Building for Life

Designing and Understanding the Human-Nature Connection

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Nature and Childhood Development

I dreamed I was in an elephant.
I dreamed I was stepped on by a giant chicken.
I dreamed I was dreaming.
I dreamed I had no brain.
I dreamed that my ears were bigger than me.
I dreamed that I had static hair forever.
I dreamed that I ate too much food.
I dreamed that when I sneezed it was a tornado.
I dreamed when I spit it was a great flood.
I dreamed that I flew to a different galaxy.
I dreamed that I was a brownie and I ate myself.
I dreamed I turned into a hockey puck and got a lot of concussions.
I dreamed I had to be cross-eyed forever.
I dreamed I finished my poem.

—Peter Weinberg, age 7

The previous chapter offered both evidence and theory to support the contention that human physical and mental well-being inextricably depends on the quality (if not the quantity) of people's experience of the natural environment and that this dependence remains critical in our modern, increasingly urban world. To explain this reliance, we considered the notions of ecosystem services, biophilia, and the spirit of place, all concepts rooted in

Much of the material in this chapter is also partially covered in S. Kellert, "Experiencing nature: Affective, cognitive, and evaluative development in children," in P. Kahn and S. Kellert, eds., *Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations* (Cambridge, MA: MIT Press, 2002).

human biology but highly shaped by people's experience, learning, and culture. Assuming that the human affinity for nature is partially genetically encoded—a product of our having evolved in a natural rather than an artificial world—the importance of childhood must be recognized as the period when this contact with nature first occurs. Even for the human animal, which appears uniquely capable of constructing its world and learning throughout its lifetime, the fundamental development of any biologically rooted tendency is likely to occur during childhood.

This chapter explores this importance of childhood contact with nature, particularly for children's emotional, intellectual, and evaluative development. We consider how children's physical and mental well-being depends on the quality of their experience of the natural world. Several important questions guide our exploration:

- How much and what kind of contact with nature is necessary for healthy childhood development?
- Does a child's experience of nature vary in importance at different ages or stages during childhood?
- What are the effects during childhood of varying forms of direct, indirect, and symbolic contact with nature? Do these impacts differ at varying ages?
- Do children today encounter fewer direct and spontaneous opportunities for experiencing nature? If so, does this reduced contact affect their maturation?
- What are the developmental consequences of an increase in indirect and, especially, vicarious forms of contact with nature? Can this shift compensate for a decline in direct experience of the natural world?
- What happens when children become separated and estranged from the natural environment because it has become significantly degraded or difficult to access?

Although critical for attempting to understand the developmental importance of childhood contact with nature, these questions have received surprisingly little scholarly attention. For example, a review of widely cited publications with such provocative titles as *The Ecology of Human Development* and *Ecological Psychology* found the words *ecology* and *environment* used to describe the effect of the human-built and social environment rather than the natural environment on children.[1] Fortunately, this situation is changing, although most social science research still devotes little attention to the subject, while the field of environmental education largely emphasizes cultivating children's knowledge and appreciation of the natural envi-

ronment rather than the environment's role in their physical and mental development. Commenting on the inattention to nature's role in childhood development, psychiatrist Harold Searles remarked that

> most writings concerning human personality development limit themselves for all practical purposes to considerations of interpersonal processes. The nonhuman environment is, by implication, considered as irrelevant to human personality development, as though the human race were alone in the universe, pursuing individual and collective destinies in a homogenous matrix of nothingness, a background devoid of form, color, and substance.[2]

Given the relative lack of available research, this chapter's conclusions will be preliminary and tentative. We will draw on a spate of recent research and writing on the topic, including essays in a book this author recently coedited with psychologist Peter Kahn, *Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations,* to explore how varying types of contact with nature affect children's emotional and intellectual development.[3]

Children's experience of nature involves three kinds of contact: direct, indirect, and vicarious (or symbolic) experience. Direct contact refers to interaction with largely self-sustaining features and processes of the natural environment. These forms of direct contact include plants, animals, and habitats that function mostly independent of human input and control, although they may sometimes be affected by human activity. Direct experience of nature is often spontaneous and unplanned, occurring in relatively unmanaged areas, such as a meadow, a creek, a forest, or sometimes even a park or a child's backyard. Ecologist Robert Pyle describes these settings as places where "kids . . . [are] free to climb trees, muck about, catch things, and get wet." These areas include "watercourses, such as creeks, canals, ravines, and ponds, a big tree, a clump of brush, bosky dell, or hollow; parks, especially undeveloped ones; and old fields, pastures, and meadows."[4]

By contrast, children's indirect experience of nature, although involving actual contact, occurs in created and highly controlled environments that depend on ongoing human management and intervention. Indirect experience of nature tends to be highly structured, organized, and planned; it may occur in settings such as zoos, botanical gardens, nature centers, museums, and parks. These indirect encounters sometimes involve domesticated animals (pets), household plants, or other elements of the nonhuman world that have been incorporated into the human household. Domesticated creatures usually mean cats and dogs but can also include horses, birds, and even fish or a potted plant that retains qualities of

"wildness." Children's indirect experience of nature can also occur through flower and vegetable gardening, raising livestock, and interacting with creatures and habitats that require human input and control.

The vicarious, or symbolic, experience of nature does not involve contact with actual living organisms or environments but, rather, with the image, representation, or metaphorical expression of nature. Vicarious experience can be clearly evident or, at times, highly stylized and obscure. Children today encounter a wide range of vicarious images and symbols of the natural world—a teddy bear, the three pigs, the big bad wolf, Mickey Mouse, Lassie, Winnie the Pooh, depictions in such films as *Free Willy* and *Never Cry Wolf*, and in National Geographic specials and other television programs such as *Animal Planet*. Such vicarious representations of nature are surprisingly prolific despite modern society's diminishing direct contact with nature, a consequence both of revolutionary new electronic media (film, television, computers) and of the widespread occurrence of more traditional forms of written communication (books, magazines, comics).

Counter to the notion that vicarious natural contact may be a particularly contemporary phenomenon, the symbolic experience of nature has an ancient lineage, perhaps as old as human society itself, which is encountered in the oldest rock art and more figuratively in innumerable myths, fables, tales, and totems over the long course of human evolution. Still, the unprecedented development of mass communications technology appears to have produced an extraordinary proliferation of natural images. Some people worry that such vicarious experience is rapidly replacing the more direct and spontaneous forms of childhood contact with the natural world, an issue that will be discussed later in this chapter. First, we will explore the relative role of each form of contact with nature in children's development. In this regard, we will link these forms of contact with nature to three kinds of childhood development: (1) cognitive or intellectual, (2) affective or emotional, and (3) evaluative or moral development (Figure 9).

