tourism on public lands; the actions being taken by the land agencies to introduce, require, and strengthen sustainable-tourism supply chain management; and potential actions that could expand it.
- Understand how visitation management within particular management units affects the flow, volume, or distribution of visitors across jurisdictions.

Outcomes—

Research within this focus area will result in new frameworks, indicators, and planning approaches for sustainable tourism management, including models and best practices for collaborative planning with regional and local tourism partners. Land managers will use research insights to train employees, monitor trends, and develop agency tourism policies. Land management agencies will have the information to communicate the economic, cultural, and environmental importance of sustainable tourism on public lands to visitors, law makers, and policy makers. With improved and consistent organizational practices, regional, state, and local destination marketing organizations will receive clear messages and expect consistent practices from land management agencies. Furthermore, sustainable tourism strategies could increase access and strengthen connections

to America’s public land heritage. They could effectively communicate the market and nonmarket benefits that are realized in the stewardship of public lands and waters, and the ecosystem services (e.g., clean water, clean air, recreation) that are provided to tourists and surrounding communities.

Strategic partnerships—

Successful implementation of this RFA will require strategic partnerships that leverage the expertise of diverse communities, disciplines, and networks. Table 8 identifies some critical current and potential partners to advance this work.

Table 8—Strategic partnerships for recreation professionals: understanding tourism economies and systems for public lands planning

Partners	To help with understanding of
Federal and state land management agencies	Local and regional approaches to tourism-related issues
Regional, state and local, and private destination marketing organizations (DMOs)	Where, how, and to what extent DMOs interact with public land management agencies
State offices of outdoor recreation	The political and economic drivers of promoting different types of public lands recreation
Communities adjacent to public lands (especially rural and gateway communities)	Local social, cultural, ecological, and economic effects of public lands tourism
Tourism planning, community development, applied economics, and public administration researchers	How to best design metrics and indicators of the sustainability of tourism operations on different scales
Tourism extension networks	How research can effectively be developed and translated to serve tourism planning needs
Industry trade organizations (e.g., U.S. Travel Association, Cruise Line Industry Association, Adventure Travel and Trade Association)	Opportunities and challenges for tourism operators that facilitate visitation to public lands
Global tourism organizations (e.g., United Nations World Tourism Organization World Travel and Tourism Council, International Ecotourism Society)	International best practices and approaches for tourism management in protected areas
Private land management entities	How these lands connect (or could connect) within a larger tourism system
Global Sustainable Tourism Council	Global standards for destination planning
Inbound tour operators bringing foreign visitors to the United States	The changing demographics and tourist preferences of international visitors

What needs to happen?—

To make progress in addressing management challenges through this RFA’s research outputs, governments will need to support the development of public land and water agency mission-specific frameworks consistent with implementing sustainable tourism. An understanding of tourism markets, consumer trends, and other

political and financial aspects related to public lands will help governments and partners strategically plan for tourism. Public land agencies will need to proactively and strategically collaborate and coordinate with tourism-sector stakeholders and researchers, especially those in rural gateway communities, to support sustainable tourism. Planning and marketing of public lands will need to be coordinated and aligned with enforcement of public land regulations. Research within this RFA will be most impactful if researchers and managers identify and implement high-leverage collaboration opportunities for federal agency engagement in regional and local tourism planning processes. The implementation of these strategies will help ensure that the economic and societal benefits of public lands tourism are leveraged to provide equitable community services and resources.

Toolbox: Management Applications

- Best management practices for sustainable tourism collaboratives that integrate the needs of diverse tourism interests, including users/visitors and providers/communities.
- Tools for determining the returns on infrastructure investments for public lands and gateway communities.
- Tools for measuring the economic effects of tourism on communities and the distribution of economic effects among stakeholders.
- Models for successful interorganizational coordination for managing sustainable tourism to public lands.
- Sustainable tourism metrics that managers can apply at multiple scales to evaluate the outcomes of actions and decisions and to provide a framework for cross-site and cross-agency comparison.
- Implementation frameworks for the National Travel and Tourism Strategy and other strategic documents.

Measuring success—

- Have we developed and institutionalized standard, cross-agency metrics that measure and monitor tourism?
- Have U.S. government agencies increased participation in international, national, regional, and local tourism planning forums?
- Have we identified and shared best practices for managing public lands as part of tourism systems with tourism planners, land managers, and communities?

Crosscutting Themes of the Research Focus Areas

The eight RFAs reveal several common challenges, demonstrating the tensions between old and new ways of thinking and how they influence the ways that recreational professionals study and manage places, activities, and people. We need more interdisciplinary interactions among researchers and managers; more consideration and coordination of scales, contexts, and systems in planning; and a more inclusive concept of recreation that reflects the many ways humans connect with natural environments. The five crosscutting themes in this section serve as general research themes, and also provide considerations for approaching research questions more specifically.

Crosscutting Themes

- Disciplinary connections
- Human connections with nature beyond leisure
- Context-driven management
- Working across multiple scales
- Science-management co-production

Disciplinary connections—

Sustainable recreation is an applied area of research and practice that is inherently multidisciplinary, spanning the entire range of biophysical and socioeconomic sciences, with traditional focus areas in ecology, economics, and human behavior. The RFAs draw attention to the lack of integration across current disciplinary approaches and make the case for including foundational thinking and analytic approaches from new disciplines, such as public health, social justice, community resilience, tourism management, organizational behavior, and public administration. Furthermore, we need to overcome the dichotomous focus of land management agencies on utilitarian, production outputs and the protection/restoration of “natural” lands that are essentially devoid of humans or cultural significance. We need a broader and more disciplinarily integrated approach to sustainable recreation research and practice to help managers consider the abstract, symbolic, and interactional ways humans connect to public lands that are not well described by either of these production- or protection-oriented approaches.

Human connections with nature beyond leisure—

People participate in outdoor activities for a variety of interconnected reasons, including spending time with family and friends, exercising, releasing stress, mastering new skills, commuting to work, earning a living, and connecting with traditions and places. Research and management approaches that have viewed

outdoor recreation only within a leisure context have addressed a narrow slice of the motivations, benefits, and outcomes of certain kinds of activities in certain kinds of places. This has limited our understanding and consideration of the ways that people connect with nature, and created challenges in managing activities that span the leisure-work spectrum. It has also resulted in the lack of consideration of human benefits in many management or policy decisions (e.g., road decommissioning or capacity limits), when they are rarely quantified.

