

Introduction to the Special Issue on Climate Change and Outdoor Recreation: Shifting Supply and Demand

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The production of high-quality outdoor recreation opportunities is dependent upon relatively stable and predictable climatic and environmental conditions. As concentrations of greenhouse gasses continue to rise, regional and local climatic conditions are becoming increasingly variable. In turn, environmental systems are adapting, often in nonlinear and unforeseen ways. For example, the onset of spring runoff to earlier times of the year and less frequent winter precipitation events are directly affecting hydrologic resources (Stewart, Cayan, & Dettinger, 2005). Consequently, many outdoor recreation resource managers are facing difficult decisions regarding how to plan for and manage outdoor recreation settings impacted by climate change. Managers need a scientifically grounded understanding of how visitation patterns will change in response to altered climatic and environmental conditions. The seven papers included in this special issue collectively address how both the supply of, and demand for, outdoor recreation settings and opportunities are being impacted by changing climatic conditions.

The first article by Zajchowski and his colleagues (2018) provides outdoor recreation planners and managers with insightful advice on how to best manage climate-related risks in times of uncertainty. Their essay provides timely guidance for planners and managers struggling with a desire to prioritize science and facts over current political agendas and agency mandates.

Two studies by Perry and her colleagues make substantial methodological contributions to the field by utilizing regional climate change models to elicit behavioral responses from snowmobilers (Perry, Manning, Xiao, Valliere, & Reigner, 2018) and state park visitors (Perry, Manning, Xiao, & Vallerie, 2018) in Vermont. The use of climate and hydroclimatological models to guide survey research is not common in research investigating the impacts of climate change on outdoor recreation opportunities (e.g., Loomis & Richardson, 2006; Richardson & Loomis, 2004; Smith et al., 2016). The coupling of biophysical and social data is an important progression within the field (Bitsura-Meszaros et al., 2015). Outdoor recreation planners and managers need estimates of future use patterns to be guided by the best available projections of future environmental conditions. The work by Perry and her colleagues demonstrates how careful collaboration between biophysical and social scientists can lead to scientifically defensible, localized, and importantly, actionable research on outdoor recreation behavior. Their innovative work will serve help outdoor recreation planners and managers across the state of Vermont.

The impacts of climate change on the behavior of outdoor recreationists is a complex process involving both direct and indirect mechanisms (Hand, Smith, Peterson, Brunswick, & Brown, 2018). The study by Ferguson and his colleagues in this special issue (2018) highlights the important role that perceptions play in mediating the relationships between an outdoor recreation setting impacted by climate change and the coping behaviors of outdoor recreationists. Through the application of a stress-coping model, the study suggests Lake Erie visitors' awareness of water quality as well as their perceptions of water quality impacts are related to the use of both cognitive and behavioral coping mechanisms. The study lays important groundwork for further investigations into the complex and dynamic ways that climate change impacts the demand for outdoor recreation opportunities, particularly related to how visitors will respond as conditions become less favorable for desired activities.

The studies by Chapagain and his colleagues (2018) as well as Askew and Bowker (2018) complement the other papers in the special issue by offering analyses at much larger spatial scales. The work of Chapagain and his colleagues combines data collected through the USDA Forest Service's National Visitor Use Monitoring program with weather data to estimate the net economic benefit of downhill skiing and snowboarding, and the projected impact of climate change on the demand and value of the activities. The authors find the total economic value of downhill skiing in the U.S. National Forest system ranges from \$2.16 to \$4.39 billion annually. The authors also find that climate change will have a substantial impact on both the demand for downhill skiing and snowboarding as well as the economic benefits derived from the activities. These results highlight the substantial amount of economic activity that will be lost as the climate continues to warm and the opportunity to have high-quality winter outdoor recreation experiences dwindle. Askew and Bowker's (2018) investigation illustrates that not all outdoor recreation activities will see a reduction in demand under climate change. Their nationwide analysis estimates the impact of climate change on participation in 17 outdoor recreation activities. The authors conducted this analysis at both the national level as well as at four sub-national regions, providing outdoor recreation managers and planners with invaluable insights into how participation in specific types of outdoor recreation activities is likely to change in the coming decades.

There are many ways in which outdoor recreation planners and managers can prepare for shifts in the demand for outdoor recreation. The work of McCreary and her

colleagues (2018) showcases one of these adaptation measures: the creation of a dedicated fund, supported through the sale of unique license plates, that would be used to fund regional climate change adaptation planning. The study found visitors' sociodemographic characteristics (income and age), their social-psychological attachments to the destination and their perceptions of climate-related risks, significantly affected their willingness to pay a fee for the plates. The study illustrates that specific populations may be highly motivated to support climate change adaptation planning. These findings provide positive news for a variety of different stakeholders in nature-based tourism dependent communities who are actively seeking out ways to proactively plan for future climate-related impacts to outdoor recreation resources.

Collectively, the special issue provides outdoor recreation resource managers with practical advice on how to plan for, and adapt to, the impacts of climate change. The research presented within the issue spans spatial scales from local to national and topically addresses everything from climate change perceptions and coping behaviors to place-meanings and destination loyalty. Each of the studies represents a valuable contribution to our understanding of the complex and dynamic relationship between climate change and outdoor recreation. More importantly, each offers practical guidance for outdoor recreation planners and managers actively addressing the impacts of climate change in their jobs. We hope the research presented within this special issue will provide actionable recommendations that enable outdoor recreation professionals to make proactive management decisions that ensure the continued production of high-quality outdoor recreation opportunities across the country.

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