From landscapes to lightscapes: indicators and standards of quality for night sky viewing at Acadia National Park

Robert Manning, University of Vermont, USA, Robert.Manning@uvm.edu
Ellen Rovelstad, University of Vermont, USA
Chadwick Moore, National Park Service, USA
Jeffrey Hallo, Clemson University, USA
Brandi Smith, Clemson University, USA

National parks in the United States were established to protect the country's monumental landscapes. But the meaning of these landscapes has evolved over time. Initially, parks were conceived primarily as scenery and tourist attractions. Later, historical and cultural landscape values were recognized. With the birth of the science of ecology, park landscapes took on important natural significance. At the beginning of the twenty-first century, the meaning of national park landscapes is being extended again to include soundscapes (the sounds of nature uninterrupted by human-caused noise) and lightscapes (environments characterized by the cyclic rhythm of the sun and moon and dark nights unperturbed by artificial light).

The emerging importance of lightscapes or night skies is a function of a growing consciousness about their values and a crisis over their steady disappearance. For millennia, people have "gazed upon the cosmos" in their enduring efforts to understand both the physical and metaphysical worlds. Human biology and culture are organized around the movement of the solar system, observations of the night sky are embodied in the religions and mythology of cultures around the world, and the celestial world has been the inspiration for art, literature, and other forms of cultural expression. "Sleeping under the stars" remains an important ritual of coming of age in the contemporary world. Unfortunately, the night sky is disappearing due primarily to "light pollution", human-caused light that reduces the brightness of the stars. National parks, especially those far from urban areas, are some of the last refuges of dark night skies, and the importance of night skies is increasingly reflected in National Park Service (NPS) policy. The NPS established a Night Skies Program in 1999 and a recent NPS report designed to guide the agency in its next century includes a recommendation that the NPS "Lead the way in protecting natural darkness as a precious resource and create a model for dark sky protection".

To help inform management of night skies in national parks, a program of research is being conducted at the University of Vermont in collaboration with Clemson University and the NPS. Part of this program of research includes two surveys of visitors to Acadia National Park to identify indicators and standards of quality for night sky viewing. Indicators and standards of quality are important elements of contemporary management-by-objectives frameworks for parks and outdoor recreation (Stankey et al. 1985; National Park Service 1997; Manning 2001; Manning 2007). Indicators of quality are measurable and manageable variables that are used as proxies for management objectives and standards of quality are the minimum acceptable condition of indicator variables (Manning 2011).

The first survey was conducted in the summer of 2012 and asked visitors to report what elements of the night sky were seen and not seen and to evaluate how this affected the quality of their park experience. Data were organized into an importance-performance grid to identify potential indicators of quality (Figure 1). Findings suggest that the ability to see celestial bodies such as stars and the Milky Way are important indicators of quality. The second survey was conducted in the summer of 2013. A representative sample of visitors was presented with a series of nine photographic simulations of the night sky at Acadia representing a full range of brightness of the stars and other celestial bodies. Respondents rated the acceptability of each of the simulations, and resulting data were graphed to form a social norm curve. The point at which the norm curve crosses the neutral point of the response scale (crosses from the acceptable range into the unacceptable range) represents a potential standard of quality. Respondents were also asked to report which photo 1) they preferred to see, 2) showed the maximum amount of human-caused light the NPS should allow, and 3) showed the amount of human-caused light that would cause them not to visit Acadia for night sky viewing. These and other study findings can help inform NPS management of lightscapes or night skies. For example, managers might reduce artificial lighting in parks, work with surrounding communities to reduce "light trespass", and offer more programming for visitors that emphasizes the importance of the night sky and where, how, and when to observe it.

