

INTERACTION WITH NATURE DURING THE MIDDLE YEARS: ITS IMPORTANCE TO CHILDREN'S DEVELOPMENT & NATURE'S FUTURE

by Randy White

© 2004 White Hutchinson Leisure & Learning Group

Almost 150 years ago, nineteenth century psychologist Herbert Spencer published his book, *Principals of Psychology*, in which he espoused the "surplus energy theory," explaining that the main reason for children's play is to get rid of surplus energy. Although his theory has been rejected by researchers and developmental theorists, it has had a lasting and unfortunate influence on the design of children's outdoor school environments (Malone 2003). As a result of Spencer's theory, schoolyards are seen as areas for physical play during recess and for sport, where children 'burn off steam,' and not for the other domains of development or for learning. In schools, playgrounds typically have manufactured climbing equipment and sports fields, and other than manicured grass, are devoid of nature and vegetation. The schoolyards for multitudes of children are not green, but gray (Moore & Wong 1997), many analogous to a parking lot (Worth 2003).

School designers' and administrators' point-of-view that schoolyards should be designed for surveillance of students, ease of maintenance and to have a break from children, rather than to stimulate the children themselves, has also contributed to the barren design of schoolgrounds where there is neither shade, shelter nor opportunities to interact with nature. (McKendrick, Bradford & Fielder 2000, Cheskey 2001, Malone 2003). Schoolyard design also reflects a lack of understanding of how quality outdoor play environments can provide children rich educational opportunities, particularly in the area of social skills and environmental learning (Evan 1997). Roger Hart, a noted developmental psychologist, attributes much of the problem to an underestimation of the importance of play to children; that it is considered discretionary rather than essential to child development, and that this misguided concept of play has trickled down into the play areas we create for children, resulting in lackluster environments with little value (Shell 1994).

Human nature itself has also helped perpetuate this design paradigm, simply because we are creatures of our experience. Our common experiences usually shape the conventional wisdom, or paradigms, by which we operate. When most adults were children, schoolyards were asphalt areas with manufactured, fixed playground equipment such as swings, jungle gyms and slides, and sports fields, and used solely for recess. Therefore, most adults see this as the appropriate model for a schoolyard.

Children's History of Contact with Nature

Modern humans (*homo sapiens*) evolved and have lived in intimate contact with nature, in the savannahs and forests, for almost their entire 120,000± year history. The cultivation of plants and the domestication of animals allowed our ancestors to dwell in permanent settlements, to expand their population more rapidly, thus beginning a long, sad divorce from nature (Manning 2004). It wasn't until recent history that most people lived in cities. But even until very recent history, children still grew up with intimate contact with nature.

Throughout most of history, when children were free to play, their first choice was often to flee to the nearest wild place—whether it was a big tree or brushy area in the yard or a watercourse or woodland nearby (Pyle 2002). Two hundred years ago, most children spent their days surrounded by fields, farms or in the wild nature at its edges. By the late twentieth century, many children's environments had become urbanized (Chawla 1994). But even then, as recently as 1970, children had access to nature and the world at large. They spent the bulk of their recreation time outdoors, using the sidewalks, streets, playgrounds, parks, greenways, vacant lots and other spaces “left over” during the urbanization process or the fields, forests, streams and yards of suburbia (Moore 2004, White & Stoecklin 1998). Children had the freedom to play, explore and interact with the natural world with little or no restriction or supervision.

Children's Extinction of Experience

The lives of children today are much different. Children today have few opportunities for outdoor free play and regular contact with the natural world. Their physical boundaries have shrunk (Francis 1991, Kyttä 2004) due to a number of factors. A ‘culture of fear’

has parents afraid for their children's safety. A 2004 study found that 82% of mothers with children between the ages of 3 and 12 identified crime and safety concerns as one of the primary reasons they don't allow their children to play outdoors (Clements 2004). Due to 'stranger danger,' many children are no longer free to roam their neighborhoods or even their own yards unless accompanied by adults (Pyle 2002, Herrington & Studtmann 1998, Moore & Wong 1997). Many working families cannot supervise their children after school, giving rise to latchkey children who stay indoors or attend supervised after-school activities. Furthermore, children's lives have become structured and scheduled by adults, who hold the mistaken belief that this sport or that lesson will make their children more successful as adults (Moore & Wong 1997, White & Stoecklin 1998).

