121 The recreation ecosystem: A social-ecological systems application for recreation ecology highlighting wildlife

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Introduction

Ecology is a complex discipline, involving interactions between organisms and between organisms and their environment. It is inherently interdisciplinary, with "organisms" referring to all life science disciplines, "environments" encompassing all natural sciences, and "interactions" implying systems analysis of natural with social, political, and economic sciences. Despite a history of conflicting philosophical and methodological approaches, Keller and Golley (2000) argue that ecology has come to embrace the idea that human-dominated communities are 'natural systems' and that ecology is a 'science of synthesis' in its interpretation of nature.

Recreation ecology is a subdiscipline that traditionally focused on advancing the understanding of negative impacts of recreational activity on ecosystems, likely resulting from the early focus of this field on one-way relationship (e.g., Cole 1987, Liddle 1997). Examples of topics illuminated through recreation ecology research include the impacts of recreation on soil erosion, water quality, vegetation, invasive species, wildfire, and wildlife. A limited subset of recreation ecology research has framed research questions as stemming from a two-way relationship, and many authors articulate their work as contributing toward the dual goals of balancing biodiversity conservation and recreation opportunities. An alternative conceptualization of recreation ecology has been proposed to broaden the field by investigating two-way relationships between outdoor recreationists and the ecosystems in which they recreate (e.g., Leung & Marion 1996, Ryan 2015).

Research outside the recreation ecology field investigates the benefits of natural ecosystems on recreationists, benefits of recreation on the protected ecosystems in which it occurs, and negative impacts of ecosystem components on recreation. Other, less common explorations apply ecological concepts to understand recreation opportunities, activities, and behavior. However, empirical research investigating relationships between social and ecological systems in the recreation context within the same research project (e.g. D'Antonio et al. 2013) are sparse. A recent review of the recreation ecology literature revealed this scarcity, with only 3.4% of articles considered interdisciplinary (Sumanapala & Wolf 2019). Interdisciplinary research is critical in understanding how social and ecological systems work together in the outdoor recreation context. This gap could be addressed through development of a framework for interdisciplinary studies in recreation ecology.

Our aim is to provide a simple framework for situating recreation ecology research in the larger social-ecological system, broadening the field to incorporate two-way interactions between recreation and ecosystems. These interactions range from positive to negative, with feedbacks occurring at nested hierarchical levels (Figure 1). We argue that this framework is more representative of this highly complex system than traditional human-impacts research and provides a more holistic understanding of the recreation ecosystem. We illustrate this framework with a wildlife case study.

The Framework: Application to Wildlife-Recreation Interactions

Through its inherent connection with all ecosystem components, wildlife provides an excellent nexus to illustrate the social-ecological system framework for recreation ecology. Below we provide a snapshot of research topics within each of the four quadrants in our proposed framework (Figure 1), first describing the quadrant traditionally addressed in recreation ecology research.

Quadrant 3: Negative effects of people on wildlife

The traditional definition of recreation ecology as human-impacts research falls entirely within this quadrant. Recreation has many direct negative effects on wildlife, ranging from stress to fatality.

Indirect effects include altering habitat features, such as soil compaction or vegetative structure.

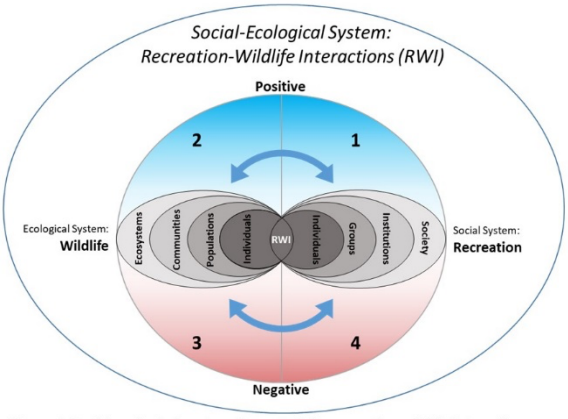

Figure 1. Social-ecological systems framework for recreation-wildlife interactions. (Reproduced with permission from Miller et al. 2020).

Quadrant 4: Negative effects of wildlife on people

Research within this quadrant is often referred to as human-wildlife conflict. Such conflicts can threaten human safety, e.g., animals attacking hikers, or result in property damage such as bears destroying cars or tents. These conflicts affect both the recreationists' experience and sometimes the fate of the animal involved. If conflicts occur repeatedly, they can scale up to affect people and wildlife at systemic levels.

Quadrant 1: Positive effects of wildlife on people

A large and growing body of literature investigates the positive outcomes of wildlife and habitat contacts for people, often quantified as ecosystem services. Wildlife-based recreation is an important draw for protected area tourism and can have large economic benefits. Natural landscapes that host native wildlife populations deliver health and well-being benefits to those that recreate in them. Incorporating the benefits of wildlife for recreationists into recreation ecology research is critical in developing knowledge of these two-way relationships. Likewise, integrating human-benefit research into protected area management can help ensure that recreationists maximize benefits from their experience while maintaining critical habitat for wildlife, thus realizing the dual goals of protected area management.

Quadrant 2: Positive effects of people on wildlife

Outdoor recreationists and others can be powerful supporters of public land and wildlife conservation goals, in donating time and money toward environmental protection, or behaving in more environmentally-friendly ways. Positive associations between conservation behaviors and participation in outdoor recreation, specifically wildlife-dependent activities, have been found in multiple settings. Benefits of wildlife-based recreation for wildlife have been institutionalized, e.g., through revenue generated by hunting and fishing licenses. Weighing these considerable benefits with the negative impacts of recreation on wildlife is critical in decision-making.

Implications

The concepts advanced above are more than a semantic debate. From a policy perspective, most protected area designations entail public use, community economic benefit, cultural resource protection, and other requirements that suggest positive interactions between humans and natural systems are important subjects for recreation ecology. While humans have an outsized impact on the environment, they also can bring outsized benefits. Research on these and other topics are usually not the focus, or well-synthesized, in recreation ecology.

The discipline of recreation ecology is at a turning point, concomitant with other fields demonstrating progress by integrating formerly siloed research into a social-ecological system. Through the proposed social-ecological system framework of recreation ecology presented here, we aim to coordinate this effort. Ultimately, we posit that these changes in the recreation ecology paradigm can advance the outdoor recreation field beyond perceived problems and improve outdoor recreation management for future generations.

References

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