Nature and Cognitive Development

A taxonomy of cognitive development developed by psychologist Benjamin Bloom and his colleagues identified six stages in children's normal intellectual development, moving from relatively simple to more complex levels of understanding, problem solving, and thinking.[5] The shift from one cognitive stage to another is typically sequential and hierarchical, with one intellectual stage usually following the preceding one. A summary of the six stages includes the following:

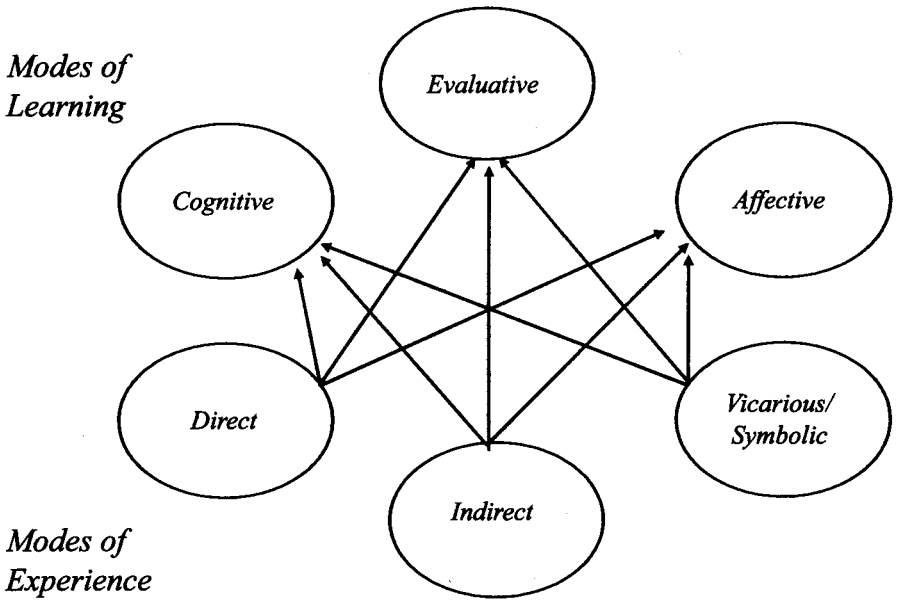

Figure 9. Modes of Experiencing Nature and Modes of Learning in Maturation and Development

- *Stage one: Knowledge.* The first stage emphasizes the child's emerging capacities to understand basic facts and terms and then apply this knowledge to presenting ideas, rendering broad classifications, and expressing a rudimentary understanding of causal relationships.
- *Stage two: Comprehension.* The second stage involves the child's developing capacity to interpret and paraphrase information and ideas and then extrapolate these understandings to other situations.
- *Stage three: Application.* The third stage stresses the child's maturing capacity to apply knowledge in generating ideas, concepts, and even principles applied to a wide range of situations.
- *Stage four: Analysis.* The fourth stage involves the child's evolving ability to examine and then break down knowledge into constituent parts and then use this understanding to elucidate underlying relationships.
- *Stage five: Synthesis.* The converse of analysis (stage four), the fifth stage emphasizes the child's ability to integrate and collate knowledge from discrete parts, organize it into structured wholes, and then use this knowledge to identify and understand relationships.

- *Stage six: Evaluation.* The final stage in cognitive development involves the child's ability to form judgments about the functional significance of parts of patterned and structured wholes based on carefully examining evidence, impacts, and outcomes.

As noted, the major task of the first stage of cognitive development is forming basic understandings of facts and terms, creating rudimentary classifications, and crudely discerning causal relationships. The natural world greatly aids this emerging capacity because it affords numerous highly stimulating and engaging opportunities to identify and order basic information and ideas. At a relatively early age, children encounter in nature a vast array of objects for labeling and discriminating features and properties. The young child continually confronts opportunities to assign names and categories to basic and nearly ubiquitous features of his or her life, including trees, bushes, plants, flowers, birds, mammals, habitats, and landscapes.

Moreover, this process occurs in direct ways as well as through more representational, metaphorical means. Part of nature's attraction for the young is its wide range of subjects encountered in so many forms. For example, in North America almost all children encounter to some degree oaks, maples, pines, poison ivy, dandelions, roses, tulips, dogwoods, robins, cardinals, turtles, snakes, fish, ants, mosquitoes, clams, crabs, rivers, lakes, streams, valleys, rocks, cliffs, boulders, wind, rain, clouds, and more. They also confront this wealth of subject matter, and a nearly equal richness of more remote or fantastic creatures, such as tigers, bears, hippos, giraffes, dinosaurs, and monsters, in realistic as well as stylized ways. The abundance of actual and symbolic opportunities nature offers for naming, sorting, and classifying is unrivaled by any other aspect of the child's world. Moreover, a major appeal is that these objects are fundamentally similar to the child either because they are alive or because they relate closely to his or her everyday world. Nature offers all children an especially salient and dramatic focus for developing the capacities to know, label, and classify, which are basic to the first stage of cognitive maturation.[6]

This opportunity occurs not only through direct contact or observation of nature but also through more metaphorical means. Children's preschool books, for example, offer many images drawn from nature to help develop the ability to name, categorize, and count. The stories include such characters as "one bear," "two giraffes," "three lions," "four hippos," or "five mountains," but rarely contain contrived artifacts of an entirely human constructed world. Nature's depiction is often anthropomorphic in these tales, but this represents a stimulating approach that almost always engages children.

Anthropologist and veterinarian Elizabeth Lawrence uses the provocative term *cognitive biophilia* to suggest that images and symbols of nature are often used to aid human communication and maturation.[7] Even in our modern society, which is characterized by extraordinarily inventive fabrication, images drawn from the natural world continue to provide an unrivaled, irreplaceable context for challenging children's cognitive development. For children, nature is the richest, most detailed, and most readily available informational context they are ever likely to encounter.[8]

Contact with nature in children's cognitive maturation can also be identified in the second stage of intellectual development, comprehension. Comprehension emphasizes the translation, interpretation, and extrapolation of facts and ideas involved in collating and validating information through observation and experience. Both real and imagined encounters with the natural world offer children a wide range of accessible and emotionally salient opportunities to develop this ability to analyze, assimilate, and comprehend facts and ideas.

A major challenge of childhood is developing the ability to translate and interpret experience by systematically assessing objective, empirical evidence. Examining the world through the eyes of a child, we see again that nature provides numerous opportunities to develop this capacity through objects that are frequently encountered in a child's ordinary life. For example, the North American child learns to comprehend that snow falls at certain temperatures and rain at others; that trees grow in soil and not in water or through asphalt; that ducks and geese inhabit wet rather than dry or upland places; that butterflies fly during the day and moths at night; that many, rather than one or a few trees, constitute a forest; that cattle and sheep group together in herds while large predators generally stand alone and apart; that crabs and clams muck about in marshy rather than dry habitats; and more.