Keith Routman



Hikers exploring Ape Cave, a lava tube on the south flank of Mount St. Helens, Washington.

Context-driven management—

Formulaic management approaches in which large bodies of data are collected without being driven by specific questions, and without plans for analyzing or integrating the data to inform decisionmaking, are often inefficient and ineffective. Although such approaches allow managers to feel that they have been comprehensive in their approaches, they often lead to situations in which managers experience “analysis paralysis” by the volume and breadth of data with which they are presented. Furthermore, because of a dearth of social science data and technical science expertise, relevant recreation data are often omitted. The more focused approach of context-driven management encourages managers to collaboratively identify the values of concern, collect relevant data, analyze the tradeoffs between various management scenarios, and then make data-informed decisions that explicitly state the values that have been considered and prioritized in decisionmaking. Managers would benefit from adapting approaches to particular managerial contexts. However, this is often at odds with the formulaic, one-size-fits-all approaches and efficiencies required by administrative processes and culture.

Working across multiple scales—

Resources are managed on public lands at many different spatial scales, making the integration or implementation of management within a social-ecological systems framework challenging. The appropriate spatial scale for consideration depends on the management problem or research question being posed, and standardizing scales of analysis can lead to inefficiencies. At the same time, there are efficiencies in collecting data that can be used for multiple purposes. All RFAs consider the multiple scales at which management issues are addressed, and the systems in which they are embedded, with most emphasizing the importance of addressing management issues at landscape scales with various levels of granularity. Some also highlight the value of developing research, tools, frameworks, and partnerships at multiple, nested scales and across jurisdictional boundaries.

Science-management coproduction—

To address the management challenges described in the RFAs, we need scientific understanding that is coproduced by scientists, managers, and other practitioners. This coproduction is challenging because of barriers to the exchange of information among researchers and managers. All the RFAs describe the need for better networks of sharing information, developing and implementing research ideas and projects, and monitoring the outcomes of science-informed management practices. Furthermore, systems of professional advancement for researchers incentivize some areas of research attention and certain types of research products. These may not directly or immediately serve management needs, creating a tension between the different demands for applied and theoretical research.

Implementation Strategies for Igniting a New Research System

Traditional approaches in which researchers produce scientific knowledge or data for consumption by managers fail to acknowledge that managers and other practitioners are part of the knowledge generation process. Coproduction of knowledge refers to the contribution of multiple knowledge sources and capacities from various stakeholders and partners with the goal of cocreating knowledge and information to inform decisions. Knowledge coproduction embraces the idea that scientists, managers and partners are part of the process of learning and discovery. Moreover, scientific knowledge is but one way of knowing. Professional technical expertise, local and traditional knowledge, and practitioner, or user knowledge and experience are all important. Harnessing these knowledge forms within the process of discovery and learning enhances our collective capacity to understand and make sound decisions.

Implementation Strategies

1. Transform agency culture in land management to enhance sustainable recreation.
2. Establish new structures and processes for recreation science coproduction and exchange.
3. Establish partnerships across organizational jurisdictions, economic and sectors, and disciplinary silos.

While synthesizing the many sources of data for this research strategy, we identified implementation strategies that will enhance knowledge coproduction. Like the crosscutting themes, these could be organizing strategies for research programs or the focus of research programs themselves. We describe three implementation strategies here.

Implementation Strategy 1: Transform Culture in Land Management Agencies to Enhance Sustainable Recreation

Agencies are challenged with fostering a culture in which sustainable recreation is treated as integral to their missions and appreciated for the diverse benefits it provides to the public. Research and management partnerships would help prompt and sustain changes to organizational culture that would enhance recreation management capabilities.

Managing public lands for sustainable recreation requires a change in organizational concepts of what public lands produce. Many public land management agencies were established in an era when outdoor recreation was viewed as a secondary byproduct of resource management (timber, range, etc.), rather than a mission-critical function. This institutional bias shapes how outdoor recreation policy has been developed and implemented and influences levels and types of investments in recreation research and development. Broad-scale sociocultural and environmental changes amplify the need for a ground-up reassessment of management philosophies toward recreation to initiate and sustain needed transformations within slow-moving bureaucracies.

A variety of institutional, organizational, staffing, and practical barriers make these changes challenging. Institutional recalcitrance, hierarchies, and administrative environments are not conducive to either the experimentation or learning needed to move into a new paradigm. The administrative, budgetary, and disciplinary silos evident in large agencies would benefit from working collaboratively, while also recognizing distinct expertise and authority, to support the building of integrated systems



Francisco Valenzuela

Crossing Lake Teusajaure, Stuur Muorkke National Park, Sweden.

that include sustainable recreation management. Large government bureaucracies often compartmentalize procedures and information specific to each discipline, resulting in reductionist solutions that are not well integrated. Land managers will benefit from reorganization of visitor management functions within agency administrative units and an expanded capacity for recreation research and management through innovative collaborations. Changes in organizational culture will help public land recreation management organizations become more self-reflective, adaptive, agile, and learning focused, while maintaining a high degree of relevance to the public.

Priority actions—

- Restructure incentives to reward research for practical, applied purposes
 - Create organizational structures and practices that facilitate agile, adaptive learning and management toward strengthening the capacity and sustainability of public lands recreation programs.
- Shift from a science delivery mindset to a science coproduction mindset
 - Invest in knowledge production and exchange to build capacity to plan, implement, and manage for sustainable recreation.
 - Explore mechanisms that lead to coproduction of knowledge and the integration of scientific and traditional knowledge to better understand aspects of sustainable recreation in a way that is useful for practitioners.
 - Develop value-added and creative financial and partnership strategies that expand the capacity of public lands recreation programs at all levels with innovative public-private partnerships, recreation fee programs, volunteer programs, support from user groups and the outdoor industry, outfitter/guide partnerships, philanthropy, local tax initiatives, and community-based service-delivery models and programs.
- Cultivate, execute, and highlight projects that model the impact of linking research and practice
 - Develop science-informed practices at demonstration sites where innovative approaches to sustainable recreation management are developed, monitored, and assessed. Use demonstration-site insights to further develop and institutionalize practices.
- Devote resources to knowledge synthesis and translation
 - Create new curriculum, training materials, and learning programs for the next cadre of recreation land management professionals, including curriculum geared toward entry-level recreation professionals, mid-career training for transitioning professionals, and non-recreation professionals interfacing with recreation.

