



CHILDREN'S CONTACT WITH THE OUTDOORS AND NATURE: A FOCUS ON EDUCATORS AND EDUCATIONAL SETTINGS

NOTE: The following are taken from four volumes of research developed by the Children & Nature Network (C&NN) and available at www.childrenandnature.org. These C&NN Annotated Bibliographies of Research and Studies were written by Cheryl Charles, Ph.D., President, Children & Nature Network and Alicia Senauer, Yale University.

Benefits to children from contact with the outdoors and nature

This section reviews research focused on the physical, mental, and social benefits that contact with the outdoors and nature provides to children. Research is grouped into several main focal areas.

Focus: Literature Reviews & Overview Documents

These articles and documents synthesize the literature related to children's contact with the outdoors and nature and, in many cases, highlight children's contact as it relates to educational settings.

Time spent outdoors supports many aspects of children's health

In this report, Muñoz reviews literature concerning the linkage between spending time outdoors and health, with a primary emphasis on research related to children. She reviews research and policy related to outdoor use and health more generally and then takes an in-depth look at topics related to children's use of the outdoors and relationships to their health. Specific topics Muñoz examines include research linking children's time spent outdoors to increased physical activity, healthy development, and overall well-being. She also examines research related to the design of children's play spaces, access to natural spaces, the use of outdoors in children's education, and research related to people and factors that constrain and enable children's outdoor play. Finally, in concluding her literature review, Muñoz identifies methodological considerations, research gaps, and provides suggestions for advancing knowledge in this area.

Author Affiliation: Muñoz is with the Sustainable Development Research Centre in Scotland.

Muñoz, S. A. (2009). Children in the outdoors: a literature review. Sustainable Development Research Centre.

This report is available online at: <http://www.countrysiderecreation.org.uk/Children%20Outdoors.pdf> (Volume 4)

Children's play in natural settings provides a suite of benefits

In this report, Stuart Lester and Martin Maudsley provide an extensive review of the literature related to children's natural play. The authors begin by examining the human relationship with the natural world and the importance of play and direct interaction with the physical environment to children. Lester and Maudsley then review the important opportunities that natural play provides, such as the creation of special places, and the numerous documented and potential benefits of children's play in natural settings, including the development of a sense of self and independence. The authors discuss evidence demonstrating a decline in children's access and opportunities to play in natural spaces and provide a range of suggestions to support children's opportunities to play in natural settings, such as through the design of effective playgrounds, school grounds, and environmental play projects, as well as ensuring adequate access to parks and nature reserves.

Lester, S., & Maudsley, M. (2006). "Play, naturally: A review of children's natural play." Children's Play Council. This report is available online at:

<http://www.playday.org.uk/PDF/play-naturally-a-review-of-childrens-natural%20play.pdf> (Volume 3)

The importance of designing spaces that support children's contact with nature

In this book chapter, Robin Moore and Clare Cooper Marcus review health threats that face many of today's children, including sedentary behavior and attention deficit disorder; the benefits that contact with nature provides to children's mental, social, and physical health; and current barriers limiting children's access to nature. The authors provide examples of designed environments, specifically in urban areas, that support children's contact with nature, including examples of innovative childcare centers and preschools, school grounds, neighborhood parks, and community institutions. Moore and Marcus emphasize the importance of the residential environment and the need to understand and incorporate children's ideas and preferences into the planning and design of spaces. The authors discuss four models of child-friendly residential neighborhood layouts with specific national and international case studies, including clustered housing and shared outdoor space, cul-de-sacs and greenways, alleys, and home zones. Moore and Marcus conclude by providing a number of key recommendations to help ensure children's access to nature in residential environments.