Indeed, no other aspect of a child's life offers this degree of consistent but varied chances for critical thinking and problem solving—a steady diet for the mind as well as the body. The child engages in an ongoing dynamic of intellectual development by distinguishing creatures, natural features, and environmental processes; by lumping and classifying life and nonlife into categories of relation and distinction; by observing and interpreting the processes of feeding, reproducing, surviving, and dying. The child observes many normal and abnormal events in nature, helping him or her progress from simple acts of identification and classification to more complex conceptualizations and predictions. This spiral through the various stages of cognitive maturation aided by a matrix of direct, indirect, and symbolic experiences of nature helps condition and strengthen the muscle we call the mind.

To expedite our discussion, we will bypass similar descriptions of the four remaining stages of cognitive development to consider how contact with nature can influence children's affective development.

Nature and Affective Development

The natural world strongly affects children's emotional maturation. Again, we can draw from the work of developmental psychologists in examining this relationship. David Krathwohl and his colleagues identified five stages in emotional maturation:

- *Stage one: Receiving.* The first stage focuses on the child's developing awareness of and sensitivity to facts, information, and ideas, and the willingness to receive and consider this information.
- *Stage two: Responding.* The second stage emphasizes the child's capacity to react to and gain satisfaction from receiving and responding to information, situations, and ideas.
- *Stage three: Valuing.* The third stage involves the child's ability to attribute worth or importance to information, ideas, and situations, reflecting a clear and consistent set of preferences and commitments.
- *Stage four: Organization.* The fourth stage emphasizes the child's ability to internalize and organize preferences and assumptions of worth into a consistent, stable, and predictable pattern of values and beliefs.
- *Stage five: Characterization by a value or value complex.* The final stage reflects the child's ability to integrate values and beliefs into a coherent worldview or philosophy of life.[9]

Only the first two stages of this taxonomy are considered here in examining children's experience of nature in affective development. Stages three through five are treated as a separate growth process that is neither entirely affective nor cognitive but, rather, is a combination of the two. In other words, values are viewed as a combination of intellect and feeling.[10]

In the first two stages of affective development, children develop the capacities to receive and respond to information, ideas, and situations. These emotional states encourage intellectual maturity as children form emotional interests that motivate them to seek and understand information and ideas. Children's feelings can be considered building blocks for acquiring knowledge, as suggested by psychologist Leonard Iozzi: "[There is] significant evidence that the affective domain is the key entry point to learning and teaching."[11]

What aspects of a child's world provide an emotional basis for receiving and responding to new information and ideas? Certainly, significant people (parents, siblings, friends, teachers, neighbors) represent an irreplaceable core that encourages emotional receptivity and attachment. However, children are also highly attracted to the natural world, most particularly to its living forms. A child's experience of nature, especially of other animals, provides an emotionally powerful, if secondary, basis for affective development.

How does this occur? A child responds to stimuli with such basic emotional states as like, dislike, attraction, aversion, doubt, joy, sorrow, fear, wonder, and more. For most children, the natural world consistently elicits these and other basic emotional states. For example, young people encounter in nature various creatures that look, move, and feel like themselves. These resemblances prompt children to respond emotionally, most importantly by extending to these creatures the presumed capacities to feel and to think, which produces an emotional bond and assumption of reciprocity. As psychologists Gene Myers and Carol Saunders explain: "Animals are so fascinating [for children because] they are highly responsive and offer many dynamic opportunities for interaction."[12] These researchers identified four properties of familiar animals that generally prompt children to identify emotionally with them: (1) "agency," the seeming ability of certain animals to initiate and sustain patterns of behavior; (2) "affectivity," the apparent capacity of certain creatures to express and reveal feelings; (3) "coherence," the tendency of particular animals to react and respond to children; and (4) "continuity," the willingness of some animals (particularly companion animals) to repeat behaviors in response to a child. All four factors typically result in certain animals becoming subjects of children's emotional attachment, which aids the children's evolving capacities for receiving and responding to information, situations, and ideas.

These affective encounters with animals, and with nature in general, tend to be so significant that most adults looking back on their childhood cite the natural world as an emotionally critical aspect of their youth. Psychologist Rachel Sebba reports that an extraordinary 96.5 percent of all adults she studied, who represented a wide range of age, gender, and other demographic groups and were raised in both urban and nonurban settings, identified the outdoors as being of critical emotional significance during their childhood. Moreover, the natural settings recalled were typically quite simple and ordinary, such as a backyard or nearby park.[13]

For many adults, these early childhood experiences of nature constitute a treasured emotional legacy that they draw on for personal creativity. Pioneering psychologist Edith Cobb reports in her study *The Ecology of Imagination in Childhood* that many highly gifted persons cite the memory of particular childhood environments as an emotional basis for their creative production. These

childhood experiences enabled them "to renew the power and impulse to create at its very source." Childhood contact with nature formed for these persons an affective crucible on which they forged a sense of wonder, exploration, and discovery. The encounters were frequently joyful, adventurous, and surprising as well as a source of curiosity, mystery, and inventiveness. As Cobb suggests:

> The child's sense of . . . nature is . . . basically aesthetic and infused with joy in the power to know and to be. These equal, for the child, a sense of the power to make. . . . The child's sense of wonder, displayed as surprise and joy, is aroused as a response to the mystery of [the] stimulus [of nature] that promises "more to come" or, better still, "more to do"—the power of perceptual participation in the known and unknown.[14]

Cobb also invokes the poetry of Walt Whitman to explain the emotive power of nature for children and its ability to infuse them with wonder and joy:

> There was a child went forth every day,
> And the first object he looked upon, that object he became,
> And that object became part of him for the day or a certain part
> of the day,
> Or for many years or stretching cycles of years.
> The early lilacs became part of the child,
> And grass and white and red morning glories, and white and red
> clover, and the song of the phoebe-bird,
> And the Third-month lambs and the sow's pink-faint litter, and
> the mare's foal and the cow's calf.[15]

The environmental scientist Rachel Carson similarly observed how often a child's capacity for wonder, exploration, and discovery begins with and is encouraged by an emotional experience in and identification with nature. She suggested that feelings of interest, enthusiasm, and joy typically originate in the natural world and become motivating forces in childhood learning and cognitive development. She also noted how often these feelings precede and motivate intellectual maturation. Carson wrote:

> For the child . . . it is not half so important to *know* as to *feel.* If facts are the seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the

> fertile soil in which the seeds must grow. The years of early childhood are the time to prepare the soil. Once the emotions have been aroused—a sense of the beautiful, the excitement of the new and the unknown, a feeling of sympathy, pity, admiration or love—then we wish for knowledge about the object of our emotional response. Once found, it has lasting meaning. It is more important to pave the way for the child to want to know than to put him on a diet of facts he [or she] is not ready to assimilate.[16]

Experiencing nature during childhood engenders both curiosity and the passion to learn that reflects a willingness to give and receive information, facts, and ideas. By interacting with the natural world, children encounter a matrix of diverse and stimulating opportunities to engage such affective capacities as wonder, imagination, and joy. Children's experience of nature provides a source of deep and enduring emotional significance throughout people's lives. As Rachel Carson suggests:

> A child's world is fresh and new and beautiful, full of wonder and excitement. . . . What is the value of preserving and strengthening this sense of awe and wonder, this recognition of something beyond the boundaries of human existence? Is the exploration of the natural world just a pleasant way to pass the golden hours of childhood or is there something deeper? I am sure there is something much deeper, something lasting and significant. . . . Those who contemplate the beauty of the earth find reserves of strength that will endure as long as life lasts. There is symbolic as well as actual beauty in the migration of the birds, the ebb and flow of the tides, the folded bud ready for the spring. There is something infinitely healing in the repeated refrains of nature.[17]

In addition to wonder, fascination, and emotional attachment, a child's experience of nature can elicit far less pleasant feelings, such as uncertainty, anxiety, pain, and fear. The emotional power of nature to inspire and instruct depends on sentiments ranging from pleasure and satisfaction to vulnerability, foreboding, and a feeling of danger. If not overwhelming, all of these positive as well as negative emotions contribute to maturation and development.

Why does the natural world emotionally arouse children so strongly and consistently? Part of the answer lies, as psychologist Rachel Sebba suggests, in its being "an unfailing source of stimulation."[18] Nature provides an endless bounty of circumstances that prompt an emotional as well as an intellectual response. Imagine for a moment the wide variety of emotional states associated with the following scenario: A young girl and her friends make a long, fatiguing

climb up a wooded mountain at the edge of town. They enter a dark, foreboding forest and eventually emerge into the light at the mountain's peak, where they look far into the distance. They return along the edge of a steep, dark canyon, where they spy a soaring hawk above and also occasionally look down at curious crawling insects as they challenge and explore the unknown. Fearing they are lost, they eventually stumble on a road that leads back home. In the course of their short journey, they experience pleasure, wonder, fascination, apprehension, anxiety, and more, all raw material in the process of emotional and intellectual maturation.

Nature provides young people with diverse and challenging opportunities for affective and cognitive growth. These experiences present many ways for children to cope and adapt, often in contrast to the ambiguity and complexity of their dealings with adults. As psychiatrist Harold Searles observes: "The non-human environment is relatively simple and stable, rather than overwhelmingly complex and ever shifting . . . and generally available rather than walled off by parental injunctions."[19]

The emotional importance of nature for children is also found in stories and fantasy. Nature's mystery and wonder are frequently revealed through children's stories, fables, fantasies, and even dreams.[20] This world of make-believe includes high mountains soaring into the mist; frightening creatures plotting people's demise; and young boys and girls aided by animal friends who manage to save the day for their families and friends. These fantasies provide ways for children to engage their sense of mystery, wonder, uncertainty, adventure, and fear of failure. Fantasizing about nature offers children highly emotional encounters in important and often disguised ways.

A potentially disturbing aspect of contemporary life is the rapid growth of fictional and fantastic depictions of the natural world accompanied by a pronounced decline in direct and real encounters.[21] Children too often today confront a contrived, artificial nature in place of an actual, ordinary experience. Confronting nature as fantasy creatures in story and film or as herds of exotic wildlife on television may be entertaining and sometimes instructive, but it can never adequately substitute for direct and real contact. The contrived experience of nature rarely provokes in children strong and lasting emotional responses, such as wonder, joy, surprise, challenge, and discovery. This sense of excitement, adventure, and imagination that a familiar experience of nature can provide is illustrated by poet Dylan Thomas's recollection of a local park from his youth:

> Though it was a little park, it held within its borders of old tall trees, notched with our names and shabby from our climbing, as many secret places, caverns and forests, prairies and deserts, as a country somewhere at the end of the sea. . . . And though we could explore it one day, armed and des-

> perate, from end to end, from the robbers' den to the pirates cabin, the highwayman's inn to the cattle ranch, or the hidden room in the undergrowth, where we held beetle races, and lit the wood fires and roasted potatoes and talked about Africa, and the makes of motor cars, yet still the next day, it remained as unexplored as the Poles. . . . And that park grew up with me; that small world widened as I learned its secrets and boundaries, as I discovered new refuges and ambushes in its woods and jungles; hidden homes and lairs for the multitudes of imagination.[22]

Again, this question of the relative importance of direct versus indirect symbolic experience of nature in children's maturation in modern society will be considered in more detail later in this chapter. Next, we examine the role of contact with nature in evaluative development.

Nature and Evaluative Development

Evaluative maturation refers to a child's evolving capacity to form values, a fundamental aspect of moral development. Understood as the attribution of worth or importance to—as well as the realization of benefits from—information and situations, values reflect a clear, consistent set of judgments and preferences. Values are the synthesis of emotion and intellect, an organizational property that cannot be explained by or reduced to either affect or cognition alone. Healthy maturation involves the formation of children's values of nature. The nine biophilic values described in chapter two form the basis of this development; when they become functionally evident, they enable children to adapt more readily as they mature into adults.[23] Because these biophilic values are weak biological affinities, their operative development in children depends on adequate experience, learning, and social support. Although they were described fully in chapter two, let us briefly review the prominent benefits of each value here.

Developing an *aesthetic* value stimulates a child's curiosity, imagination, and ability to create and discover; to discern order and organization; to form ideas about symmetry, harmony, and balance; and to recognize the potential for achieving safety, sustenance, and security. Developing a *dominionistic* value fosters a child's resourcefulness and the ability to cope with adversity, to take risks and confront the unknown, to explore and discover, to achieve a sense of independence and autonomy, and to gain self-confidence and self-worth. Forming a *humanistic* value enhances a child's capacity for bonding, companionship, and giving and receiving affection; caring for others and expressing intimacy and trust; and being sociable and cooperative. Developing a *moralistic* value increases a child's ability to form judgments about good and bad, to treat the world with kindness and respect, to develop a sense of faith and trust, and to experience spiritual meaning and purpose.

Developing a *naturalistic* value enhances a child's curiosity, exploration, and discovery; demonstrating competence and craft; and achieving self-confidence and self-esteem. Forming a *negativistic* value helps a child avoid harm and injury; minimize risk and uncertainty; and experience feelings of awe, humility, and respect for forces greater than the self. Developing a *scientific* value fosters a child's capacity for observation, analysis, and empirical examination; critical thinking and problem solving; and appreciation and respect for the diversity and complexity of creation. Forming a *symbolic* value enhances a child's classificatory and taxonomic skills, communication and cognitive capacities, and ability to cope with complicated aspects of psychosocial development through imagery and story. Finally, developing a *utilitarian* value enhances the child's ability to achieve physical comfort and security, to demonstrate craft and skill, and to eventually reap material and physical rewards.