Implementation Strategy 2: Establish New Structures and Processes for Recreation Science Coproduction and Exchange

Collaborative approaches are needed to integrate the scientific knowledge produced by researchers with the accumulated practical knowledge held by managers and other practitioners. Such approaches will create opportunities conducive to information exchange to allow development of more efficient and effective applications.

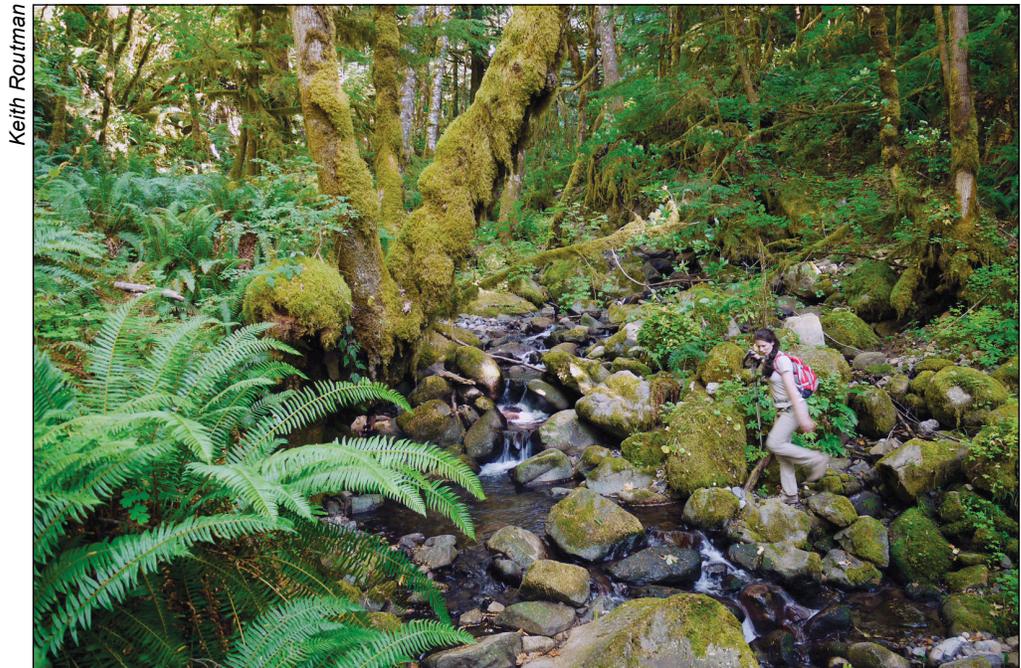
Public land management agencies in the United States and protected areas globally face pressing challenges associated with protecting the integrity of natural and cultural resources while also providing access to an increasingly diverse array of visitors engaged in a plethora of outdoor activities, using rapidly changing consumer technologies. Today's recreation managers need the most up-to-date data, scientific information, and research findings to address emerging problems. In many public agencies, such as agriculture and tourism, extension agents translate scientific products into decision-support tools, management applications, and user-friendly approaches. In many cases, scientific findings gathered in one geographic or administrative setting can be applied elsewhere, but it may not be clear how or under what conditions the findings apply.

Effective outdoor recreation management would benefit from investment in new institutional structures for science creation, delivery, and exchange in a way that fosters collaboration, coproduction, and mutual learning. Managers help science to advance by pointing out priority needs and providing substantive experiential knowledge. Researchers can help frame questions, access diverse scientific communities, and develop empirically based approaches to tackling questions. Additionally, extension specialists can help translate, apply, and communicate science to a variety of settings and conditions. A system of mutual scientific information exchange, coproduction, and shared learning is imperative, and a two-way extension model would aid in the dissemination of applied science. Investments in institution and capacity building to promote science coproduction, exchange, and delivery would help improve the efficiency and efficacy of sustainable recreation management.

Priority actions—

- Form communities of practice that create networks at multiple scales
 - Establish an active and dynamic community of practice that brings together scientists, managers, and other practitioners of outdoor recreation and tourism.
 - Explore use of existing and emerging institutions that embrace extension services, such as in tourism and agriculture. Find ways to better incorporate outdoor recreation into the extension system.

- Create a mechanism for research funding for sustainable recreation and tourism research similar in structure to the Cooperative Ecosystem Studies Units Network, with an associated funding mechanism to foster cooperation between federal agencies and universities, including university extension services.
- Leverage spatial tools and data dashboards to aid integration with other disciplines
 - Invest in interagency and interdisciplinary teams of researchers and managers to tackle problems that persist across landscapes and management jurisdictions.
 - Encourage formal and informal structures and settings that bring together innovators from universities, industry, and government to develop creative new tools, technologies, and approaches to aid in recreation planning and management.
- Deepen knowledge of cultural, ethnic, and generational factors through direct participation
 - Develop habits, protocols, and markers of success for science coproduction in a way that values and recognizes a diversity of knowledge forms and sources and that integrates scientific, professional, experiential, indigenous, and local knowledge systems.



Keith Routman

Hiker visiting the Columbia River Gorge National Scenic Area.

Implementation Strategy 3: Establish Partnerships Across Organizational Jurisdictions, Economic Sectors, and Disciplinary Silos

Investing in cutting-edge science and innovative technology for sustainable recreation and tourism requires interdisciplinary collaboration and public-private partnerships across sectors. Research from disciplines such as public health, environmental technology, business, data science, cognitive science, and communication science can spark advances. Forming strong and innovative partnerships between public, private, and academic entities will harness collective knowledge and capacity for advancing sustainable recreation and tourism science and practice.

The science of outdoor recreation and tourism is inherently interdisciplinary, drawing from social sciences, resource management, and ecology. Traditional approaches to the management of outdoor recreation on public lands have focused on ways to minimize impacts to the natural environment while maximizing visitor opportunities and experiences. Management of visitors has been the focus, leading to the planning tools developed in the 1980s. Increasingly, recreation professionals and scholars recognize the importance of understanding visitor motivations and expectations for experiences that shape uses and perceptions of public lands; consumer trends and communication platforms that shape activity patterns and technology use; and demographic trends that shape who is visiting public lands and how their cultural lenses and norms shape their expectations and actions. We need communication science to understand how social marketing can encourage desired visitor behaviors. We need to use big data sources to gain insight into visitor preferences and experiences. And finally, we need a greater awareness of the connections between outdoor recreation and human health, as well as new research collaborations to quantify the health benefits of public lands. To address these questions, we need new disciplinary partnerships with communications, business, data science, public health, and other disciplines.

