NATURALISTIC PLAY ENVIRONMENTS: ACTIVATING CHILDREN'S ECOLOGICAL AWARENESS, DEVELOMPENT AND SENSES THROUGH NATURAL MATERIALS

By

ELIZABETH AUGUSTA JACKSON

A thesis submitted in partial fulfillment of
the requirements for the degree of

MASTERS OF SCIENCE IN LANDSCAPE ARCHITECTURE

WASHINGTON STATE UNIVERSITY
Department of Landscape Architecture

MAY 2009

To the Faculty of Washington State University:

The members of the Committee appointed to examine the thesis of ELIZABETH AUGUSTA JACKSON find it satisfactory and recommend that it be accepted.

_____

Jolie B. Kaytes, M.L.A., Chair

_____

William G. Hendrix, Ph.D.

_____

Virginia I. Lohr, Ph.D.

_____

Brenda J. Boyd, Ph.D.

ACKNOWLEDGEMENTS

First and foremost I would like to thank Professor Jolie Kaytes for her technical and artistic assistance, support and creative ideas throughout my thesis process. Even while on sabbatical in Australia and New Zealand, I could count on her informative advice and opinion. I would like to thank my committee, Professor Virginia Lohr and Assistant Professor Brenda Boyd for their support and enthusiasm for this topic area. I would like to thank Professor Bill Hendrix for serving on my committee and providing advisory support in Jolie's absence. I would also like to thank Rhonda Gaylord in the Fischer Agricultural Sciences Library for her helpful research assistance.

NATURALISTIC PLAY ENVIRONMENTS: ACTIVATING CHILDREN'S ECOLOGICAL AWARENESS, DEVELOMPENT AND SENSES THROUGH NATURAL MATERIALS

Abstract

By Elizabeth Augusta Jackson, M.S.
Washington State University
May 2009

Chair: Jolie Kaytes

Natural environments provide rich and dynamic landscapes for children's outdoor play. Natural materials stimulate children's senses, activate their imagination and encourage children's cognitive, social, emotional, evaluative and physical development. When children interact with natural materials within a naturalistic environment, they gain an awareness of the processes, structures and forms within that landscape, developing a greater appreciation for the natural environment and an *ecological awareness*.

Today, children's outdoor play areas typically reflect a standardized design aesthetic dominated by manufactured play equipment. Traditional playgrounds often fail to incorporate elements reflective of the natural environment or engage children's senses. As children increasingly lose contact with outdoor natural areas, they experience an "extinction of experience," or a loss of an awareness of or appreciation for the natural environment (Pyle, 2003).

This thesis examines how natural materials can activate children's ecological awareness, development and senses within an outdoor *naturalistic play environment*. This thesis determines which natural landscape materials reflect ecological concepts of landscape health, integrity, process, structure and form. Using theories of child development, this thesis then analyzes how natural materials activate children's cognitive, emotional, evaluative, physical and social development. After determining how natural materials reflect ecological concepts and stimulate children's development, I analyze how natural materials engage children's sense of touch, taste, sound, sight and smell. To augment my research, I integrate my own childhood memories of natural environments and illustrative renderings of natural materials. Ultimately, this thesis determines which natural materials effectively stimulate children's ecological awareness, development and senses and how these materials, when used in combination with other natural materials, create a naturalistic play environment reflective of the *natural* environment.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

TERMS FOR UNDERSTANDING

Biophilia-"The innately emotional affiliation of human beings to other living organisms" (Kellert & Wilson, 1993, p. 31).

Chance: "Something that happens unpredictably without discernible human intention or observable cause; an element even of natural events that are contingent on historical context and current condition" (Karr, 2002, p. 149).

Change-"transformation, transition, or substitution." "Alteration of structure and function over time through [species] interaction and mutual influences" (Johnson, et al., 2002, p. 317).

Cycles: "Tendency of system to experience recurrent patterns, usually leading back to the same starting point" (Karr, 2002, p. 149).

Ecological Awareness- An awareness of the structures, forms and processes of the natural environment generated through direct contact with the natural landscape.

Ecological Understanding- "The expectation and awareness that human actions have consequences and that an intricate web of relationships connects patterns and processes in the physical, biological, and social environments" (Hill, et al., 2002, p. 272).

Ecosystem- An entity that consists of an abiotic and biotic community that are linked together by the flow of energy through the subentities and the cycling of resources such as water and nutrients (Sanderson & Harris, 2000).

Health-"Flourishing condition, well-being, vitality; culturally preferred state that is sustainable" (Karr, 2002, p. 148).

Integrity: “Biological integrity [is] the condition of a place that has its evolutionary legacy intact-with the full complement of its biodiversity components *and* the biogeographic processes that generate and maintain them” (Johnson, et al., 2002, p. 322).