Three major stages occur in the maturation of children's values of nature. The first stage generally occurs before age six or during early childhood and focuses on developing utilitarian, dominionistic, and negativistic values of nature. These values reinforce a child's sense of physical and material security and the avoidance of threat and danger. Although not absent during this period, affection for nature is subordinated to the more fundamental concerns for safety, sustenance, and security. The very young are anxious about direct and uncontrolled contact with nature, with the exception of restricted contact with highly familiar creatures and settings (e.g., companion animals encountered close to family members and trusted others). Exploratory encounters typically occur in the protective, guiding environment of the home. During early childhood, children are fascinated by drawings and photographs of nature, particularly of big and familiar animals—such as fat hippos; long, preposterous giraffes; and frightening yet thrilling wolves—that help develop their abilities to identify and acquire language and numeric skills.[24]

The second stage in the development of children's values of nature occurs during middle childhood (roughly ages six to twelve). During this period, the child forms basic ideas about nature and gains a rudimentary empirical understanding of the natural world. Middle childhood marks a time of rapidly developing humanistic, symbolic, and aesthetic values of nature. Children at this age learn to recognize other creatures and habitats, although still primarily those near their own homes and neighborhoods rather than in wild settings. Children in middle childhood also begin to appreciate other creatures as independent and autonomous, existing apart from their own immediate interests and needs, and they start to comprehend the "differentness" and "otherness" of life. They also develop the capacity to form strong bonds with animals, especially with companion animals and well-known species. As their grasp of the separateness of the natural

world grows, they further begin to develop a sense of responsibility and caring for nature based on conscience rather than simply on punishment for doing something wrong.

During middle childhood, children also begin to venture away from the immediate home into the relatively unfamiliar terrain of the backyard and neighborhood, as they start to engage and immerse themselves in more natural and less domesticated settings. Here, they can expand their interests, curiosities, and feelings of competence independent of adult supervision. Children of this age rapidly develop a cognitive interest in the natural world, including basic information and ideas about nature that assist in problem solving and creative ventures (often in neighborhood open spaces). These local natural settings provide many chances for children during middle childhood to explore, discover, imagine, and create.[25] As psychologist David Sobel explains:

> Middle childhood is a critical period in the development of the self and in the individual's relationship to the natural world. The *sense of wonder* of early childhood gets transmuted in middle childhood to a *sense of exploration.* Children leave the security of home behind and set out . . . to discover the new world. . . . Middle childhood appears to be the time when the natural world is experienced in highly evocative ways. It appears to be the time when children strike out, alone or with peers, to explore an ever-expanding repertoire of reachable places, in search of new experiences and adventure.[26]

During middle childhood, children also use natural settings to develop an identity apart from their parents and immediate household. Eminent psychologist Erik Erikson describes middle childhood as a time when the young person becomes engaged in making things, demonstrating industry and competence, and establishing a self apart from adult control.[27] Nearby nature in particular affords children of this age a varied and stimulating source for creating a place away from but near the home—for example, forts, dens, hideouts, and playhouses. Commonly secreted in the foliage of ordinary nature, these constructions provide the chance for independent creation, producing a sense of autonomy and confidence in children of this age as they manipulate objects in the effort to create their own world of safety and security. As Sobel further describes:

> During . . . middle childhood, the self is fragile and under construction and needs to be protected. . . . The secretive nature of the hiding place is significant. . . . To go farther in their explorations, many children at this age create an outpost, a place to be "at home" in the outdoors.

> Forts and playhouses serve as places to look at the world from a place of one's own, as places for experimenting with how to put things together. The satisfaction of being able to transform the environment successfully and comfort in being able to make a place for oneself.[28]

These constructive, creative encounters with nature during middle childhood often produce great satisfactions—as well as memories commonly retained into adulthood. As writer Wallace Stegner observes: "There is a time somewhere between five and twelve . . . when an impression lasting only a few seconds may be imprinted . . . for life. . . . Expose a child to a particular [natural] environment at this susceptible time and he will perceive in the shapes of the environment until he [or she] dies."[29]

Psychologist Louise Chawla reported that adults almost universally cite the outdoors of middle childhood as one of the most significant settings of their childhood. She suggests that adults use these recollections of nature for what the poet Wordsworth called "tranquil restoration," a time to reflect and draw strength from the presumed simplicity and beauty of youth. Citing research by Hoffman, Chawla asserts that adults reminiscing about childhood emphasize "moments [in nature] in which [they] seemed to experience a . . . sense of rapture or great harmony." These instances of intimate immersion in nature often become seared in memory and are recalled throughout a person's life, particularly at moments of crisis or injury.[30]

Symbolizing nature is also important for children's development during middle childhood.[31] Unlike the very young, whose images of nature focus mainly on naming and counting, the fantasies of middle childhood dwell on more complicated matters of psychosocial development. Children at this age use nature symbolically to confront issues of identity, selfhood, good, evil, trust, betrayal, innocence, guilt, order, and chaos. They accomplish this through stories, tales, and myths involving characters such as Cinderella, Snow White, Winnie the Pooh, the Lord of the Rings, and others. Children confront in these often anthropomorphic stories disturbing and risky situations of conflict, need, desire, power, and authority, though almost always in beguiling and enchanting ways. Psychologist Bruno Bettelheim, in his classic essay "The Uses of Enchantment," emphasizes the symbolic utility of the nonhuman world, described here by human ecologist Paul Shepard:

> The [children's stories] dramatize the intrinsic childhood worries which the youthful listener unconsciously interprets as his [or her] own story and his [or her] own inner self . . . [Bettelheim] believes the problems to be universal, having to do with protection from malicious relatives, the

> uncertain intentions of strangers, [the child's] verbal or physical limitations, . . . the bodily changes and functions associated with growth, . . . rivalry, jealousy and envy. . . . Every story is a magical prophecy of personal transcendence. . . . Their message is that special skills, often the powers represented by different animal species, will come to the rescue, solve the problems, save the day.[32]

The third stage in children's development of their values of nature occurs during adolescence (ages thirteen to seventeen). Children at this age significantly develop their ecological, moralistic, and naturalistic perspectives of the natural world. Rapid, pronounced development of abstract and conceptual reasoning about nature occurs, helping adolescent children form ethical and moral judgments about their relationship to the natural world.

They understand and appreciate larger spatial and temporal scales, which are reflected in their evolving grasp of such concepts as ecosystems and evolution. They also become more concerned about moral obligations to care for and to protect nature, particularly treatment of other animals and issues of inflicting pain, suffering, or causing pollution and despoiling the natural environment. This does not suggest that younger children are incapable of forming moral judgments about the natural world; rather, this evaluative tendency becomes far more pronounced and manifest during the late teenage years.