Moore, R. C., & Cooper Marcus, C. (2008). "Healthy planet, healthy children: Designing nature into the daily spaces of childhood." In S. Kellert, J. Heerwagen & M. Mador (Eds.), *Biophilic design: Theory, science and practice*. Hoboken, NJ: John Wiley & Sons, Inc. This book chapter is available online at:

http://www.naturalearning.org/docs/MooreCooperMarcus_Healthy.pdf (Volume 3)

Direct experience in nature is critical and diminishing

Nature is important to children's development in every major way — intellectually, emotionally, socially, spiritually, and physically. In one of his newest books, *Building for Life: Designing and Understanding the Human-Nature Connection* (Island Press, 2005), Dr. Stephen R. Kellert of Yale

Development & the Earth's Future." In addition to citing references and providing a succinct

Author Affiliation: The authors are with the Children's Hospital at Montefiore and Rose F. Kennedy Center in New York.

Barros, R. M., Silver, E. J., & Stein, R. E. K. (2009). School recess and group classroom behavior. *Pediatrics*, 123(2), 431-436. This study may be available in a library near you or can be purchased online through the publisher at: <http://www.jpeds.com/> (Volume 4)

Allocating time to physical activity in school does not negatively impact academic achievement

Over the years, there has been much discussion about the benefits and drawbacks of allocating time to physical activity in schools. In this article, Trudeau and Shepherd review the literature with regard to the relationships between physical education, school-based physical activity, school sports, and academic performance. Based on their review of a number of quasi-experimental and cross-sectional studies, the authors conclude that physical activity can be added to the school curriculum without negatively impacting children's academic achievement. The authors highlight literature which indicates that additional time spent in physical activity may in fact result in small increases in students' grade point averages and more efficient learning in the classroom. In addition, Trudeau and Shepherd summarize studies that have found positive associations between physical activity in school and children's physical fitness, concentration, memory, behavior, and school satisfaction. The authors summarize supporting mechanistic evidence from the neurosciences and highlight the need for additional research to further clarify relationships between academic performance and school-based physical activity.

Author Affiliation: Trudeau is with the Université du Québec à Trois-Rivières in Canada. Shephard is with the University of Toronto in Canada.

Trudeau, F., & Shephard, R. J. (2008). Physical education, school physical activity, school sports and academic performance. *International Journal of Behavioral Nutrition and Physical Activity*, 5, 12. This study may be available in a library near you or can be purchased online through the publisher at: <http://www.ijbnpa.org/> (Volume 4)

School gardens positively impact children's learning and behavior

Gardening takes place in many schools throughout the nation. Blair reviews research in the U.S. on school gardening and its relationship to children's learning and behavior. She begins her review by highlighting the range of reasons why school gardens exist, which include providing children experiences with natural ecosystems, enhancing children's understanding of food systems, helping children develop environmental attitudes and behaviors, and serving as a basis for experiential learning. Blair then reviews quantitative and qualitative studies on the impact of school gardening on children's learning and behavior. Of the 12 quantitative studies reviewed, she found that 9 of the 12 studies found significant and positive impacts of gardening with regard to test measures, which included children's science achievement and food consumption behavior. Of the 7 qualitative studies reviewed, Blair found a number of commonalities among study findings, including that students enjoyed and were highly motivated by gardening; students demonstrated improved school attitude and pride in the garden; and gardening enhanced student bonding, teamwork, and learning opportunities. In addition, she reviewed studies that evaluated principals' and teachers' opinions about school gardens. Based on her review of the literature, Blair determined that, overall, current research indicates that gardening can have a positive impact on student achievement and behavior.

desire to re-experience, sense of calm, desire to share, awe and wonder, assessment of beauty, level of frustration, and disinterest—she found no statistical difference in student ratings between the real and virtual field trips. Many students reported that they liked “spotting plants” or “being in the context of the environment” on the real field trip, while students reported that they liked the “ability to fly” or “use their imagination” on the virtual field trip. Overall, Harrington found that the real field trip provided a chance for students to use all their senses and for spontaneous events to occur and instigate investigation and learning (e.g., finding a salamander), while the virtual field trip provided students with new views of the environment and enabled individual exploration. As a result of this study, Harrington concluded that a virtual field trip can be used successfully as part of a curriculum, but that a real trip provides a superior learning environment that goes beyond specific curriculum-based learning. While this study may be limited due to its small sample size, it provides important insight into the complementary value of real and virtual-based learning opportunities, as well as ideas on how to improve both types of experiences for students.