In addition, we need new cross-sector partnerships among federal, state, and local agencies to coordinate the expansion and extension of the benefits of outdoor recreation and tourism to the public. State governments in the United States are increasingly investing in outdoor recreation, prompted by recognition of the ties between outdoor recreation, economic development, and human health. County and municipal partners are coordinating efforts with community-based organizations on the local scale with potential ties to federal agencies. As resources become strained, it is important for multiple agencies and entities with shared interests in outdoor recreation

to come together to leverage existing capacities and draw on unique strengths. One example of an emerging partnership is between health providers, veteran organizations, recreation industry leaders, outfitters and guides, and public land agencies to provide positive outdoor experiences for veterans and their families. These types of partnerships can create synergies and help to energize outdoor programs.

Priority actions—

- Invest in cross-sector partnerships
 - Identify nontraditional partners that coalesce around critical topics in recreation and tourism management, such as in health care, transportation, and economic development.
- Promote inclusion of academic and industry science alongside agency efforts
 - Organize targeted workshops, working groups, and conference sessions that bring together scholars and practitioners from multiple disciplines.
 - Create entrepreneurial opportunities, such as micro-grants, to entice new partners to work together.
- Employ more direct and replicable data collection methods that can be used across boundaries and sectors
- Create partnerships among public land agencies, universities, the outdoor industry, private foundations, nongovernmental organizations, medical centers, and technology innovators. Such partnerships will convene the collective knowledge and create the capacity to develop innovative tools, management frameworks, and approaches that work toward sustainable recreation and tourism.



Keith Routman

Climbers ascending the final pitch to the summit, Mount Thielsen, Oregon.

Measuring Success

As we proceed with the research activities prioritized in this strategy, we will need to routinely ask ourselves if we are making progress toward our collective aspiration to improve the social, cultural, economic, managerial, and environmental sustainability of recreation. How will we know if our organizational cultures are changing in a way that allows researchers and managers to partner more effectively across disciplinary silos? How will researchers and managers know if they have been successful in their efforts to coproduce and apply relevant recreation science? How will we know if science-informed management is producing desirable outcomes on the ground? By measuring success in terms of process, outputs, and outcomes, we will be able to gauge our collective progress in implementing this research strategy.

Process: Are people coming together? Is our culture of science-management collaboration improving?

Questions that will help us measure improvements to our processes include the following: Have our networks of collaborators increased in quality and quantity? Do social network indicators show enhanced or increased partnerships and collaboration? Have research programs coalesced and new funding sources been identified? Are research programs being coproduced, with research informed by management from the earliest phases? Potential metrics include grants received, research programs developed through science-management collaborations, regional communities of practice organized, and federal dollars spent on convening and conducting recreation and tourism research.

Outputs: Are we producing useable frameworks, models, and tools?

Questions that will help us measure the quality of our outputs include the following: Are managers adopting the products developed by recreation researchers? Are they providing feedback that is used to improve tools, frameworks, and other products? Potential metrics include science synthesis publications; implementation/demonstration studies and projects; development, piloting, refinement, and adoption of management tools; and new policies that mandate the use of best-available recreation science.

Outcomes: Are we using outputs effectively and are they producing desired outcomes?

Questions that will help us measure the success of our outcomes include the following: Are we closer to the vision statements described in the RFAs? Are there positive outcomes resulting from the process and products of research-management partnerships? Have organizational cultures evolved to better serve recreation demands? Have approaches been successively adapted to changing circumstances? Potential metrics include organizational assessments; recreation program evaluations at multiple scales; comparing demographic profiles of public lands visitors with U.S. Census Bureau data; and longitudinal analysis of visitor satisfaction data.

A Collective Call to Action

Public lands matter to us all. With more than 80 percent of Americans now living in cities, there has never been a clearer call to strengthen our ties to public lands and broaden the base of understanding about the importance of the benefits of nature interaction for people. Connecting with Americans and building relationships with new audiences will affect how public lands are valued and supported. Outdoor recreation and stewardship activities that connect people and communities with public lands is a fruitful pathway for creating the next generation of conservationists and stewards of our natural and cultural heritage. The ISOR initiative is designed to encourage new dialogues, foster the coproduction of new knowledge, and stimulate interactions among researchers, managers, and practitioners that leads to cutting-edge tools to manage, monitor, and encourage sustainable use of natural and cultural resources.

The ISOR research strategy suggests an unprecedented alignment of public land management agencies, universities, outdoor programs, and strategic partnerships to leverage our collective knowledge, resources, and energies around sustainable approaches to manage outdoor recreation and tourism. Collaboration is critical to achieving our mutual goals. Researchers, managers, and practitioners from around the United States have provided their experience and insight to illuminate critical information needs, research initiatives, and plans for coordinating efforts to design and develop innovative planning frameworks, decision tools, and approaches that inform on-the-ground management. This research strategy calls for reinvestment in research and development for outdoor recreation and tourism, building stronger bonds between scientists, managers, and practitioners, and fostering new working relationships that allow us to coproduce knowledge and generate valuable, actionable information for land managers and stakeholders that can be immediately put into practice.

We are committed to supporting the principles of the research strategy and to providing attention and support that will help them take hold. A community of recreation and tourism practitioners continues to convene and champion key topics, including specific strategies and recommendations for implementing the strategy. New leaders are emerging, and efforts to build our community through regional and national workshops and advantageous gatherings at national conferences will help expand our efforts and build our community. We encourage partners to learn more about ISOR initiatives by joining the community of practice. We also seek to stimulate new knowledge and information by encouraging researcher-manager teams to develop new tools, frameworks, and approaches that encourage sustainable practices and to model adoption of innovative approaches in pilot projects across land management jurisdictions.



Keith Routman

Backpackers in the Eagle Cap Wilderness, Wallowa-Whitman National Forest, Oregon.

The ISOR research strategy challenges researchers across agencies, organizations, and industry to embrace a fundamentally different way of working together. The strategy invites all agencies and partners to explore the social phenomena of outdoor recreation and to discover new knowledge and develop new management models that will aid us in our shared quest to sustainably develop our natural and cultural heritage for future generations through outdoor recreation management. We believe that through thoughtful and informed planning at multiple spatial and temporal scales, outdoor experiences can be extended to more people and can include an increasing diversity of settings, activities, and experiences while building resiliency in the socioecological environment. We encourage engagement of outdoor providers, partners, other agencies, and community stakeholders to develop optimal solutions that meet shared goals and community needs. The research strategy encourages innovators who seek to embrace a culture of mutual responsibility and shared success, who leverage assets to tackle complex challenges, and who demonstrate an enduring commitment to a collaborative, facilitative, and entrepreneurial approach. Our intent is for these practices to become the new “business as usual” in our efforts to ignite the science of outdoor recreation.