The culture of childhood that played outside is gone and children's everyday life has shifted to the indoors (Hart 1999, Moore 2004). As a result, children's opportunity for direct and spontaneous contact with nature is a vanishing experience of childhood (Rivkin 1990, Chawla 1994, Kellert 2002, Pyle 2002, Kuo 2003, Malone 2004). One researcher has gone so far as to refer to this sudden shift in children's lives and their loss of free play in the outdoors as a 'childhood of imprisonment' (Francis 1991). Childhood and regular play in the outdoor natural world is no longer synonymous. Pyle (1993) calls this the 'extinction of experience,' which breeds apathy towards environmental concerns. Kellert (2002) says society today has become "so estranged from its natural origins, it has failed to recognize our species' basic dependence on nature as a condition of growth and development."

Not only have children's play environments dramatically changed in the last few decades, but the time they have to play has decreased. Between 1981 and 1997, the amount of time children ages 6 to 8 in the U.S. played decreased 25%, by almost four hours per week, from 15 hours a week to 11 hours and 10 minutes. During the same period, the time they spent in school increased by almost 5 hours (Hofferth & Sandberg 2000). A recent study surveyed mothers and found that 70% of mothers in the U.S. played outdoors everyday when they were children, compared with only 31% of their

children, and that when the mothers played outdoors, 56% remained outside for three or more hours compared to only 22% of their children (Clements 2004).

The Importance of Children's Interaction with Nature

A growing body of literature shows that the natural environment has profound effects on the well being of adults, including better psychological well being, superior cognitive functioning, fewer physical ailments and speedier recovery from illness. Research is also providing convincing evidence of the more profound benefits of experiences in nature for children due to their greater plasticity and vulnerability (Wells & Evans 2003).

The findings indicate that:

- Children with symptoms of Attention Deficit Hyperactivity Disorder (ADHD) are better able to concentrate after contact with nature (Taylor 2001).
- Children with views of and contact with nature score higher on tests of concentration and self-discipline. The greener, the better the scores (Wells 2000, Taylor 2002).
- Children who play regularly in natural environments show more advanced motor fitness, including coordination, balance and agility, and they are sick less often (Grahn, et al. 1997, Fjortoft 2001).
- When children play in natural environments, their play is more diverse with imaginative and creative play that fosters language and collaborative skills (Moore & Wong 1997, Taylor, et al. 1998, Fjortoft 2000).
- Exposure to natural environments improves children's cognitive development by improving their awareness, reasoning and observational skills (Pyle 2002).
- Nature buffers the impact of life stress on children and helps them deal with adversity. The greater the amount of nature exposure, the greater the benefits (Wells 2003).
- Play in a diverse natural environment reduces or eliminates bullying (Malone & Tranter 2003).
- Nature helps children develop powers of observation and creativity and instills a sense of peace and being at one with the world (Crain 2001).

- Early experiences with the natural world have been positively linked with the development of imagination and the sense of wonder (Cobb 1977, Louv 1991). Wonder is an important motivator for life long learning (Wilson 1997).
- Children who play in nature have more positive feelings about each other (Moore 1996).
- A decrease in children's time spent outdoors is contributing to an increase of children's myopia in developed countries (Nowak 2004).
- Natural environments stimulate social interaction between children (Moore 1986, Bixler, Floyd & Hammutt 2002).
- Outdoor environments are important to children's development of independence and autonomy (Bartlett 1996).