Adolescents also become far more ambitious and adventurous in challenging unfamiliar terrain. These outdoor experiences offer important opportunities to develop physically and psychologically, to exercise independence and autonomy, and to build self-confidence and self-esteem. Research on outdoor programs (reported in chapter two) reveals the considerable effects on maturation these experiences often produce during late adolescence, including enhanced capacities for coping and problem solving, critical thinking, and interpersonal skills. The following comments attest to the perceived benefits these outdoors encounters provide for late adolescents in particular:

> [My outdoor program occurred at] a pivotal point in my life. It gave me the opportunity to take a risk. It strengthened my sense of self. It gave me a feeling of purposefulness, self-respect, and strength that I had never had before. When you have confidence in yourself it affects every aspect of your life.

> [My outdoor experience] was the most amazing, awe-inspiring, thought provoking, and challenging experience of my life. It helped me to believe that if there is anything I really want to

> do in life, I have the ability to do it. All I have to do is look deep inside myself and I can find it. [It] helped me realize who I was and how I fit into the world around me. This realization affects every decision I make in my life.
>
> [Being in nature] gave me an unbelievable confidence in myself. I found a beauty, strength, and an inner peace that I never knew was present. I learned the most I ever learned about life, myself, and skills that I still use everyday. It made me more confident, focused, and self-reliant. I have become more compassionate towards not only nature, but towards other people. I learned about respect, setting goals, working to my maximum and past it. These are skills I consider to be important in everything I do, and I feel they will help me continue to be successful throughout life.[33]

On the other hand, some research has reported diminishing interest and involvement in nature among teenagers. Psychologists Rachel and Stephen Kaplan report that adolescence is a "time-out" period when concern about peer relationships and social competence replace attraction to the outdoors.[34] Further exploration, however, suggests that these interpersonal concerns do not substitute for or replace adolescent interest in nature so much as they indicate the need for these children to share these outdoor experiences with others of their own age. This may suggest why group-oriented outdoor programs, such as those offered by the National Outdoor Leadership School and Outward Bound, are so popular among late adolescents.

The three-stage development of children's values of nature shares several characteristics in common with the processes of affective and cognitive maturation described earlier in this chapter.[35] First, values formation appears to progress from more concrete and direct relationships with nature to more abstract understandings and interactions. Second, the initial focus on individual needs and immediate interests in relation to nature widens with age to become a broader concern for social interactions and relationships. Third, the focus on the natural world shifts at an early age from local and parochial settings to a more regional and even global emphasis during adolescence. Finally, early childhood emphasis on emotional and affective development in relation to nature broadens during middle childhood to more cognitive concerns, and during adolescence to a greater stress on abstract ecological and moral reasoning about nature.

The Importance of Direct Experience

We have considered how various kinds of direct, indirect, and vicarious contact with nature exerts a shaping influence on children's emotional, intellectual, and moral development.

Echoing the assertion of psychiatrist Harold Searles, we have found: "The non-human environment, far from being of little or no account to human personality development, constitutes one of the most basically important ingredients of human psychological existence."[36]

Considerable data underscored the particular influence that direct experience of familiar natural settings has on children's maturation, especially during middle childhood.[37] Direct, often spontaneous contact with nature appears to constitute an irreplaceable core for healthy childhood growth and development. Commenting on the importance of direct experience, conservation biologist and writer Robert Pyle argues: "It is through close and intimate contact with a particular patch of ground that [children] learn to respond to the earth. . . . We need to recognize the humble places where this alchemy occurs. . . . Everybody has a ditch, or ought to. For only the ditches—and the fields, the woods, the ravines—can teach us to care enough."[38]

Ecologist and anthropologist Gary Nabhan has similarly observed the importance of familiar and ordinary—rather than unusual or spectacular nature—in his own children's maturation. He reflects: "I've come to realize that a few intimate places mean more to . . . children . . . than all the glorious panoramas."[39] Both theory and evidence support the view that direct, ongoing experience of nature in relatively familiar settings remains a vital source for children's physical, emotional, and intellectual development.

Why does direct contact with nature affect childhood maturation so strongly? The work of psychologist Rachel Sebba can help address this question, particularly several critical characteristics of the direct experience of nature that exercise a powerful effect on children.[40] First, Sebba emphasizes that the natural world is extraordinarily diverse and variable, thus, exerting an especially stimulating impact on a child's senses of sight, sound, smell, touch, and taste. Moreover, these responses are unavoidable and occur in nearly all settings, from rural to urban. Children are rarely far from the sight of plants, the feel of wind, the smell of soil, the sounds of songbirds, even the disturbing presence of spiders. A child's sensory experience of nature is so ubiquitous that it often remains intuitive and unnoticed, a constant aspect of life. Second, Sebba points out that the child's normal experience of nature occurs in a continuous, dynamic way: "The natural environment is characterized by a continual change of stimuli (over time or across area)." Nature's sensory effect is constantly shifting and modulating across geographic areas and throughout the day and season, forcing on the child its recognition, awareness, and response.

Third, Sebba emphasizes that the natural world is revealed in random, unpredictable ways. As she suggests: "The external environment is characterized by instability." A dynamic, altering natural environment demands the child's "alertness and attention" and, as a consequence,

requires that the child adapt his or her perception and behavior to respond to new, emerging, and often challenging situations.

Finally, Sebba points out that nature is replete with animate life and life-like features. She observes: "The natural environment is . . . one from which life springs and one which exerts forces that cause inanimate objects to move." This aliveness is revealed in forms familiar to children, which they can easily identify with as an integral part of their lives. This quality of animation fundamentally distinguishes for children the natural from the built environment. No degree of finely executed fabricated or artificial product can fully replicate the vital, ambient qualities of living nature. The natural world constitutes that singular place where life is born, grows, feeds, seemingly feels and thinks, and then dies. Even nonliving elements in nature, including the air, water, and landscapes, often seem life-like for most children, even if not precisely alive. The child intuits that these features support and sustain life, and though not an ecologist, he or she can readily observe that all creatures need water, that some animals eat plants and others eat other animals, and that the air is the irreplaceable foundation for life and behaves at times like a great ambient beast.

A basic dilemma of the modern age is whether children still experience enough direct contact with the natural world. Some argue that a disturbing aspect of contemporary life is a profound decline in both the quantity and quality of children's direct experiences of nature. Children are increasingly separated from the natural environment, direct contact with nature being gradually replaced by indirect and vicarious experience.[41]

Many factors have contributed to this decline in modern children's direct experience of nature, including extensive pollution and degradation, decline of open spaces, habitat fragmentation, loss of biological diversity, the growth of artificial and impervious surfaces, the replacement of native fauna and flora by exotic and introduced species, the disappearance of familiar species and environments, crowding and congestion, and an increased reliance on motorized transportation. Changing social and cultural patterns have also added to the decline. Traditionally, adults have served as the critical role model for a child's developing interests in the natural world mainly by introducing and familiarizing the child with various outdoor activities and communicating this knowledge from one generation to another. Yet adults—especially parents—now appear to be less and less involved in shaping children's outdoor interests. This situation is likely a consequence of increasing geographic and social mobility, declining extended-family networks, less stable communities, urbanization, and destruction of local habitats. Increased concern about children's safety also seems to have made adults less willing to allow children to play spontaneously outdoors without supervision.[42]