Author Affiliation: Harrington is with the University of Pittsburgh.

Harrington, M. C. R. (2009). An ethnographic comparison of real and virtual reality field trips to Trillium Trail: the salamander find as a salient event. *Children, Youth and Environments, 19(1), 74-101.* This article is available online at: http://www.colorado.edu/journals/cye/index_issues.htm. (Volume 4)

Hands-on outdoor learning benefits students

This report by Janet E. Dymont presents findings from her 2003 study on the impacts of green school ground initiatives at 45 elementary, middle, and high schools in the Toronto District School Board. As part of this study, Dymont surveyed nearly 150 parents, teachers, and principals about the impact of greening initiatives on a variety of outcomes, including curriculum delivery, student learning and academic achievement, teaching practices, and student behavior. The author also conducted in-depth interviews with 21 respondents from 5 schools. Despite the variety of schools studied, Dymont found a number of common benefits of greening initiatives. For example, 90% of respondents reported that student enthusiasm and engagement in learning increased on green school grounds as compared to teaching indoors and 70% of respondents reported that their motivation for teaching increased on green school grounds as compared to teaching indoors. Dymont also questioned participants about key challenges and opportunities for improvement with regard to green school ground initiatives. Commonly identified barriers included availability of funding and adequate logistical support and human resources. Respondents also provided a variety of suggestions for improvement, including professional development and training opportunities, assistance with physical design, and additional funding support for construction and maintenance. Importantly, this study demonstrates that the benefits of school ground greening initiatives are numerous and varied, and can be realized by different schools with a variety of different types of greening projects. Dymont concludes the report by providing a series of high-level policy recommendations to assist schools across Ontario in successfully implementing and realizing the full benefits of school ground greening initiatives.

Dymont, J. (2005). “*Gaining ground: The power and potential of school ground greening in the Toronto District School Board: Evergreen.*” This report was commissioned by Evergreen, a charitable organization focused on bringing communities and nature together and is available online at: http://www.evergreen.ca/en/lg/gaining_ground.pdf (Volume 3)

Nature-smart kids get higher test scores

The American Institutes for Research® conducted a study, submitted to the California Department of Education, of the impact of weeklong residential outdoor education programs. The focus was on at-risk youth, 56% of whom reported never having spent time in a natural setting. Comparing the impact on students who experienced the outdoor education program versus those in a control group who had not had the outdoor learning experience, results were statistically significant. Major findings were: 27% increase in measured mastery of science concepts; enhanced cooperation and conflict resolution skills; gains in self esteem; gains in positive environmental behavior; and gains in problem-solving, motivation to learn, and classroom behavior. (Original Research)

“Effects of Outdoor Education Programs for Children in California.” American Institutes for Research: Palo Alto, CA: 2005. Available on the Sierra Club web site.

http://www.sierraclub.org/youth/california/outdoorschool_finalreport.pdf (Volume 1)

School achievement is enhanced when curricula are environment based

Sponsored by many state departments of education, this 1998 study has an important place in documenting the enhanced school achievement of youth who experience school curricula in which the environment is the principal organizer. This study, completed in 1998, was followed by two related studies, conducted by the State Education and Environment Roundtable (SEER), both of which produced results consistent with this original study. (Original Research)

Lieberman, Gerald A.; and Linda L. Hoody. “Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning.” SEER: Poway, CA, 1998. “California Student Assessment Project.” SEER: Poway, CA, 2000. The third and most recent of the SEER studies we are featuring is described below.