Mediated Experience

Today, with children's lives disconnected from the natural world, their experiences are predominately mediated in media, written language and visual images (Chawla 1994). The virtual is replacing the real (Pyle 2002). TV, nature documentaries, National Geographic and other nature TV channels and environmental fundraising appeals are conditioning children to think that nature is exotic, awe-inspiring and in far, far away, places they will never experience (Chipeniuk 1995). Children are losing the understanding that nature exists in their own backyards and neighborhoods, which further disconnects them from knowledge and appreciation of the natural world.

Loss of Contact with Nature is Nature's Loss

Not only does the loss of children's outdoor play and contact with the natural world negatively impact the growth and development of the whole child and their acquisition of knowledge, it also sets the stage for a continuing loss of the natural environment. The alternative to future generations who value nature is the continued exploitation and destruction of nature. Research is clearly substantiating that an affinity to and love of nature, along with a positive environmental ethic, grow out of children's regular contact with and play in the natural world (Bunting 1985; Chawla 1988; Wilson 1993; Pyle 1993; Chipeniuk 1994; Sobel 1996, 2002 & 2004; Hart 1997; Moore & Wong 1997; Kals et al.

1999; Moore & Cosco 2000; Lianne 2001; Kellert 2002; Bixler et al. 2002; Kals & Ittner 2003; Phenice & Griffore 2003; Schultz et al. 2004).

Schoolyards Offer Hope

With children's access to the outdoors and the natural world becoming increasingly limited, schools, where children spend 40 to 50 hours per week, may be mankind's last opportunity to reconnect children with the natural world and create a future generation that values and preserves nature (Herrington & Studtmann 1998, Malone & Tranter 2003). Many authorities believe the window of opportunity for the formation of bonding with and positive attitudes towards the natural environment develops sometime during early and middle childhood and requires regular interaction with nearby nature (Cohen & Horn 1993; Wilson 1993; Sobel 1990, 1996 & 2004; Kellert 2002; Phenice & Griffore 2003)

Premature Abstraction Breeds Biophobia

The problem with many school environmental education programs is that they approach education from an adult's, rather than a child's perspective. Children's curiosity with the natural world and unique way of knowing requires discovery and exploratory learning, rather than a pure didactic approach. One of the main problems with most environmental education is premature abstraction, teaching children too abstractly. One result of trying to teach children at too early of an age about abstract concepts like rainforest destruction, acid rain, ozone holes and whale hunting can be dissociation. When we ask children to deal with problems beyond their cognitive abilities, understanding and control, they can become anxious, tune out and develop a phobia to the issues. In the case of environmental issues, biophobia—a fear of the natural world and ecological problems—a fear of just being outside—can develop. Studying about the loss of rainforests and endangered species may be age appropriate for middle school children, but is developmentally inappropriate for elementary school students (Cohen & Horn-Wingerg 1993, Sobel 1996, Coffey 2001, Kellert 2002).

John Burroughs cautioned that, "Knowledge without love will not stick. But if love comes first, knowledge is sure to follow." The problem with most environmental

education programs is that they try to impart knowledge and responsibility before children have been allowed to develop a loving relationship with the earth (Sobel 1996). Children's emotional and affective values of nature develop earlier than their abstract, logical and rational perspectives (Kellert 2002). We need to allow children to develop their biophilia, their love for the Earth, before we ask them to save it. Rather than books and lectures, nature itself is children's best teacher (Coffey 2001). The more personal children's experience with nature, the more environmentally concerned and active children are likely to become (Bunting & Cousins 1985, Harvey 1989).