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Appendix 1: Glossary of Terms

The following terms, used throughout this report, have been included here for the reader's convenience. Some of these terms are being reconsidered as we begin to break down traditional barriers between work and leisure and expand our notions about the multiple benefits derived from being outdoors or connecting with nature.

outdoor experience—A physiological or psychological effect felt by an individual or group that is associated with being in nature, learning about nature or the outdoors, or participating in outdoor activities.

outdoor recreation—Outdoor experiences resulting from recreation activities that occur in and depend on the natural environment (Moore and Driver 2005).

public land—Lands and waters managed by federal, state, and local governments. In the United States, ownership of public lands is shared by all citizens.

protected area—A defined geographical space that is recognized, dedicated, and managed (through legal or other effective means) to achieve long-term nature conservation with associated ecosystem services and cultural values (Dudley 2008).

recreation—Activities undertaken during leisure and the intrinsically rewarding experiences that result from engaging in those activities (Clawson 1985). (This traditional notion of recreation distinguishes between leisure-time and work activities. Contemporary conceptions recognize the blurred distinctions and have broadened the spectrum of activities included in this category.)

recreation conflict—Interference with a visitor's recreational goals that he or she attributes to the behavior or actions of another person.

recreation ecology—The study of the ecological interrelationships of humans and the environment in the context of outdoor recreation or nature-based tourism and their management (Leung and Marion 2000, Monz et al. 2013).

recreation opportunity—The availability of a user choice to participate in a preferred activity in a preferred setting to realize desired experiences (USDA FS 1982).

resilience—The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks (Walker et al. 2004).

social-ecological system—A complex and adaptive system that emphasizes that humans are intrinsically part of nature and not separate from it. The system is defined at different spatial or temporal scales that may be linked (Berkes et al. 2000).

sustainability—A paradigm for thinking about the future in which environmental, societal and economic considerations are balanced in the pursuit of an improved quality of life (UNESCO 2019).

sustainable recreation—The provision of desirable outdoor opportunities for all people, in a way that supports ecosystems, contributes to healthy communities, promotes equitable economies, respects culture and traditions, and promotes stewardship ethics now and for future generations.

sustainable tourism—Tourism that takes full account of its current and future economic, social and environmental impacts, and that addresses the needs of visitors, the industry, the environment, and host communities (UNWTO 2020).

systems approach—A holistic view of components and interrelationships among the components of a system (Berkes et al. 2000).

tourism—Activities of persons traveling to and staying in places outside their usual environment for not more than 1 consecutive year for leisure, business, and other purposes (UNWTO 2020).

visitor use—A human presence on public lands for reasons that may include outdoor recreation, education, interpretation, inspiration, and physical and mental health (Interagency Visitor Use Management Council 2016).

Appendix 2: Partial Results of National Recreation and Tourism Needs Assessment Survey

1. Background and Approach

The purpose of the assessment is to expand our understanding of management challenges, information needs, and other issues associated with the sustainability of recreation and tourism on public lands and protected areas. Recreation and tourism professionals were asked to complete a 10-minute online assessment. Questions were a combination of fixed response and open-ended questions. The assessment was sent to 153 individuals on a list generated by a workshop planning committee and 34 additional individuals who were recommended by these respondents. The assessment was forwarded to many others using a chain referral sampling approach. The survey was also circulated among the Tourism and Protected Areas Specialists (TAPAS) Group, which is part of the International Union for Conservation of Nature's World Commission on Protected Areas.

We received responses from 146 members of the recreation and tourism community from many different types of organizations and with a variety of roles. (30 of whom responded to the TAPAS circulation). This report presents descriptive data for most questions. Data were not gathered anonymously; results here represent the collective responses. The report presents basic tables or graphs with responses to each question and brief comments about patterns observed. This project was organized by the U.S. Forest Service Pacific Northwest Research Station and the organizing team of the Sustainable Recreation and Tourism Working Group.

2. Response Summary

The largest category of respondents came from universities (30 percent), followed by the National Forest System (21 percent), and nongovernmental organizations (16 percent). Further detail is provided in table A2.1. Respondents falling into the "other" category were primarily independent consultants, or those who work in the private sector. Respondents were asked about their professional expertise, selecting from multiple categories (fig. A2.1). The most common categories included planning, including both recreation or tourism planning and natural resource planning, followed by researcher.

Examples of roles falling under the "other" category included private sector (outdoor recreation provider, tour development, responsible tourism lodge owner, destination management); training and education; activist; community relations; stakeholder coordination; government affairs; permitting, fees, and legislative issues; and marketing, promotion, and communication.

Table A2.1—Respondents by organization type

Organization type	<i>Number</i>	<i>Percent</i>
University	42	30
U.S. Forest Service National Forest System	30	21
Nongovernmental organizations	23	16
U.S. Forest Service Research and Development	9	6
Other federal agencies	9	6
Bureau of Land Management	8	6
National Park Service	7	5
State/local government	6	4
Other	8	6
Total	142	