major study is “Grounds for Action: Promoting Physical Activity through School Ground Greening in Canada” by Anne C. Bell and Janet E. Dymont. While this study has roots in concern about obesity in children, it documents results and benefits beyond weight loss. Children who experience school grounds with diverse natural settings are more physically active, more aware of nutrition, more civil to one another, and more creative. One of the major benefits of green school grounds is increased involvement by adults and members of the nearby community, from helping with gardens to enriching the lifescape of the school grounds. Concerned about policy implications, this report offers specific recommendations for actions communities can take, from local neighborhoods to cities, states, and provinces. (Original Research)

Bell, Anne C.; and Janet E. Dymont. “Grounds for Action: Promoting Physical Activity through School Ground Twi

reported that their school ground appeals to a wider variety of student interests after greening; 85% reported that their school ground now supports a wider variety of play activities; and 84% reported that since greening, their school ground encourages more exploration of the natural world. While this study may be limited due to its reliance on retrospective self-report, it provides important insight into the benefits of green school grounds and their potentially significant role in complementing more traditional school ground areas and improving the quality and quality of elementary school children's physical activity.

Author Affiliation: Dymont is with the University of Tasmania in Australia. Bell is with Evergreen in Canada.

Dymont, J. E., & Bell, A. C. (2008). Grounds for movement: green school grounds as sites for promoting physical activity.

Green School Gyms improve children's health

BTCV is a charitable organization in the United Kingdom that created Green Gyms to improve people's health and the environment. As part of Green Gyms, individuals participate in a range of conservation and gardening projects outdoors, such as planting trees and constructing footpaths. From 2007 to 2009, BTCV implemented Green Gyms in 9 primary schools. As part of these School Green Gyms, a weekly 1 to 1.5 hour session was provided for 10 weeks for groups of about 10 children at each school. During these sessions, children participated in environmental activities on their school grounds or nearby open spaces. BTCV commissioned a university to evaluate the School Green Gyms. As part of this evaluation, children completed a questionnaire before and after participation in the program. In analyzing the data, researchers found that children's psychosocial health and overall health significantly improved after the Green Gyms program. In addition, they found that children's weekend physical activity levels significantly increased after the program and that children felt very positive about the program. While the study data is based on self-reported information and it is difficult to separate the impact of the program activities from the outdoor context, this evaluation provides valuable information about the impact of an innovative program on children's health.

BTCV. (2009). Evaluation findings: health and social outcomes 2009. BTCV. This report is available online at: http://www2.btcv.org.uk/display/greengym_research (Volume 4)

Children benefit from appropriate risk-taking during outdoor play

Play is critical to children's healthy development. Little and Wyver examine outdoor play with a focus on early childhood education and urban Western culture. The authors review a number of social and environmental factors that have influenced children's outdoor play experiences in recent years (e.g., traffic, lack of space, other time demands, and parental fears). Little and Wyver discuss the importance of children's experience with risk to healthy development, including children's ability to develop and refine their motor skills and enjoy and gain confidence in being physically active. The authors also review literature related to the impacts of not providing children with opportunities to engage in challenging and risk-related experiences, including children's engagement in inappropriate risk-taking and underdevelopment of decision-making skills related to making sound risk judgments. Little and Wyver discuss the inability of many early childhood educators to provide challenging and stimulating outdoor experiences to children due to restrictive regulations and a cultural emphasis on eliminating or minimizing physical risk. The au

Little, H., & Wyver, S. (2008). Outdoor play - does avoiding the risks reduce the benefits? *Australian Journal of Early Childhood*, 33(2), 33-40.

Nearby nature reduces stress in children

This study, reported in 2003, by Cornell assistant professor Nancy Wells, focuses on rural children and finds that even a view of nature — green plants and vistas — helps reduce stress among highly stressed children. Further, the more plants, green views and access to natural play areas, the more

***Kids Walk-to-school: Then and Now—Barriers and Solutions.* Center for Disease Control and Prevention, 2006. This information is available online at: http://www.cdc.gov/nccdphp/dnpa/kidswalk/then_and_now.htm (Volume 2)**

Schools are too far away for children to walk or bike to

In 2003, Beldon Russonello and Stewart Research and Communications conducted a survey to investigate American's attitudes toward walking. In this national, random sample telephone survey of 800 adults, they found that while 71% of adults indicated that they walked or rode a bike to school when they were young, only 22% of children do so today. The primary reason reported for more children not walking or biking was because schools were too far away.