The Greening of Schoolyards

Fortunately, there is a growing movement with schools in the Western world to transform parts of their schoolyards from barren areas of grass, asphalt, and wood chips with manufactured equipment into naturalized environments for children's exploration and play, that also supports classroom learning. One program, *Learning Through Landscapes*, set out in the 1980's to transform all the schoolyards in Britain (Worth 2003). Additional programs are underway in Canada (*Evergreen Society*), Australia (*Learnsapes*), Nova Scotia (*Model Schools Project*) Scotland and Sweden (*Skolans Uterum*) (Moore & Cosco 2000). In the U.S., there is a growing natural schoolyard movement to reconnect children with nature. States, including Maryland, California, Ohio, Florida, New Hampshire, Utah and Vermont have initiated greening programs (Raver 1999). Both Boston (*Boston Schoolyard Initiative*) and San Francisco (*Green Schoolyard Alliance*) have programs underway. These natural schoolyards include mini-forest, 'wild habitats,' ponds and streams, butterfly gardens, insects, animals and gardening areas. Many of these programs take the approach of using both place-based and project-based education to both integrate their naturalized schoolyards into the full curriculum and for environmental learning. This makes the schoolyards extensions of the classroom where experiential learning through discovery and hands-on experiences with nature can take place both during and outside of classroom time (Sobel 2004, Malone & Tranter, 2004).

Benefits of Naturalize Schoolyards

Research on natural schoolyards is demonstrating the broad benefits this paradigm shift in schoolyard design and environmental teaching has in addition to the developmental benefits of offering children play and learning in naturalized environments. Children learn by constructing their own knowledge about the world, not by memorizing facts (Piaget 1962). Harvard psychologist Howard Gardner says that scholastic knowledge “seems strictly bound to school settings,” while outdoor education fosters “connected knowing,” where education is part of, rather than separate from life (Gardner 1991). Sobel (2004) reviewed the research on naturalized schoolyards and found that they have a positive impact on children’s development of environmental stewardship values, and the greater the diversity of the natural landscapes, the greater children’s appreciation of nature and experiences in it. Malone and Tranter (2003) found that the schoolyards most conducive to environmental learning were unstructured, e.g., forest areas, not specifically designed for children’s play. The combination of both formal learning and informal, positive experiences in the naturalized environments were found most associated with the development of children’s responsible behaviors (Fisman 2001). A study of ten schools and a statewide program by the National Environmental Education and Training Foundation (2000) found that when schools use the context of local areas and naturalized schoolyards in their instructional practices, academic performance improves in reading, math, science, social studies and writing. A study of 40 schools in California that used the natural environment as “an integrated context of learning” with hands-on, project-based learning found that student performance improved in standardized test scores, grade point average, willingness to stay on task, adaptability of different learning styles and problem solving (Leiberman & Hoody 1998). Studies also show a reduction in anti-social behavior such as violence, bullying, vandalism and littering, as well as a drop in absenteeism (Coffey 2001, Moore & Cosco 2000).

Conclusion

Children and society as a whole can benefit significantly by maximizing both the informal play and formal learning opportunities that natural schoolyards offer children. Natural schoolyards are places where children can reclaim the magic that is their birthright, the ability to learn in their unique experiential way through exploration and discovery in the natural world. When natural schoolyards are also integrated with the full curriculum, they enhance both children's academic and environmental education. But perhaps even more important, natural schoolyards offer the hope that future generations will develop the environmental values to become stewards of the Earth and the diversity of Nature.

Randy White is the CEO of the White Hutchinson Leisure & Learning Group, a Kansas City, Missouri-based firm that specializes in the design of children's indoor and outdoor learning, play and leisure environments. Randy can be reached at *via the company's website*: <http://www.whitehutchinson.com/children> or at +816.931-1040, ext 100.