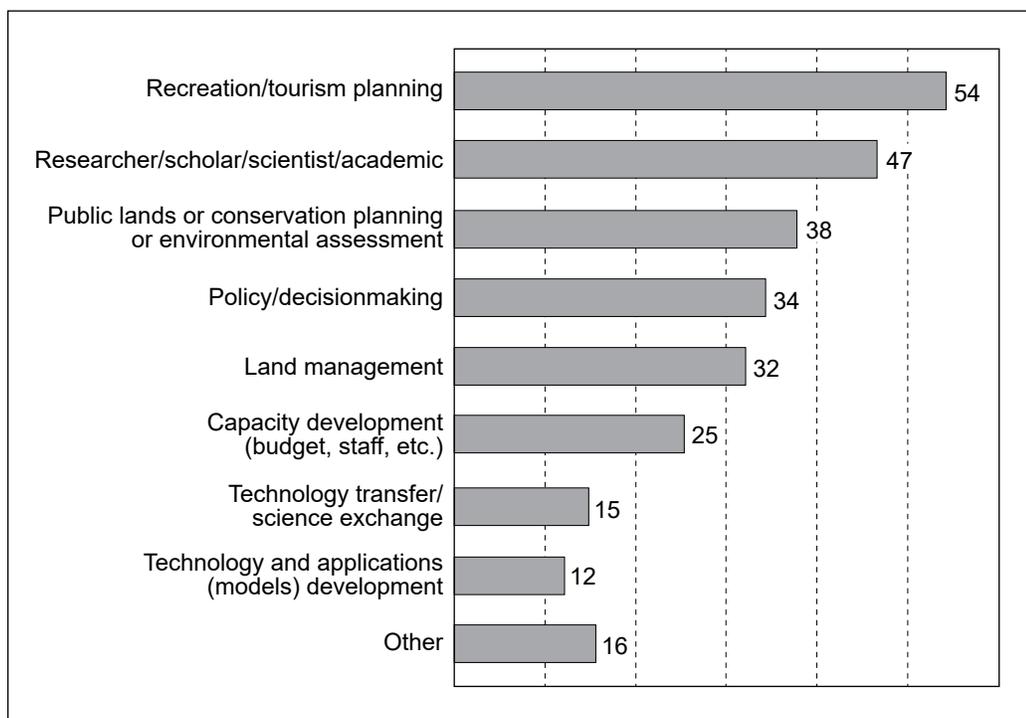


Figure A2.1—Percentage of respondents in each primary role or professional expertise (n = 146).

3. Management Challenges: Recreation and Tourism

What do you see as the current challenges in managing or planning for outdoor recreation and tourism on public lands that could benefit from additional research?

We identified six themes of current challenges in managing or planning for outdoor recreation and tourism on public lands based on 146 responses (tables 2 and A2.2). The most popular theme addressed the challenge of managing increasing current and future demand with existing capacity (58 percent). Although many respondents addressed the perpetual lack of adequate funding, responses also indicated other capacity-related areas, such as ineffective partnerships and collaborations, inability to implement existing management practices and enforce regulations, lack of expertise in procuring funding, and poor distribution of allotted funding. These issues are exacerbated by the current and projected increases in outdoor recreation demand.

Responses highlighted the need for improved integration of social science methods and data, with common challenges regarding understanding users for improved visitor management (45 percent), expanding opportunities to new and diverse users (38 percent), and understanding the social and economic value of public lands (33 percent). Some respondents suggested that current management and monitoring models and tools (32 percent) either needed better implementation or reassessment of the utility of these models and tools in the current social and environmental climate. Environmental issues such as visitor impact also came up as a common challenge (21 percent).

The challenge of using new technology fell under two themes: understanding users (e.g., through user interactions with public lands through social media), and management and monitoring models and tools (e.g., leveraging data from social media to monitor visitation rates and locations).

Information, Tools, and Research Needs

What information, tools, or research would help improve our ability to manage outdoor recreation and tourism on public lands?

Nine themes of information, tools, and research to improve our ability to manage outdoor recreation and tourism on public lands emerged from 137 responses (tables 3 and A2.3). Social science-oriented information, tools, and research proved to be important, with 35 percent of respondents expressing a need to improve our understanding of users, 15 percent indicating a need for tools to better engage diverse users, and 9 percent expressing a need for further research on human benefits of recreation on public lands. One-third of respondents indicated the need for better tools for recreation management, including both specific topics such as spatial

Table A2.2—Management challenges identified for sustainable recreation and tourism on public lands, with explanations and examples, listed in order of decreasing frequency (n = 146)

Theme		Subthemes	Explanation
	<i>Number (percent)</i>		
Managing increasing current and future demand with existing capacity	85 (58)	Agency capacity, funding, demand, participatory management, interdisciplinary collaborations, partnerships, infrastructure	Challenges of building agency capacity to effectively implement management practices, foster effective partnerships, enforce regulations, maintain and develop infrastructure, and distribute and procure funding, especially considering recent and projected increases in demand for outdoor recreation opportunities.
Understanding users	66 (45)	Conflict, technology	This theme addresses the need to better understand users, considering topics such as user motivations, expectations, perceptions, locations of activities, and how people connect with nature and public lands.
Expanding outdoor recreation opportunities to new and diverse users	55 (38)	Access, communication, education, infrastructure, permitting	Providing access to an increasingly diverse public, improving access for non-users, and communicating effectively with diverse users and other agencies and stakeholders.
Understanding social and economic value	48 (33)	Economic impact of tourism, social impact of tourism, understanding values of protected areas	Lack of understanding and emphasis of protected area social and economic values toward goals such as improving benefit sharing with communities and communicating value to policy makers; an overemphasis on such tangible values was also addressed.
Management and monitoring models and tools	46 (32)	Technology	Reassessing the effectiveness of existing management conceptual models and tools; developing more effective models and tools, and streamlining these across areas and agencies.
Managing for positive human-environment interactions	31 (21)	Environmental impact of recreation, impact of climate change on recreation	This theme addresses (1) the challenges of managing impacts of increased and diversifying forms of recreation on the environment, and (2) changing recreation patterns resulting from climate change.

technology and social media, and a general call for improving existing tools and developing new ones.

Improved communication avenues and tools were addressed within two themes: research-management communication (24 percent) and public outreach (17 percent). Although agency capacity was one of the main challenges addressed in the first open-ended question (see section 2 above), fewer tools and information needs that were brought up fell under this theme. Respondents offered creative solutions to address these challenges through a variety of approaches.

Table A2.3—Information, tools, and research needs to improve outdoor recreation and tourism management on public lands, with themes, frequency and percentage of responses, subthemes, and an explanation (n = 137)

Theme	Subthemes	Explanation
	<i>Number (percent)</i>	
Understanding users	48 (35) Visitor use patterns, preferences, capacity, crowding, tourism	This theme included visitor preferences, conflicts, capacity, crowding, number of visitors, and visitor use patterns; the need for longitudinal studies to understand how free pass programs impact long-term forest use and diversity; and suggestions to move outreach programs to young adults as they form value systems and to focus more research on understanding different concepts of nature, nature connections, and desires for public lands by diverse groups.
Technology and tools	46 (33) Spatial technology, social media, developing new tools, improving existing tools	Tools need to be updated, simpler, easier to use, and systems-based. We need more data for existing tools, an integration of separate tools and data into unified and simplified systems. Integrate spatial recreation information into management, drones for monitoring, social media for demographic and visitor use data, and link physical health indicators with social science data.
Research-management communication	33 (24) Technology transfer, managerial education	Managers need better training in tools and technology, researchers need to better communicate science to management. Implementation of the Interagency Visitor Use Monitoring Council program was mentioned several times.
Public outreach	24 (17) Education, public outreach, communication	Orient people who are new to the outdoors, collaborate with local communities, teach environmental sustainability such as “leave no trace”, and integrate interpretive signs and infrastructure to situate visitors into natural and cultural landscapes.
Ecosystem health	23 (17) Climate change recreation effects on ecosystem health	Effects of climate change on recreation and tourism, ecological impact of increased recreation, how to influence visitor choices to benefit the environment, and improve recreation infrastructure sustainability (i.e. location, design, and maintenance).
Expanding outdoor recreation opportunities to new and diverse users	21 (15) Diversity, user types, access	Engaging diverse users and non-users through understanding a variety of human connections with public lands, access, visitation, and distribution of demographic groups, creating innovative methods for engaging diverse users, and incorporating diverse interests in planning