Beldon Russonello and Stewart Research and Communications. "Americans' Attitudes toward Walking and Creating Better Walking Communities." *Surface Transportation Policy Project Report*. Washington: Beldon Russonello & Stewart Research and Communications, 2003. This report is available online at: www.transact.org/report.asp?id=205 (Volume 2)

Sociodemographic and physical environment factors influence children's active travel between home and school

Larsen and colleagues investigated relationships between children's mode of travel to and from school and various social and physical environment factors among 11- to 13-year-old students from a diversity of schools in London, Ontario, Canada. As part of this study, over 600 students, living within 1 mile of their school, completed a survey about their travel behavior and neighborhood. In addition, researchers used a Geographic Information System to identify participants' home and school neighborhoods and used various databases to calculate specific sociodemographic and physical environment characteristics (e.g., presence of street trees, intersection density, and dwelling density). In analyzing the study data, Larsen and colleagues found that 62% of students actively traveled from home to school, while 72% of students actively traveled from school to home. Researchers found that students were more likely to actively travel to or from school if they lived closer to school, were male, their neighborhood had a higher land use mix, and there were more street trees. For example, boys were about 1.5 times more likely to actively travel to/from school than girls. Additional research is needed to understand why some of these factors influence children's travel behavior. While this study may be

Technology may help engage children in outdoor activities

Chavez conducted an exploratory study to investigate the role of technology in supporting or

Author Affiliation: Dwyer, Hardy, and Baur are with the University of Sydney in Australia. Higgs is with Charles Sturt University in Australia.

Dwyer, G. M., Higgs, J., Hardy, L. L., & Baur, L. A. (2008). What do parents and preschool staff tell us about young children's physical activity: a qualitative study. *International Journal of Behavioral Nutrition and Physical Activity*, 5, 11. This study may be available in a library near you or can be purchased online through the publisher at: <http://www.ijbnpa.org/> (Volume 4)

Not all children have recess and those that do have recess do not have it for very long periods of time

Recess is an important opportunity for children to be outdoors, to play and to be physically active. In this report, the National Center for Education Statistics (U.S. Department of Education) investigated food and physical activity in public elementary schools. This report is based on a survey of 1,198 public elementary schools in all 50 states and the District of Columbia. The survey covered a variety of topics, including whether schools provided recess, the number of days per week recess was provided, and the length of time for recess. A few of the report's findings include:

Most public elementary schools have scheduled recess (87% to 93%), depending on the specific grade discussed, however, 7% to 13% of elementary schools do not have scheduled recess.

Most schools have recess every day (83% to 88%), depending on the specific grade discussed.

The majority of schools have recess once a day (55% to 66%), depending on the specific grade discussed.

The average number of minutes per day or recess ranged from 23.8 to 27.8 (depending on the specific grade discussed).

There were differences with regard to whether a school provided recess, the frequency of recess, and the amount of recess, based on specific school characteristics (e.g., school size, location, region, percent minority enrollment, or percent poverty concentration). For example, schools with the highest poverty concentrations were more likely not to have scheduled recess than those with lower concentrations of poverty.

Parsad, B. and Lewis, L. *Calories In, Calories Out: Food and Exercise in Public Elementary Schools, 2005* (NCES 2006-057). U.S. Department of Education. Washington, DC: National Center for Education Statistics, 2006. This study is available online at: <http://nces.ed.gov/Pubs2006/nutrition> (Volume 2)

Focus: Outdoor Spaces

The quality and quantity of children's outdoor spaces may influence their experiences and contact with the outdoors and nature. These articles examine topics related to children's outdoor spaces.