Resources on the Web:

Key Organizations Working to Make the World's Schoolyards Greener.

http://www.ecoschools.com/KeyOrgs/KeyOrgs_wSidebar.html

Resources for Landscape Planning for School Grounds

<http://www.edfacilities.org/rl/landscape.cfm>

Resources for Ecological Schoolyards

<http://www.newvillage.net/Journal/Issue3/3ecoschoolyards.html>

Planning Schoolgrounds for Outdoor Learning, National Clearinghouse for Educational Facilities, 2000

<http://www.edfacilities.org/pubs/>

References

Bartlett, Sheridan (1996). Access to Outdoor Play and Its Implications for Healthy Attachments. Unpublished article, Putney, VT

Bixler, Robert D., Floyd, Myron E. & Hammutt, William E. (2002). Environmental Socialization: Qualitative Tests of the Childhood Play Hypothesis, *Environment and Behavior*, 34(6), 795-818

Bunting, T.E. & L.R. Cousins (1985). Environmental dispositions among school-age children. *Environment and Behavior*, 17(6)

Chawla, Louise, (1988). Children's Concern for the Natural Environment, *Children's Environments*, (5)3

- Chawla, Louise, (1994). Editors' Note, *Children's Environments*, 11(3), 175-176
- Cheskey, Edward, (2001). How Schoolyards Influence Behavior. in *Greening School Grounds: Creating Habitats for Learning*, (eds) Grant, Tim and Littlejohn, Gail., Toronto: Green Teacher and Gabriola Island, BC: New Society Publishers
- Chipeniuk, Raymond C. (1994). Naturalness in Landscape: An Inquiry from a Planning Perspective (PhD dissertation), University of Waterloo, Ontario.
- Chipeniuk, R. (1995). Childhood foraging as a means of acquiring competent human cognition about biodiversity, *Environment and Behavior*, 27, 490-512
- Clements, R. (2004). An investigation of the status of outdoor play. *Contemporary Issues in Early Childhood*, 5(1) 68-80
- Cobb, E. (1977). *The Ecology of Imagination in Childhood*, New York, Columbia University Press.
- Coffey, Ann (2001). Transforming School Grounds, in *Greening School Grounds: Creating Habitats for Learning*, (eds) Grant, Tim and Littlejohn, Gail., Toronto: Green Teacher and Gabriola Island, BC: New Society Publishers
- Cohen, Stewart & Horm-Wingerg, D. (1993). Children and the environment: Ecological awareness among preschool children. *Environment and Behavior* 25(1), 103-120
- Crain, William (2001). Now Nature Helps Children Develop. *Montessori Life*, Summer 2001.
- Evan, J. (1997). Rethinking Recess: Signs of Change in Australian Primary Schools. *Education Research and Perspectives* 24(1): 14-27
- Fishman, Lianne (2001). Child's Play: An empirical study of the relationship between the physical form of schoolyards and children's behavior. MEd 2001 Accessed June 1, 2004 from http://www.yale.edu/hixon/research/pdf/LFishman_Playgrounds.pdf
- Fisman, Lianne (2001). Child's Play: An empirical study of the relationship between the physical form of schoolyards and children's behavior. MEd 2001 Accessed June 1, 2004 from http://www.yale.edu/hixon/research/pdf/LFishman_Playgrounds.pdf
- Fjortoft, I. And J. Sageie (2000). The Natural Environment as a Playground for Children: Landscape Description and Analysis of a Natural Landscape. *Landscape and Urban Planning* 48(1/2) 83-97
- Fjortoft, Ingunn (2001). The Natural Environment as a Playground for Children: The Impact of Outdoor Play Activities in Pre-Primary School Children. *Early Childhood Education Journal*, 29(2): 111-117
- Francis, Mark (interview) au Kathryn Devereaux (1991) "Children of Nature", *U. C. Davis Magazine*, 9(2) University of California, Davis.
- Gardner, H. (1991). The tensions between education and development. *Journal of Moral Development*, 20(2), 113-125