Table A2.3—Information, tools, and research needs to improve outdoor recreation and tourism management on public lands, with themes, frequency and percentage of responses, subthemes, and an explanation (n = 137) (continued)

Theme	Subthemes	Explanation
	<i>Number (percent)</i>	
Agency capacity	18 (13) Staffing, funding, policy, laws	Research and support is needed on identifying partners, appropriated dollars, donations, and other funding sources. Stronger relationships with managers and researchers in the natural sciences may integrate better funding and support. There is a need to remove barriers in the approval process for survey research, improve survey techniques, identify policy-relevant data, and streamline NEPA processes.
Economic information	17 (12) Ecosystem services, tourism, development, retail services, forest products	Better understanding of economic benefits of public lands, including the value of ecosystem services, associated tourism and outdoor industry trends, and distribution of economic benefits to local communities.
Human benefits	12 (9) Public health, well-being, cultural ecosystem services	Emphasis was placed on highlighting the importance of recreation on public lands to its public health benefits, as well as human well-being, satisfaction, and benefits from cultural ecosystem services.

NEPA = National Environmental Policy Act.

Appendix 3: Sustainable Recreation Research Workshop Participants

Workshop Attendees, Golden, Colorado, April 2018

Name	Organizational affiliation	Title
Arato, Christine	National Park Service	Chief of interpretation and education
Armstrong, Melanie	Western Colorado University	Professor and public lands coordinator
Arthaud, Greg	U.S. Forest Service	National program leader, Ecosystem Services Research
Atkinson, Lauren	Western State Colorado	Student
Bailey, Margaret	CHM Government Services and Society for Outdoor Recreation Professionals	Vice president of development
Baker, David	Bureau of Land Management	Outdoor recreation planner
Barborak, Jim	Colorado State University	Co-director, Center for Protected Area Management
Benitez, Luis	Colorado State Government Office of Outdoor Recreation Industry	Director
Benzar, Kitty	Western Slope No Fee Coalition	President
Blahna, Dale	U.S. Forest Service, Pacific Northwest Research Station	Research social scientist
Bosak, Keith	University of Montana	Professor
Bowker, Mike	U.S. Forest Service, Southern Research Station	Research social scientist
Boyce, Sandy	U.S. Forest Service, Washington office	National wildlife ecologist
Bricker, Kelly ^a	University of Utah	Professor
Brown, David	America Outdoors Association	Vice-president for government affairs
Brunswick, Nancy	U.S. Forest Service, Intermountain Region	Regional landscape architect
Bustam, Tinelle	U.S. Forest Service, Washington office	National assistant director
Cervený, Lee	U.S. Forest Service, Pacific Northwest Research Station	Research social scientist
Cottrell, Stuart	Colorado State University	Professor
Cressy, Daniel	U.S. Forest Service, Pacific Southwest Region	Regional landscape architect/recreation planner
D'Antonio, Ashley	Oregon State University	Professor
Derrien, Monika	U.S. Forest Service, Washington office	Sustainable Recreation Program lead; Presidential Management Fellow
Dexel, Levi	University of Colorado Outdoor Program	Assistant director
Dow, John	U.S. Forest Service, Rocky Mountain Region	Forest planner
English, Donald	U.S. Forest Service, Washington office	National Visitor Use Monitoring program leader
Fehlau, Robin	Bureau of Land Management	Outdoor recreation planner
Finger, Tim	Bureau of Land Management	Recreation Program, Colorado
Fix, Peter	University of Alaska Fairbanks	Professor
Flores, David	U.S. Forest Service, Rocky Mountain Research Station	Research social scientist
Floyd, Myron	North Carolina State University	Professor

Workshop Attendees, Golden, Colorado, April 2018 (continued)

Name	Organizational affiliation	Title
Franchina, Rachel	U.S. Forest Service, Rocky Mountain Region	Mountain resorts team lead; Society of Outdoor Recreation Professionals president
Garcia, Graciela ^a	Latino Outdoors	Colorado regional coordinator
Goodwin, Katie	Access Fund	Public land associate
Hall, Troy	Oregon State University	Professor
Hartter, Joel	University of Colorado	Associate professor
Helmer, Matthew	U.S. Forest Service, Pacific Northwest Research Station	Research social scientist
Heung, Janette	Colorado Office of Outdoor Recreation Industry	Deputy director
Hopkins, Brian	Bureau of Land Management	Assistant field manager
Jenkins, David	U.S. Forest Service, Eastern Region	Director of recreation
Ketelle, Martha	Unaffiliated	Former forest supervisor, White River National Forest
Kihia, Simon	U.S. Forest Service, Pacific Northwest Research Station	Program manager
Kovaly, James	Clear Creek County	Trails supervisor
Kramer, Anna	American Alpine Club	Policy coordinator and grants manager
Lara, Ben	U.S. Forest Service, Rocky Mountain Region	District recreation and lands officer
Lenard, Kalem	Bureau of Land Management	Associate field manager
Leung, Yu-Fai	North Carolina State University	Professor
Lohr, Luanne	U.S. Forest Service, Research and Development	National lead, economics
Lucero, Carl	U.S. Forest Service Research and Development	Director
Luther, Beth	Clear Creek County	Executive assistant to the Board of County Commissioners
Lyon, Katie	U.S. Fish and Wildlife Service, Human Dimensions	Social scientist
Machnik, Lisa	U.S. Forest Service, Pacific Northwest Region	Recreation, Heritage, Lands and Partnerships staff officer
Martin, Steve	Humboldt State University	Professor
McCool, Stephen	University of Montana	Professor emeritus
Meier, Noelle	U.S. Forest Service, Northern Region	Recreation, Wilderness, and Trails Program manager
Meldrum, Bret	National Park Service	Social scientist
Meyer, Warren	National Forest Recreation Association; Recreation Resource Management	Vice president
Miller, Anna	U.S. Forest Service, Pacific Northwest Research Station	Research social scientist; Oak Ridge Institute for Science and Education fellow
Milnor, Adam	National Park Service	Community planner
Morgan, Dorothy	Bureau of Land Management	Outdoor recreation planner
Morse, Wayde	Auburn University	Professor

