LETTER

Reply to Jacobs and Manfredo: More support for a pervasive decline in nature-based recreation

Jacobs and Manfredo (1) assert that (*i*) some forms of nature recreation are increasing, giving wildlife viewing as example; (*ii*) U.S. environmentalism has remained positive in a narrow range since the 1980s; (*iii*) we must measure all forms of outdoor participation within the individual to be able to gauge trends; and (*iv*) the correspondence between outdoor recreation and biodiversity support is likely low. We feel that these assertions are not well supported.

We evaluated 16 long-term trends in nature recreation using all measures for which we found data that met our requirements: collected annually, beginning in 1987 [the peak in U.S. National Park visitation (2)] or earlier to present, and national in scope (3). The 14 U.S. time series were 15–72 years long and currently represent 1.5 billion participation events annually. These are likely to capture the most prominent national trends. In reference to the U.S. Fish and Wildlife Service report (4) cited in ref. 1, we did not use wildlife viewing data because these data were collected every 5 years rather than annually and only go back to 1991. In any case, the report does not show a *per capita* increase in wildlife viewing. In 1991, there were 40% wildlife viewers, declining to 31% in 1996, 2001, and 2006.

Dunlap (5) is cited in ref. 1 to suggest that environmentalism in the United States has remained positive within a narrow range over the past 20 years. However, seven of eight proenvironmental responses in that work peak between 1989 and 1992. All eight proenvironmental attitudes dropped 3–21% from these peak years to the most recent years surveyed (Table 1), strongly mirroring and corroborating the decline in nature participation we describe in our article.

It would be an extraordinary individual whose recreation choices could be used to adequately measure changes in all forms of outdoor participation, and it would be challenging to compare that individual's longitudinal choices between ages 15 and 50. Fortunately, this is a common problem faced by organizations interested in evaluating market trends, and it is generally overcome by surveying a random sample of the larger population. We obtained >20 years of annual standardized surveys of nature-based recreation across the United States, from Statistical Abstract and additional purchased data. Significantly, our other approaches (visitation and license data) suggested similar conclusions to the survey data, and most time series from all three approaches were extremely highly correlated with one another, as well as with Japanese National Park visitation.

Finally, although we are not familiar with the concerns of specificity mentioned (1), we are familiar with research that suggests that environmental attitudes and sensitivity as adults are strongly correlated with participation in nature recreation, particularly as children (6, 7), with significance as high as $P = 0.001$ (6). Factors that influence participation in any one particular form of recreation may be many and sundry. But the influence of nature participation on environmental awareness appears to be lasting and large, at least for those current-day environmentalists surveyed (8).

Oliver R. W. Pergams† and Patricia A. Zaradic‡***

**Department of Biological Sciences, University of Illinois, 845 West Taylor Street, Chicago, IL 60607; and ‡Red Rock Institute, Inc., 116 Petrie Avenue, Bryn Mawr, PA 19010*

Table 1. Data summarized from Tables 1–4 of Dunlap (5)

Question	Max/min year	Max/min year, %	Latest year	Latest year, %	Proenvironmental change, %
Are we spending too little on the environment? AGREE	1990	71	2000	62	−9
Are we spending too much on the environment? AGREE	1989, 1990	4	2000	7	−3
At the present time, do you think environmental protection laws and regulations have gone too far? AGREE	1992	63	2001	44	−19
At the present time, do you think environmental protection laws and regulations have gone not far enough? AGREE	1980	25	2001	21	−4
Protecting the environment is so important that requirements and standards cannot be too high, and continuing environmental improvements must be made regardless of cost. AGREE	1989, 1990	74	2002	56	−18
Protecting the environment is so important that requirements and standards cannot be too high, and continuing environmental improvements must be made regardless of cost. DISAGREE	1989	18	2002	39	−21
Protection of the environment should be given priority, even at the risk of curbing economic growth. AGREE	1990, 1991	71	2002	54	−17
Economic growth should be given priority, even if the environment suffers to some extent. AGREE	1990	19	2002	36	−17

Max/min year is the year in which the value reported reached its most proenvironmental level. Depending on how the question was phrased, this could be a maximum or minimum in the value itself.

1. Jacobs MH, Manfredo MJ (2008) Decline in nature-based recreation is not evident. *Proc Natl Acad Sci USA* 105:E40.
2. Pergams ORW, Zaradic PA (2006) Is love of nature in the US becoming love of electronic media? 16-year downtrend in national park visits explained by watching movies, playing video games, internet use, and oil prices. *J Environ Manage* 80:387–393.
3. Pergams ORW, Zaradic PA (2008) Evidence for a fundamental and pervasive shift away from nature-based recreation. *Proc Natl Acad Sci USA* 105:2295–2300.
4. U.S. Fish and Wildlife Service (2007) *2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: National Overview*. (U.S. Fish and Wildlife Service, Washington, DC).
5. Dunlap RE (2002) An enduring concern: Light stays green for environmental protection. *Public Perspectives* September/October:10–14.
6. Wells NM, Lekies KS (2006) Nature and the life course: Pathways from childhood nature experiences to adult environmentalism. *Child Youth Environ* 16:1–24.
7. Bögeholz S (2006) Nature experience and its importance for environmental knowledge, values and action: Recent German empirical contributions. *Environ Education Res* 12:65–84.
8. Chawla L (1999) Life paths into effective environmental action. *J Environ Educ* 31:15–26.

Author contributions: O.R.W.P. and P.A.Z. wrote the paper.

The authors declare no conflict of interest.

†To whom correspondence should be addressed. E-mail: pergams@uic.edu.