Play in nature, particularly during the critical period of middle childhood, appears to be an especially important time for developing the capacities for creativity, problem solving, and emotional and intellectual development. This has apparently been the norm throughout human history, as designer Randy White describes based on an extensive review of relevant literature:

> Throughout most of history, when children were free to play, their first choice was often to flee to the nearest wild place. . . . 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. . . . But . . . as recently as 1970, children [still] had access to nature and the world at large. They spent the bulk of their recreation time outdoors, using the . . . playground, parks, . . . vacant lots and other spaces "left over" during the urbanization process.[43]

Unfortunately, during at least the past twenty-five years, the chances for children to directly experience nature during playtime has drastically declined. For many reasons, most children today have fewer opportunities to spontaneously engage and immerse themselves in the nearby outdoors. This change reflects a declining availability of appealing, accessible habitats as well a reduction in children's time and inclination to play outdoors. As White again observes:

> Not only have children's play environments dramatically changed in the last few decades, but also the time children 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. . . . 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.[44]

Modern especially urban society appears to rely more and more on indirect and vicarious forms of contact with nature instead of direct, spontaneous experience. More than ever, contemporary children encounter nature through organized, supervised, and formal visits to places like zoos, nature centers, and museums, or through the lens of television, film, and the computer. Children today are more likely to encounter exotic wildlife from Africa or Asia (whether in the zoo or on television) than to have contact with common creatures in nearby

settings. As political scientist David Orr observes: "The reigning political economy has shifted the lives and prospects of children from direct contact with nature to an increasingly abstract and symbolic nature; routine and daily contact with animals to contact with things; . . . direct exposure to reality to abstraction and virtual reality."[45]

Robert Pyle invoked the evocative phrase "the extinction of experience" to describe these tendencies toward diminished and compromised direct contact with ordinary nature.[46] Pyle, a conservation biologist and author of the World Conservation Union's book on endangered invertebrates, certainly understands the biological meaning of the term *extinction* as it is reflected in some twenty-seven thousand annual projected species extinctions today.[47] Yet he also recognizes from a more anthropocentric view that the significant decline in the human (and especially childhood) experience of nature constitutes a profound loss of psychological and social bearings as much as it does the elimination of unique gene pools. He writes:

> Simply stated, the loss of neighborhood species endangers our experience of nature. . . . Direct, personal contact with living things affects us in vital ways that vicarious experience can never replace. I believe that one of the greatest causes of the ecological crisis is the state of personal alienation from nature in which many [children] live. We lack a widespread sense of intimacy with the living world. . . . The extinction of experience . . . implies a cycle of disaffection that can have disastrous consequences. As cities and metastasizing suburbs forsake their natural diversity, and their citizens grow more removed from personal contact with nature, awareness and appreciation retreat. . . . So it goes . . . the extinction of experience sucking the life from the land, the intimacy from our connections.[48]

Yet we know little about the long-term developmental impacts of children having far fewer opportunities to directly experience the natural world. Our knowledge is also scant regarding the possible compensatory effects of an apparent increase in indirect and vicarious experiences of nature fostered by the rapid growth of electronic media, organized programs, and formal institutions. Nonetheless, children's affective, cognitive, and evaluative development appears to have suffered greatly from reduced direct contact with the natural environment due to increasing habitat degradation, biodiversity loss, declining open space, urban sprawl, pollution, and shifts in familial and community patterns.

Would it be exaggerating to label this decline in direct contact with nature an extinction of experience? Although major losses of biological diversity measured in thousands of species extinctions undeniably represents a biological catastrophe, this appalling event pri-

marily afflicts obscure invertebrates in remote places (e.g., tropical rain forests), far removed from the ordinary lives of most contemporary children. Still, children encounter the decline of the natural world every day through widespread extirpations of familiar species and habitats. Most children today experience an impoverished, highly simplified natural world as a result of pollution, urban sprawl, and the widespread conversion of natural habitats to artificial ones. Children regularly confront nature's declining and precarious condition; the abundance of pollutants in the air, water, and soil; and the decline of legendary creatures such as the tiger, grizzly bear, gorilla, elephant, rhinoceros, panda, whale, and more. How does this daily exposure to pervasive environmental abuse (in the place of natural health, beauty, and diversity) affect a child's sense of hope and optimism over the long term? What is lost when children no longer experience direct, ongoing access to local species in nearby settings?

Can a rapid, significant increase in opportunities for indirect and vicarious contact with nature replace or at least compensate for substantial reductions in direct ordinary experience of the natural world? Children today participate more than ever in many organized, planned activities in nature through school programs; visits to zoos, natural history museums, and nature centers; and outdoor programs, wildlife watching, and nature tourism. Contemporary children also have unprecedented access to the natural world through television, film, computers, and the Internet. These media represent revolutionary technological developments never before encountered in human history that give children unparalleled access to species and habitats from across the globe in the comfort and security of their homes and schools.

But do these encounters exert the same quality of developmental impact on children as do more direct, unstructured contacts, especially in local settings? Recalling the four features of the direct experience of nature cited by Louise Chawla—intensity, variability, instability, ambience—indirect or vicarious contact rarely offers the same degree of opportunity for experiencing challenge, adaptation, immersion, creativity, discovery, problem solving, or critical thinking as that afforded by direct encounters in the natural world. Confronting nature through television or computer, or at the zoo or nature center, does not provide children with intimacy, adventure, or surprise, all of which (and much more) form the basis for substantive learning and development. As Robert Pyle describes:

> Electronic mediation . . . may effectively convey facts and impressions and generally reinforce interest in animals and geography. But when the world comes edited for maximum impact and bundled into quick bites and bytes, it fails to convey the everyday wonder of the much maligned

> ordinary. Just as real life does not consist primarily of car chases and exploding buildings, quotidian nature is much more about grasshoppers in the pigweed than it is rhinos mating on a pixilated screen.[49]

The direct experience of nature also extends to the child the possibilities of uncertainty, risk, and failure. These realities necessitate adaptation and problem solving as well as the need to construct solutions and to think critically, all of which are essential to lasting learning and maturation. These conditions rarely arise when children passively watch television, visit a zoo, manipulate a computer screen, or even in most classrooms. As Pyle suggests: "Everyone has . . . a chance of realizing a pleasurable and collegial wholeness with nature. But to get there, intimate association is necessary. A face-to-face encounter with a banana slug means much more than a Komodo dragon seen on television. . . . Direct, personal contact with other living things affects us in vital ways that vicarious experience can never replace."[50]