Landscape: “An interconnected, dynamic living system” (Johnson, et al., 2002, p. 333).

Landscape Form: Flora and fauna species and independent physical objects

Landscape Structure: “Aggregate landforms of a region” (Karr, 2002, p. 148).

Manufactured Playground Equipment- Post-and-beam and post-and-platform based playground structures, produced by a playground manufacturer company typically consisting of plastic, steel, aluminum, rubber or wood.

Natural- Reference to landscapes not constructed by humans and reflect degrees of ecological health, integrity, process, structure and form.

Naturalistic Environment- Constructed landscapes that reflect and promote concepts of landscape health, integrity, process, structure and form.

Naturalistic Play Environment- A constructed landscapes using natural materials that reflect, promote and convey concepts of landscape health, integrity, process, structure and form, activate child development and the senses.

Perception: ‘The process of stimulation and cognitive understanding of environmental stimuli’ (Rodaway, 1994).

Play props: “Fixed features and loose props… with fixed and movable parts, [allowing] children…to manipulate and interchange parts of their environment” (Moore, Goltsman, & Iacofano, 1987, p. 168).

Pleasure Grounds- Late 19th century and early 20th century parks built to counteract the mechanical, polluted and busy atmosphere of American cities during that time. Designed in a pastoral character, often including lakes, meadows, curvilinear paths and ample vegetation (Cranz, 1982).

Process: "Natural phenomena… [including] biological (metabolism genetics, natural selection, demographics, nutrient cycling) as well as physical (hydrology and the water cycle, weathering, biogeochemical cycles)- that regulate species abundances and distributions" (Karr, 2002, p. 150) .

Sense ("making sense") : The order and meaning of the environment, our perspective (Rodaway, 1994, p. 5).

Sense ("the senses"): "The medium through which information about the environment is gathered" (Rodaway, 1994, p. 25) ; Our sense organs by which we receive information about the environment (Rodaway, 1994, p. 25).

Standard Playground Equipment- Constructed equipment such as swings, see-saw, slides, for physical recreation purposes of varying materials.

Stimulus: The energy and information transmitted from a source (Gibson, 1966, p. 29).

Theory of Loose Parts- "In any environment, both the degree of inventiveness and creativity, and the possibility of discovery, are directly proportional to the number and kind of variables in it" (Nicholson, 1971, p. 30).

CHAPTER ONE

INTRODUCTION

> "It is not half so important to *know* as to *feel*. Exploring nature… is largely a matter of becoming receptive to what lies all around you. It is learning again to use your eyes, ears, nostrils and finger tips, opening up the disused channels of sensory impression" (Carson, 1956, pp. 56,67)

Children are innately attracted to the natural environment (Kahn., 2002; Kaplan & Kaplan, 2002; Kellert, 2005; Rivkin, 1995; Sebba, 1991; Sobel, 1993). Natural outdoor environments are stimulating, engaging and ever changing landscapes that activate children's senses (Sebba, 1991). Within the natural environment children's senses are triggered by tactile elements, olfactory nuances in the air, sounds, ecological processes or edible vegetation (Rodaway, 1994). Children's senses translate the processes, forms and structure of the natural environment into perceptual information, which influences children's development (Eriksen, 1985; Kellert, 2002). Outdoor play environments promote children's cognitive, social and emotional development, as well the opportunity for imagination, creativity and exploration (Frost, 1992; Frost, Brown, Sutterby, & Thornton, 2004; Hartle & Johnson, 1993; Heerwagen & Orians, 2002). The benefits children obtain while playing within *natural enviornments* is well documented (Bell, 2001; Burdette & Whitaker, 2005; Carson, 1956; Clements, 2004; Fjortoft & Sageie, 2000; Kahn & Kellert, 2002; Louv, 2006; R. Moore, 1986); however, this research has yet to influence the design of outdoor *playground* environments (Eriksen, 1985).

Children's lives have changed dramatically throughout the past few decades, becoming increasingly structured and shifting indoors, away from outdoor natural environments (Hofferth & Curtin, 2006; Kellert, 2002). Children's lives are dominated by organized sports, increased

homework, television and electronic games, all of which reduce children's available free time (Louv, 2006). Parental fears of child abductions, children's safety and litigation concerns further encourage children to play indoors. Robert Pyle explains that as children move indoors and lose contact with the natural environment they will encounter an "extinction of experience" (Kellert, 2002). As children become increasingly disassociated and emotionally detached from the elements and processes inherent to the natural environment, their awareness of and appreciation for the natural environment is reduced (Kellert, 2002; Pyle, 2003). Researchers note that as children become increasingly separated from the natural environment, both physically and physiologically, children's understanding and sympathy for nature will be affected (Pyle, 2003).

