

Adapting to climate change in the changing climate of resource management

THE BEATLES SANG, “NOTHING’S GONNA CHANGE MY world.” As witnesses to such climate change effects as sea-level rise, reduction in glacier mass, and timing of snowmelt and plant growth, protected area managers know otherwise. As the climate changes, so does the world, and so must protected area management style. In a presentation of general guidelines for the management of national parks and protected areas under climate change, Baron et al. (2009) highlight an unavoidable fact: “Climate patterns of the past will not be climate patterns of the future.” Though science will continue to play a fundamental role in understanding climate change, to help increase resilience of some resources, the authors urge natural resource professionals to embrace new ways of thinking about resource protection that incorporates planning for uncertainty about rates, magnitude, and specific kinds of change that are plausible. They indicate that experiments in management style are at least as important to adaptation to climate change as advances in science. “Adaptation to climate change, not resistance to it, is the best option,” the authors stress, and they recommend adaptive management “wherever possible.”

Much of the authors’ review of scientifically based principles for natural resource management under climate change will sound familiar to *Park Science* readers. For example, assessing and prioritiz-

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ing resources at risk based on expert opinion, workshops, literature summaries, and targeted research, and the role of monitoring to detect change in high-priority resources, are all well-established strategies. However, establishing climate-related thresholds for ecological change probably represents new thinking for some, as this activity requires sorting out acceptable versus unacceptable levels of change and evaluating the degree to which change can be controlled or not. Methods for adapting to climate change can be more focused if the standard against which current and future conditions can be compared—the reference conditions—are well defined. When they are defined clearly, a goal for protection or restoration can be better executed. If reference conditions cannot be retained as climate changes, they can help managers focus on planning for adaptation to conditions that are sustainable.

Adaptation to climate change is about adapting to uncertainty. Scientific uncertainty revolves around our ability to (1) foresee or predict changes with enough certainty so as to be able to begin planning for their occurrence, (2) imagine possible changes that are hard to predict with certainty, and (3) prepare for unknown and therefore surprising changes, possibly caused by climatic interactions with other human activities. One approach the authors describe is the development of management plans that do not aim for a specific outcome, but instead embrace the complexity of landscapes and ecosystems. This strategy depends on the magnitude and kind of uncertainty, and on the degree to which ecological processes can be controlled. Planning for uncertainty could involve several approaches. For example, when uncertainty is low and ecological processes are highly controllable, traditional planning (desired future conditions) may suffice, whereas when uncertainty is high amid controllable processes, adaptive management is recommended. This latter approach allows managers to move ahead with imperfect knowledge and refine management actions as new information comes to light. The authors also review the utility of scenario planning when uncertainty is high and controllability is low, and “hedging” for when controllability and uncertainty are low. They stress the importance of public involvement in the “scenario building” process for its ability to generate management support.

Uncertainty not only complicates management choices but also affects the social realm in which public agencies practice resource management. As resource risk rises, managers need to be empowered to take nontraditional, “reasoned management risks without concern for retribution,” the authors say. That is, in order to be as effective as possible in dealing with the uncertainties of climate change, the decision process should be what is most important rather than the decision itself. Working in this paradigm, the authors argue, will require that management actions be based on public involvement and transparency in discussions. Given the indication for adaptive management, this dynamic of stakeholder collaboration will make it necessary to reevaluate those actions frequently.

Adaptation, the authors contend, can be enhanced by taking action to minimize human-caused stressors to park and protected area ecosystems. Reducing pollution, habitat fragmentation, poaching and resource exploitation, and the spread of disease can all improve an ecosystem’s resilience to climate change. Revisiting policies from time to time as new findings from science come to light is another idea that will help the National Park Service adapt. Finally, because the climate operates at local, regional, continental, and global scales, so too must management of ecological processes be directed at appropriate levels. Bird and mammal migrations are examples of the need for broader, cooperative management to help species adapt to climate change. Ecosystem-based management “consortia” such as those used at Yellowstone and Great Smoky Mountains national parks are good models for building cooperation across multiple jurisdictions.

In conclusion, Baron et al. (2009) lay the groundwork for resource managers to develop “a robust and diverse set of strategies . . . to confront the uncertainties and complexities of climate change.” As they demonstrate, effective adaptation will require new thinking about park management that embraces uncertainty and continually integrates new science. Planning will need to change, too, to include different scenarios, and the rationale for particular actions should be discussed publicly and transparently in order to increase understanding of and support for park management.

Reference

Baron, J. S., L. Gunderson, C. D. Allen, E. Fleishman, D. McKenzie, L. A. Meyerson, J. Oropeza, and N. Stephenson. 2009. Options for national parks and reserves for adapting to climate change. *Environmental Management* 44:1033–1042.

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