Workshop Attendees, Golden, Colorado, April 2018 (continued)

Name	Organizational affiliation	Title
Novak, Lis	U.S. Forest Service, Washington office	National recreation planner
Pavoni, Dana	U.S. Forest Service, Pacific Northwest Region	Recreation staff officer
Penbrooke, Teresa	GP RED	CEO and founder of GP RED
Placchi, Jack	Bureau of Land Management	Recreation planner
Povec, Maria	American Alpine Club	Policy director
Rasmussen, Randy	Back Country Horsemen of America	Director, Public Lands & Recreation
Roberts, Nina	San Francisco State University	Professor
Roberts, Ryan	Colorado State University	Ph.D. student
Robertson, Jason	U.S. Forest Service, Rocky Mountain Region	Deputy director for Recreation, Lands and Minerals
Rogers, Karla	Bureau of Land Management	Landscape architect and human ecologist
Rose, Levi	Outdoor Alliance	Land use planning and GIS manager
Sánchez, Jose	U.S. Forest Service, Pacific Southwest Research Station	Research economist
Schlafmann, Michael	U.S. Forest Service, Pacific Northwest Region	Public services staff officer
Schuster, Rudy ^a	U.S. Geological Survey	Branch chief/social scientist
Selin, Steven	West Virginia University	Professor
Semmens, Darius	U.S. Geological Survey	Research physical scientist
Smith, Katherine	U.S. Forest Service, Pacific Northwest Research Station	Assistant director, program development
Snider, Gabrielle	U.S. Forest Service, Enterprise	Natural resource specialist
Stein, Jennifer	National Park Service	Program analyst
Stein, Taylor	University of Florida	Professor
Torres, Omero	U.S. Forest Service, Pacific Northwest Region	Public services staff officer
Valenzuela, Francisco	U.S. Forest Service, Southwestern Region	Director of Recreation, Heritage & Wilderness
Vieira, Joseph	Bureau of Land Management	Planner
Weldon, Leslie	U.S. Forest Service, Washington office	Deputy chief, National Forest System
Wentworth, John	Town of Mammoth Lakes	Mayor
Werner, Steve	American Land & Leisure	President
White, Eric	U.S. Forest Service, Pacific Northwest Research Station	Research social scientist
White, Rachel	U.S. Forest Service, Pacific Northwest Research Station	Science writer
Wiens, David	International Mountain Bike Association	Executive director
Williams, Daniel	U.S. Forest Service, Rocky Mountain Research Station	Research social scientist
Yankoviak, Brenda	U.S. Forest Service, Rocky Mountain Region	Continental Divide National Scenic Trail administrator

^a Involved in the process but unable to attend the workshop.

Appendix 4: Sustainable Recreation Research Workshop Summary

Press Release: Workshop Ignites Interest in the Future of Outdoor Recreation

April 3–5, 2018

Golden, Colorado

In early April, surrounded by the spectacular beauty of Colorado’s Rocky Mountains, a diverse, talented, and energetic group came together to shape a positive future for public lands, recreation, and human well-being. Convened jointly by U.S. Forest Service Research and Development and National Forest Systems, the meeting was organized by scientists from the Pacific Northwest Research Station in collaboration with the Bureau of Land Management, the National Park Service, and several universities. The workshop drew nearly 90 participants who work in recreation across federal and state agencies, non-governmental organizations, industry, and other partner organizations. The purpose of the three-day workshop was to chart a course to strengthen sustainable recreation research and management capacity nationally and internationally.

Addressing participants, Carl Lucero, Director of U.S. Forest Service Resource Use Sciences in the Research and Development branch, said that the workshop comes at a critical time. “This is an exciting opportunity, particularly because we have management and research co-creating an agenda,” he said. “Forest Service R&D has a commitment to working with managers to provide tools and decision support to help diversify recreation. We want to respond to an important and growing need.”

Public land management agencies have a pressing need for new and better information about outdoor recreation trends. Social, political, and economic conditions have changed from the previous era when recreation policies and standards of practice were established. The U.S. population is growing and becoming more diverse. Visitation has increased, yet agency capacity to manage recreation has declined. Concerned about equity and access, agencies seek ways to connect diverse communities with the benefits of outdoor experiences.

Those benefits are vast. Outdoor recreation has a far-reaching positive impact across the U.S. and our economy. Outdoor recreation activities accounted for 2 percent of the entire U.S. gross domestic product in 2016. Further, the values individual humans receive from recreation and spending time in natural environments cannot be overestimated.

As Francisco Valenzuela, U.S. Forest Service Director of Recreation, Heritage, and Wilderness for the National Forest System and a key workshop leader stated, “Without public lands, we cannot exist. What would we be without public lands? Something more bleak, more gray, with less freedom, less beauty.”

New research will help recreation agencies and organizations be more strategic in enhancing outdoor experiences and responding to changing needs. Workshop participants discussed topics ripe for new tools, research, and synthesis, including: improving connections to diverse communities, data collection and technology, recreation planning and management, understanding visitor benefits, and the economics of outdoor recreation.

The effort to bring together a community of practice to shape the future of recreation research and management was led by scientists at the Pacific Northwest Research Station. Before convening the workshop, they assessed the information needs of recreation and tourism professionals across a range of organizations. This helped focus topics of discussion at the workshop. Over the three days of the workshop, new relationships formed between science and management communities and with outdoor recreation partners. Land managers, public officials, and recreation organizations shared ideas with researchers and began building the foundation for a strategic agenda to direct future research and identify the need for new applications and approaches for planning, management, and monitoring of recreation use.

Outcomes of the workshop will include a set of working papers on critical topics that inform outdoor recreation and tourism that will be published as a technical report, a community of practice for exchanging information and developing a common language, and a research agenda that expands upon research emphasis areas identified in the workshop to guide research on recreation and tourism in the digital age.

Leslie Weldon, Deputy Chief of the U.S. Forest Service, gave the keynote address at the workshop. She summarized the importance of outdoor recreation to the agency’s mission: “To secure the future of healthy public lands we have to invest in understanding the connection between people and the land. That is our highest aspiration. The future of the land depends on people caring about it.”

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