

Written Testimony of
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Chairman Kildee, Congressman Sarbanes, honorable members of the Subcommittee, and Governor O'Malley: my name is Dr. Oliver Pergams. I am a Director of Red Rock Institute, a scientific research foundation, and am a conservation biologist at the University of Illinois at Chicago. Science is a second career for me: my first career was in the financial markets, beginning as a bank foreign exchange trader and ending as owner of a commodities trading company. I hope therefore to bring a little broader perspective.

It is an honor for me to appear before you today to share our research on the declining percentage of Americans visiting nature. I will share my thoughts on what this trend means for our children's health, and for their environmental attitude as adults. I will emphasize research showing the most effective way to instill an appreciation for nature is through hands-on nature experiences, incorporated into elementary environmental education. Lastly, I will speak briefly on resulting economic benefits.

I. Declining Percentage of Nature-Based Recreation

Our research published Feb. 2008 shows that people in the US and other developed nations are spending far less time in nature than ever before¹. This research is included as an attachment to my written testimony. With colleague Dr. Patricia Zaradic, I tested 16 measures of nature participation related to visitation of various types of public lands in the US and other countries; number of various types of game licenses issued; and amount of time spent camping, backpacking, or hiking. The US activities with the greatest participation were visits to US State Parks, US National Parks, and US National Forests. All three visitation rates are in downtrends and are declining on average between 1% and 3% per year.

¹ Pergams, O. R. W. and P. A. Zaradic. 2008. Evidence for a fundamental and pervasive shift away from nature-based recreation. *Proceedings of the National Academy of Sciences USA* 105:2295-2300.

- *The longest and most complete of the 14 US nature recreation datasets show that ongoing declines in nature participation typically began between 1981 and 1991, are losing on average over 1% per year, and have lost between 18% and 25% to date. There is no longer any real doubt that the percentage of people involved in most nature-based recreation is in long-term decline.*

II. Benefits of Nature-Based Environmental Education

The first benefit I'd like to talk about is environmental attitude. Our 2007 review of related research² suggests that direct contact with nature, especially as children, is the most critical influence on later attitude toward the environment^{3,4}. Our article is included as a second attachment. Family vacations and time with family and other mentors outdoors are a major influence on later environmental attitude. Environmental education is also important, but to a lesser degree than direct actual experience of natural areas^{4,5}. It is ideal when exposure to nature occurs in the presence of a knowledgeable mentor or teacher. Such a teacher answers questions and helps to convert the rich experience of nature to knowledge and increased curiosity in the student. Direct contact with "wild" nature (such as hiking, playing in the woods, camping, hunting, or fishing), and (to a lesser extent) "domesticated" nature (such as gardening or pet care), before age 11, has been shown to be particularly important in shaping environmental attitudes and behaviors in adulthood⁴. This research is very important to today's proceedings: it means that:

- *While classroom environmental education of children is important and absolutely necessary, incorporating as many hands-on nature experiences as possible is crucial. These experiences should be with wild nature if at all possible, and with domestic nature as second choice.*

Next I'd like to talk about the effects of nature, or lack of nature, on children's development. Three ways of experiencing nature have been described⁶. Direct experience is undirected play in nature, for example in a forest, neighborhood park, backyard, or even a vacant lot. Indirect experience includes

² Zaradic, P. A. and O. R. W. Pergams. 2007. Videophilia: Implications for childhood development and conservation. *Journal of Developmental Processes* 2:130-144.

³ Bögeholz, S. 2006. Nature experience and its importance for environmental knowledge, values and action: Recent German empirical contributions. *Environmental Education Research* 12:65-84.

⁴ Wells, N. M., & Lekies, K. S.(2006. Nature and the life course: Pathways from childhood nature experiences to adult environmentalism. *Children, Youth and Environments* 16:1-24.

⁵ Chawla, L. 1999. Life paths into effective environmental action. *Journal of Environmental Education* 31:15-26.