- Grahn, P., Martensson, F., Lindblad, B., Nilsson, P., & Ekman, A., (1997). UTE pa DAGIS, Stad & Land nr. 93/1991 Sveriges lantbruksuniversitet, Alnarp
- Hart, Roger (1997). *Children's Participation: The theory and practice of involving young citizens in community development and environmental care*, Earthscan Publications Limited, UK
- Hart, Roger (1999). In Anne Raver, Tutored by the Great Outdoors at a Southern Pines Playground, New York Times, October 7, 1999. New York
- Harvey, M. (1989). The Relationship between Children's Experiences with Vegetation on Schoolgrounds. *Journal of Environmental Education* 21(2): 9-18
- Herrington, Susan, & Studtmann, Ken (1998). Landscape Interventions: New Directions for the design of children's outdoor play environments. *Landscape and Urban Planning*, 42, 191-205
- Hofferth, Sandra L. & Sandberg, John F. (2000). Changes in American Children's Time, 1981-1997, Center for the Ethnography of Everyday Life. Accessed June 1, 2004 from <http://www.psc.isr.umich.edu/pubs/>
- Kals, E., Schumacher, D., & Montada, L. (1999). Emotional affinity towards nature as a motivational basis to protect nature. *Environment & Behavior*, 31(2), 178-202
- Kals, Elisabeth & Ittner, Heidi (2003). Children's Environmental Identity, Indicators and Behavioral Impacts, in *Identity and the Natural Environment, The Psychological Significance of Nature*, Clayton, Susan and Opatow, Susan (eds), The MIT Press, Cambridge, Massachusetts
- Kellert, Stephen R. (2002). Experiencing Nature: Affective, Cognitive, and Evaluative Development, in *Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations*. Cambridge, MA: The MIT Press.
- Kuo, Frances (2003). book review of Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations *Children, Youth and Environments* 13(1) accessed June 12, 2004 from http://thunder1.cudenver.edu/cye_journal/review.pl?n=49
- Kyttä, Marketta, (2004). The extent of children's independent mobility and the number of actualized affordances as criteria for child-friendly environments, *Journal of Environmental Psychology*, 24(2), 179-198
- Leiberman, Gerald & Hoody, Linda, (1998). Closing the Achievement Gap: Using the Environment as an Integrated Context for Learning (San Diego, California: State Education and Environmental Roundtable)
- Louv, Richard (1991). *Childhood's Future*, New York, Doubleday,.
- Malone, Karen & Tranter, Paul (2003). Children's Environmental Learning and the Use, Design and Management of Schoolgrounds, *Children, Youth and Environments*, 13(2), Accessed June 9, 2004 from http://www.colorado.edu/journals/cye/13_2/Malone_Tranter/ChildrensEnvLearning.htm
- McKendrick, J., Bradford, M., & Fielder, A. (2000). Kid Customer? Commercialization of Playspace and the Commodification of Childhood. *Childhood* 7: 295-314