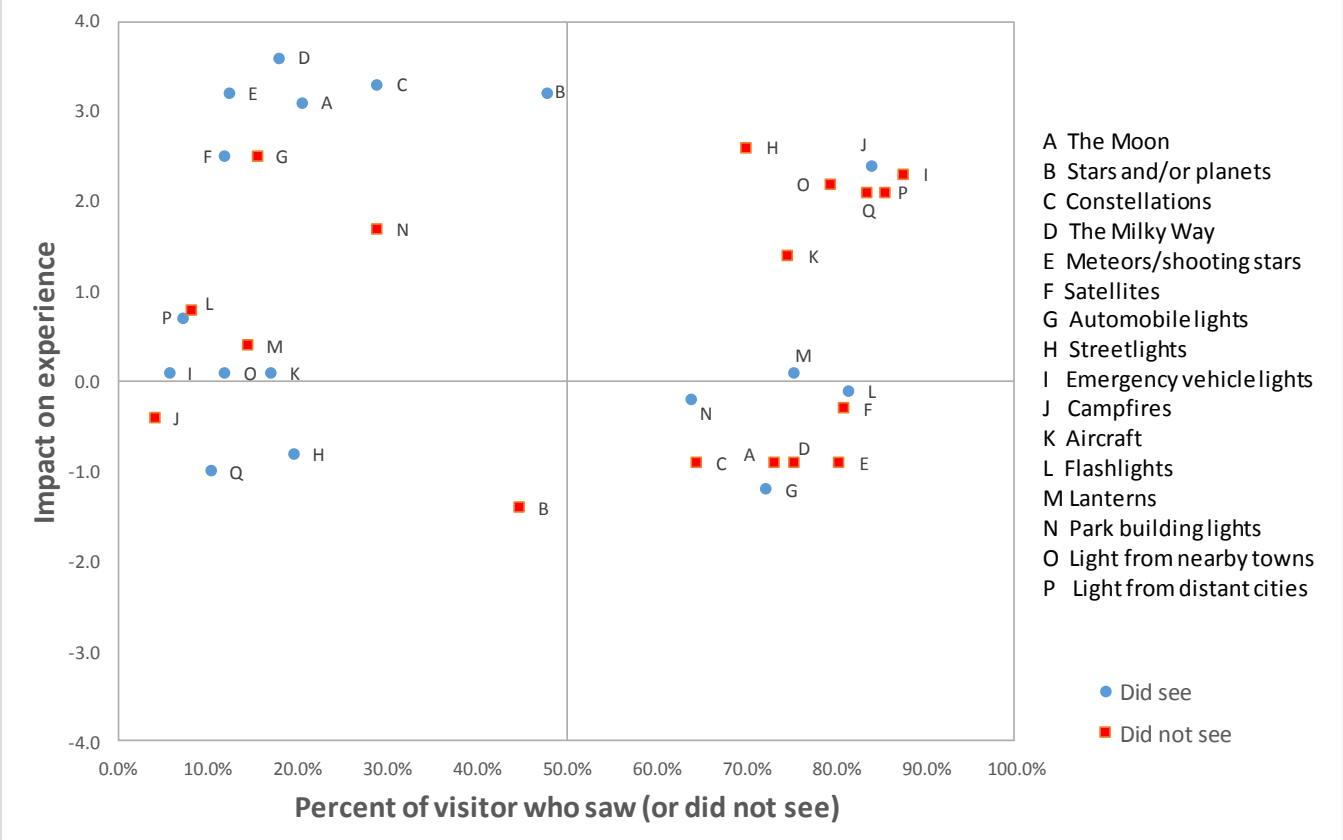

Figure 1. Importance-performance analysis of items seen and not seen by visitors.

References

Manning, R 2001, Visitor experience and resource protection: A framework for managing the carrying capacity of national parks, Journal of Park and Recreation Administration, vol 19, no. 1, pp. 93-108.

Manning, R 2007, Parks and carrying capacity: Commons without tragedy, Island Press, Washington, DC.

Manning, R 2011, Studies in outdoor recreation: Search and research for satisfaction, 3rd edn, Oregon State University Press, Corvallis, OR.

National Park Service 1997, VERP: Visitor experience and resource protection (VERP) framework - A handbook for planners and managers. Denver Service Center, Denver, CO.

Stankey, G, Cole, D, Lucas, R, Peterson, M, & Frissel, S 1985, The limits of acceptable change system (LAC) for wilderness planning. USDA Forest Service General Technical Report INT-176. 37 p.