⁶ Kellert, S. R. 2002. Experiencing nature: Affective, cognitive, and evaluative development in children. In P. H. Kahn, Jr. & S. R. Keller (Eds.), *Children and nature: Psychological, sociocultural, and evolutionary investigations*. (pp. 117-152). Cambridge, MA: The MIT Press.

zoos, nature centers, aquariums, and museums. Vicarious experience is without actual physical contact with nature; for example art, photographs, videos, and webcams.

Direct experience with nature plays the most significant role in children's cognitive and evaluative development. Direct experience of nature offers a multitude of continuously changing sights, sounds, smells, and touches that promote a wide range of adaptive and problem solving responses, alertness, and attention. The more structured, indirect experiences of nature do not require the same level of spontaneous engagement and do not have the same developmental benefits. The least engaging and spontaneous type of nature contact is vicarious experience through electronic media. This research is also very important to today's proceedings: it means that:

- *The nature experiences incorporated should be direct experiences if at all possible, with indirect experiences second choice, and vicarious experiences a very distant third choice. The presence of a teacher or mentor is still necessary.*

Just as exposure to nature has positive effects, lack of exposure has negative effects. Children under 13 living in the United States spend on average only about half an hour of unstructured time outdoors each week⁷. Research suggests that this lack of nature exposure is leading to many developmental problems. For example, 5-year-olds limited in playing outdoors exhibited poorer social, behavioral, and motor skills and had fewer playmates than children who played more outdoors⁸. Children attending a day care center surrounded by orchards, pastures, and woodlands (and where the children went outdoors every day regardless of weather) had better motor coordination and greater attention capacity than did children who attended an urban day care center surrounded by tall buildings⁹. Children who moved to housing with more nature nearby tended to have higher levels of cognitive functioning and focus than children who moved to housing with less nature¹⁰. Activities conducted in natural green settings tended to lower the symptoms of children with ADD/ADHD and raised self-esteem¹¹.

⁷ Hofferth, S., & Sandberg, J. 2001. Changes in American children's time, 1981–1997. In S. L. Hofferth & T. J. Owens (Eds.), *Children at the millennium: Where have we come from, where are we going?* Oxford, England: Elsevier Science.

⁸ Hüttenmoser, M. 1995. Children and their living surroundings: Empirical investigations into the significance of living surroundings for the everyday life and development of children. *Children's Environments* 12:403–413.

⁹ Grahn, P., Mårtensson, F., Lindblad, B., Nilsson, P., & Ekman, A. 1997. Ute på dagis. *Stad and Land*, Nr. 145 [Outdoor daycare. City and country]. Hässleholm, Sverige: Norra Skåne Offset.

¹⁰ Wells, N. M. 2000. At home with nature: The effects of nearby nature on children's cognitive functioning. *Environment & Behavior* 32:775–795.

¹¹ Taylor, A. F., Kuo, F. E., & Sullivan, W. C. 2001. Coping with ADD: The surprising connection to green play settings. *Environment and Behavior* 33:54–77.

III. Economic Benefits of Nature-Based Environmental Education

We have seen that elementary environmental education and hands-on nature experiences for children will increase interest in nature and affirm environmental attitudes. This in turn will have enormous and beneficial impacts on our use of nonrenewable resources and on our economy. The reduction in health costs relating to increased outdoor exercise will be substantial. Increased interest in nature would raise attendance at our great public lands, and reverse the negative trend in US nature-based tourism in general.

In addition, we must consider that a downward trend in the quality of science education has emerged as a national crisis. The percentage of graduate students in science and engineering has declined steadily since 1993. Meanwhile, imports of science and engineering brainpower are up almost 40 percent. We must reverse this trend in order to remain competitive in the global economy.

IV. Closing

In closing, I recognize that implementing nature-based environmental education will not be easy and will take strong political will and courageous leadership. But I firmly believe that our efforts, if we succeed, will pay rich dividends for our nation's future generations.

Thank you again for this opportunity to testify. I welcome your questions on these topics.