Early childhood educators prefer vegetated outdoor play spaces

The quality of children's outdoor environments can influence their health and development. In this study, Herrington investigated early childhood educators' opinions on their center's outdoor play spaces. She conducted focus group interviews with 78 educators at a diversity of childcare centers for 3- to 5-year-olds in Vancouver, Canada and evaluated the design of each outdoor play space. In analyzing the data in terms of educators' positive and negative comments about center location,

layout, and plant material, Herrington found that outdoor play spaces with plants had significantly more positive responses from educators than spaces without plants. She also found that educators at centers with plants commented more positively on seasonal changes than educators at centers without plants. In considering the socioeconomic status of the centers, Herrington found that the greatest need for vegetation was in mixed-income and economically stressed neighborhoods. Overall, she found that play spaces in economically stressed neighborhoods received some of the most negative comments from educators. With regard to desired changes at their centers, Herrington found that 79% of educators wanted more sensory stimuli for children, such as plants or water; 64% wanted more space; 57% wanted more challenging equipment; and 50% wanted less concrete. In addition, all the educators at centers with bark mulch indicated that they wanted it removed as it caused splinters. While this study may be limited due to its reliance on volunteers, it provides valuable insight into the opinions of early childhood educators and the importance of vegetation in their positive evaluation of outdoor play spaces.

Author Affiliation: Herrington is with the University of British Columbia.

Herrington, S. (2008). Perspectives from the ground: early childhood educators' perceptions of outdoor play spaces at child care centers. *Children, Youth and Environments, 18*(2), 65-87. This article is available online at: http://www.colorado.edu/journals/cye/index_issues.htm. (Volume 4)

Schoolyards are dominated by turf grass and impervious surface

Increasingly, research is demonstrating the benefits that green space can provide to children's health and well-being and to environmental quality (e.g., reduced urban runoff and moderation of climate). Children spend about one third of their day at school; however, little is known about the actual physical structure of school property. In this study, Alexis Schulman and Catherine A. Peters classified and compared land cover on 258 U.S. public elementary and middle schoolyards in three major U.S. cities (Baltimore, Boston, and Detroit). The authors used aerial photographs from the mid- to late 1990s and Geographic Information System software to classify and analyze schoolyard landcover. Schulman and Peters found that, on average, schoolyards covered more than 68% of the school property and that they were dominated by turf grass and impervious surface, with very little tree cover (on average, less than 10%). The authors also found that schoolyard size had an important influence on cover type in that larger schoolyards tended to have lower levels of impervious surface. Schulman and Peters contend that the amount of tree cover found in most schoolyards is inadequate given health and environmental quality research findings to date. In concluding their article, the authors discuss important opportunities and obstacles to greening schoolyards and provide a number of recommendations.

frequent childhood experiences in natural places tend to feel more comfortable visiting these places alone and have a more positive attitude towards these spaces as adults (e.g., they feel more energetic and restored in these spaces). The authors discuss several limitations to their study, including the possibility that adult memories of childhood may be distorted, and the implications their study findings might have given the increasing restrictions children face today with regard to outdoor access and play.

Thompson, C. W., Aspinall, P., & Montarzino, A. (2008). "The childhood factor - Adult visits to green places and the significance of childhood experience." *Environment and behavior*, 40(1), 111-143. This study may be available in a library near you or can be purchased online through the publisher at: <http://eab.sagepub.com/> (Volume 3)