What about the compensatory effects of high-quality zoos, museums, nature centers, or outdoor programs? These activities can and do influence knowledge and appreciation of the natural world.[51] But do these activities sufficiently substitute for direct contact in ordinary natural settings? Let us examine some relevant findings from studies of zoos. First, zoological parks are not a modern invention; menageries originated as long as four thousand years ago, the modern zoo emerged in Europe during the sixteenth and seventeenth centuries, and some four hundred accredited zoos exist today. Zoological parks are also extremely popular, with annual visits in the United States alone totaling more than 130 million people, and with 98 percent of Americans having visited a zoo at some point in their lives. Research on modern zoos that have naturalistic exhibits and ambitious educational programs has found that these places can positively affect children's knowledge and appreciation of wildlife. Yet research also suggests that this understanding is transitory and rarely contributes significantly to children's maturation and development. Moreover, visits to less progressive zoos often result in marginal to no improvement in learning and even at times to negatively affect children's appreciation and concern for the natural environment.[52]

Zoos and other indirect forms of natural contact have limited developmental effects because they provide few opportunities for spontaneous immersion and challenge and because they occur infrequently, existing only on the periphery of children's lives. Indirect organized contact with nature also tends to be passive, requires little feedback, and commonly emphasizes entertainment more than sustained learning and maturation. Visits to zoos, aquariums, and museums often focus on exotic, unusual species and habitats unrelated to chil-

dren's daily lives. These indirect, highly regulated, and often contrived forms of contact with nature are commonly more of a simulation and a "show" (no matter how sophisticated the fabrication), and most children recognize them as such. The zoo or museum lacks the reality and relevancy of direct experience in ordinary settings.

What about outdoor programs in relatively undisturbed natural settings, such as those described earlier in this chapter, which have been proven to exert significant developmental impacts on adolescent children in particular? Clearly, these programs are important learning experiences, but several factors limit their capacity to substitute for direct ordinary contact. First, these programs typically are available to only a small fraction of today's youth because of their high costs and their location in pristine settings. The programs also constitute highly unusual forms of contact with nature that take place in settings only marginally related to the everyday reality of most children. As one participant suggested: "[Participation] shifted my perspective a little bit. . . . I went and gathered some strength. But, the experience now seems so distant. Everything we learned is relevant, but it is so abstract. We learned how to organize and be careful with what we do with our bodies. But with the everyday hustle [and] bustle of daily life it is hard to incorporate this into my life."[53]

Structured, organized, planned encounters in the natural world generally do not offer the spontaneity, challenge, and relevancy afforded by direct experience in ordinary familiar settings. Positive developmental effects certainly occur from indirect and vicarious contact with nature, but these benefits should be viewed as complementary to rather than substitutes for direct experience of local environments. As Robert Pyle describes:

> Nature reserves . . . are not enough to ensure connection. Such places, important as they are, invite a measured, restricted kind of contact. . . . Children . . . need free places for puttering, netting, catching, and watching. . . . Spots near home where [they] can wander off a trail, lift a stone, poke about, and merely wander: places where no interpretive signs intrude their message to rob [their] spontaneous response.[54]

Experiencing nature in ongoing, unregulated, direct ways offers children irreplaceable opportunities for exploring and discovering, for creating and developing their personalities and identities, for probing and testing the margins of their world. Direct access to modest and even compromised natural settings can strongly influence childhood development. Even vacant lots, what one researcher called "unofficial countryside," can allow children opportunities to construct, create, and develop a sense of independence and identity.[55]

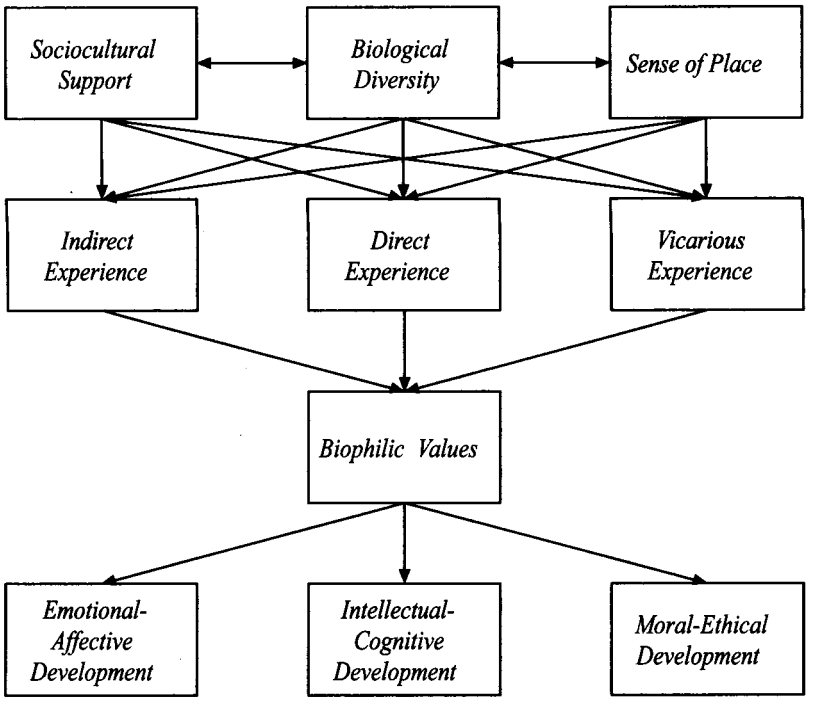

Figure 10. Hypothetical Relationship of Sociocultural Support, Biological Diversity, and Sense of Place to Experience of Nature and Development of Biophilic Values and Emotional, Cognitive, and Evaluative Development

Conclusion

This chapter, thus, concludes somewhat ambivalently. We have explored how children's emotional, intellectual, and evaluative development depends on varied, ongoing experiences of natural process and diversity. The need for such experiences can be satisfied through a broad matrix of direct, indirect, and vicarious encounters with nature in settings and circumstances from early childhood through adolescence. This contact produces the greatest maturational benefits when it occurs in stable, accessible, and culturally relevant social and physical environments. This array of factors, along with their hypothetical impacts on children's development, appears in Figure 10.

Yet a review of the various contemporary forces that have greatly diminished children's ongoing direct experience of nature prompts a more sobering conclusion. We have offered considerable evidence here and in chapter two suggesting that the ultimate raw material for much of human intellect, emotion, personality, industry, and spirit is rooted in a healthy, accessible, and abundant natural environment. Can children achieve meaningful, satisfying

lives despite the degradation of their direct experience of nature? Like adults, children can endure and survive polluted air and water as well as the extirpation of many life forms. But will they prosper physically, psychologically, or morally under such conditions? Given the perspective and material presented in this chapter, it seems unlikely.

The decline in children's experience of nature will not change until a fundamental shift occurs in the attitudes and practices of developers, designers, educators, political leaders, and ordinary citizens. The enormous challenge facing us is how to minimize and mitigate the adverse environmental impacts of the modern built environment and how to provide more positive opportunities for contact with nature among children and adults as an integral part of everyday life. How can we reconcile—if not harmonize—the natural and human built environments through changes in how we design and develop our increasingly urban world? This is the subject of chapter four.