- Moore, Robin C. (1986). The Power of Nature Orientations of Girls and Boys Toward Biotic and Abiotic Play Settings on a Reconstructed Schoolyard. *Children's Environments Quarterly*, 3(3)
- National Environmental Education & Training Foundation (2000). *Environment-based Education*, The National Environmental Education & Training Foundation, Washington, DC
- Moore, Robin (1996). Compact Nature: The Role of Playing and Learning Gardens on Children's Lives, *Journal of Therapeutic Horticulture*, 8, 72-82
- Moore, R. & Wong, H. (1997). *Natural Learning: Rediscovering Nature's Way of Teaching*. Berkeley, CA MIG Communications.
- Moore, Robin & Cosco, Nilda, (2000). Developing an Earth-Bound Culture Through Design of Childhood Habitats, Natural Learning Initiative. paper presented at Conference on People, Land, and Sustainability: A Global View of Community Gardening, University of Nottingham, UK, September 2000). Accessed June 12, 2004 from <http://www.naturalearning.org/publications/publications.htm>
- Moore, R. (2004). Countering children's sedentary lifestyles – by design. Natural Learning Initiative. Accessed June 12, 2004 from <http://www.naturalearning.org>
- Nowak, R. (2004). Blame lifestyle for myopia, not genes. *NewScientist*, July 10, 2004, 12
- Olds, Anita (2001). *Children Come First* Video, Community Playthings
- Phenice, L. & Griffore, R. (2003). Young Children and the Natural World. *Contemporary Issues in Early Childhood*. 4(2), 167-178
- Piaget, J. (1962). *Play, dreams, and imagination in children*. New York: Norton
- Pyle, Robert (1993). *The thunder trees: Lessons from an urban wildland*. Boston: Houghton Mifflin.
- Pyle, Robert (2002). Eden in a Vacant Lot: Special Places, Species and Kids in Community of Life. In: *Children and Nature: Psychological, Sociocultural and Evolutionary Investigations*. Kahn, P.H. and Kellert, S.R. (eds) Cambridge: MIT Press
- Pyle, Robert (2002). Eden in a Vacant Lot: Special Places, Species and Kids in Community of Life. In: *Children and Nature: Psychological, Sociocultural and Evolutionary Investigations*. Kahn, P.H. and Kellert, S.R. (eds) Cambridge: MIT Press
- Raver, Anne (1999). Tutored by the Great Outdoors at a Southern Pines Playground, New York Times, October 7, 1999. New York
- Rivkin, Mary S. (1990). *The Great Outdoors: Restoring Children's Rights to Play Outside*. National Association for the Education of Young Children, Washington, D.C.
- Schultz, P. Wesley, Shriver, Chris, Tabanico, Jennifer J. & Khazian, Azar M. (2004) Implicit connections with nature. *Journal of Environmental Psychology*, 24(1), 31-42
- Shell, Ellen Ruppel (1994). Kids Don't Need Equipment, They Need Opportunity, *Smithsonian Magazine*, 25(4), 78-87

- Sobel, D., (1990). A place in the world: Adults' memories of childhood's special places. *Children's Environments Quarterly* 7(4)
- Sobel, David, (1996). *Beyond Ecophobia: Reclaiming the Heart of Nature Education*, Great Barrington, MA: The Orion Society.
- Sobel, David (2002). *Children's Special Places: Exploring the Role of Forts, Dens, and Bush Houses in Middle Childhood*, Detroit, MI: Wayne State University Press
- Sobel, David (2004) *Place-Based Education, Connecting Classrooms & Communities*, Great Barrington, MA: The Orion Society.
- Taylor, A.F., Wiley, A., Kuo, F.E., & Sullivan, W.C. (1998). Growing up in the inner city: Green spaces as places to grow. *Environment and Behavior*, 30(1), 3-27
- Taylor, A.F., Kuo, F.E. & Sullivan, W.C. (2001). Coping with ADD: The surprising connection to green play settings. *Environment & Behavior*, 33(1), 54-77
- Taylor, A.F., Kuo, F.E. & Sullivan, W.C. (2002). Views of Nature and Self-Discipline: Evidence from Inner City Children, *Journal of Environmental Psychology*, 22, 49-63
- Wells, Nancy M. (2000). At Home with Nature, Effects of "Greenness" on Children's Cognitive Functioning, *Environment and Behavior*, 32(6), 775-795
- Wells, Nancy M. & Evans, Gary W. (2003). Nearby Nature: A Buffer of Life Stress Among Rural Children. *Environment and Behavior*, 35(3), 311-330.
- White, R. & V. Stoecklin (1998). Children's Outdoor Play & Learning Environments: Returning to Nature. Accessed June 11, 2004 from <http://www.whitehutchinson.com/children/articles/outdoor.shtml>
- Wilson, Ruth (1993). *Fostering a sense of wonder during the early childhood years*. Columbus, OH: Greyden
- Wilson, Ruth A. (1997). The Wonders of Nature - Honoring Children's Ways of Knowing, *Early Childhood News*, 6(19).
- Worth, Jennifer (2003). Book review of Greening School Grounds: Creating Habitats for Learning, *Children, Youth and Environments*, 13(2). Accessed June 9, 2004 from <http://www.colorado.edu/journals/cye/>