Direct experience and mentoring are key elements

The focus of this recent research from Dr. Louise Chawla is on those factors that contribute to individuals choosing to take action to benefit the environment when they are adults. This is a reprise of earlier research by Dr. Chawla in the 1990s (*Journal of Environmental Education*, 1998, 1999). Positive, direct experience in the out-of-doors and being taken outdoors by someone close to the child — a parent, grandparent, or other trusted guardian — are the two most significant contributing factors. While lifelong activism is the primary focus of Dr. Chawla's inquiry, as reported in this article, her well-documented study includes citations and explanations of many additional benefits to children from early experiences in the out-of-doors. Creativity, physical competence, social skills, environmental knowledge, confidence, and problem-solving ability are among those benefits to children's development. Given the important role of adults in taking children into the out-of-doors, Dr. Chawla is specific about the attributes of the experiences those adult mentors provide. She states, the "adults gave attention to their surroundings in four ways — care for the land as a limited resource essential for family identity and well-being; a disapproval of destructive practices; simple pleasure at being out in nature; and a fascination with the details of other living things and elements of the earth and sky." Modeling those attributes while in the presence of the child does even more. AsJ-19.755 -1cTD-.000e"T

researchers found that participants highly overestimated plant species richness in Switzerland and worldwide. Importantly, Lindemann-Matthies and Bose found that most participants were interested in biodiversity issues and thought that it was important. While this study had a relatively small sample size, it demonstrates that despite the increased attention biodiversity has received from the environmental research and policy communities, many people in Switzerland are still unfamiliar with biodiversity. To enhance biodiversity education and conservation, Lindemann-Matthies and Bose suggest the need to reconnect people to nature, promote more in-depth knowledge of biodiversity, and encourage people to take environmentally-friendly actions.

Author Affiliation: The authors are with the University of Zurich in Switzerland.

Lindemann-Matthies, P., & Bose, E. (2008). How many species are there? public understanding and awareness of biodiversity in Switzerland. *Human Ecology*, 36(5), 731-742. This study may be available in a library near you or can be purchased online through the publisher at: www.krepublishers.com/...Journals/.../JHE-00-0-000-000-1990-1-Cover.htm (Volume 4)

Children can identify few local species

Knowing about one's environment is an important foundation to being able to understand various issues and act in an informed and responsible manner. In a recent study, BBC Wildlife Magazine asked 700 children between the ages of 9 and 11 from 17 schools in Bristol (United Kingdom) to identify a number of local wild species. The magazine also asked participants a number of questions related to wildlife and their activities more generally. While 70% of children could correctly identify blackberry and magpie, only 8% could identify goldfinch and 12% a primrose. Additional research is needed to better understand this study's findings and whether or not these numbers might represent a significant lack of or decline in environmental knowledge.

Information on this study can be found online at: <http://www.bbcwildlifemagazine.com/newsread.asp?id=45018> (Volume 3)

Children know more about Pokémon than common wildlife

In a small, innovative study, Dr. Andrew Balmford and colleagues surveyed 109 United Kingdom (UK) primary schoolchildren (ages 4 to 11) to investigate their knowledge of natural and non-natural objects. Each child was shown a set of 20 flashcards—10 of common British wildlife species (including plants, invertebrates, and mammals) and 10 of Pokémon characters. The authors found that while individual children's scores varied, children's overall identification success for common wildlife species rose from 32% at age 4 to 53% at age 8 and then fell slightly, whereas children's identification success for Pokémon characters rose from 7% at age 4 to 78% at age 8. Dr. Balmford and colleagues discuss the possible implications of children's lack of knowledge of common wildlife types and the importance of reconnecting children with local nature.

Balmford, A., Clegg, L., Coulson, T., & Taylor, J. "Why Conservationists Should Heed Pokémon." *Science*, 295(5564), 2367-2367, 2002. This study is available online at: http://www.sciencemag.org/cgi/content/full/295/5564/2367b?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=pokemon&searchid=1141908863643_6399&FIRSTINDEX=0&journalcode=sci (Volume 2)

Biology students know very few common plants

In this study, Anne Bebbington tested nearly 800 advanced-level biology students (secondary school students in the United Kingdom (UK) who are generally 16-17 years of age) on their ability to identify 10 common wildflowers that were illustrated in color on a sheet of paper. Interestingly, she