Outdoor playground design has long been dominated by standard playground equipment. During the 1950's, large, brightly colored post-and-deck construction became the preferred aesthetic for manufactured playgrounds environments (Solomon, 1995). In the 1980's and 1990's, public concern regarding the safety of playground equipment, coupled with increased playground litigation, led to the development of strict safety guidelines and uniform playground designs (Frost, 1992). Currently, structured playground equipment is regarded as poor and ineffective for children's growth and development (Frost, 1992). Although researchers have demonstrated the developmental benefits of natural areas, typically playground areas do not include materials derived from or reflective of the natural environment (Heerwagen & Orians, 2002). My research will analyze the transformations of the past century within America's playground aesthetic, describing the shifting social influences that have shaped playground design and contributed to the inclusion or omission of natural materials within playground environments.

My research aims to reconnect children to the natural environment within naturalistic play environments. My thesis will explore how materials reflective of the *natural environment* can be utilized within a *naturalistic play environment* to stimulate children's ecological awareness, development and senses. For the purposes of this thesis, the term *naturalistic environment* will be used to refer to landscapes and their inherent processes, vegetation and structures that are constructed by humans. The term *natural* and *nature*, for the purposes of this thesis, refer to landscapes and their structure, processes and vegetation that are not designed by humans. I will not evaluate natural materials for their ability to provide habitat or recreate complete and intact ecological environments. Instead, I will evaluate materials for their ability to *convey* ecological concepts. I propose that natural materials within naturalistic play environments, like natural environments, have the ability to communicate notions of landscape health, integrity, structure, process and form to children. When children play within naturalistic a play environment, the physical materials within that landscape convey ecological concepts of health, integrity, process, structure and form to children through their senses. When human senses are activated in a natural environment, we gain a better awareness and appreciation for the natural environment (Meyer, 2008).

Expanding on the work of Hill, White, Maupin, Ryder, Karr, Freemark et al. titled *In Expectation of Relationships: Centering Theories Around Ecological Understanding* (2002) as well as Elizabeth Meyer's recent manifesto "Sustaining Beauty" (2008), I will apply the notion of *ecological understanding* to a naturalistic play environment. Ecological understanding is defined, according to Hill, et al. as "The expectation and awareness that human actions have consequences and that an intricate web of relationships connects patters and processes in the

physical, biological, and social environment" (p. 272). Applying this concept to children's awareness of the natural environment, I propose that children can develop an *ecological awareness* of the natural environment through the natural materials within that landscape. Ecological awareness is defined as an awareness of the structures, forms and processes of the natural environment generated through direct contact with the natural landscape.

My analysis of current design literature revealed a set of natural materials recommended for children's outdoor play areas. Following my initial discussion of sixteen of these materials, I will analyze which of these natural materials demonstrate ecological concepts of landscape health, integrity, process, structure and form. My research will then consider each material using contemporary theories of child development and define which natural materials contribute to children's cognitive, emotional, evaluative, social and physical development. This thesis then analyzes natural materials for their ability to activate children's senses. This sequential analysis will provide detailed information for each natural material, specifying how each material delivers ecological concepts and informs children's ecological awareness; promotes children's cognitive, emotional, evaluative, social and physical development; and activates children's sense of sight, sound, smell, taste and touch.

This process is augmented with illustrative drawings of natural materials to express my personal childhood memories associated with these materials. Throughout the thesis, illustrative watercolor renderings will also provide a visual demonstration of the tactile and sensory qualities of each natural material. The watercolor illustrations will be combined, concluding in a cohesive illustration of all sixteen materials, providing a visual description of a naturalistic play environment. Additionally, a written narrative of my childhood memories will express and

explore the importance of natural play environments for children. Both illustrative and written components are included to awaken the reader's own childhood memories, feelings, smells, or emotions reminiscent of the natural environment. Safety considerations regarding individual natural materials will also be discussed. This research will reveal how natural material combinations, within the context of a naturalistic play environment, can successfully activate children's ecological awareness, development and senses.

CHAPTER TWO

DISCUSSION OF PLAY

While the universal presence of children's play has long been studied and accepted, the definition of 'play' is widely debated by researchers (Frost, 1992; Frost & Klein, 1979; Wilkinson, 1980). The diversity of play definitions represents an equally wide range of theories that seek to define the biological, physical and developmental rationalization behind children's play. [i] One influential theorist, who is still widely referenced today, is Jean Piaget. Piaget's cognitive-developmental theory states that children's play is a biological response and results from an exchange between themselves and the environment (Frost & Klein, 1979).

Scientific data suggests that play is a biological action- the result of "electrochemical synapses working within sensory cells inside the brain" (Frost, Brown, Sutterby, & Thornton, 2004, p. 19). A multitude of studies reveal that play is essential to a child's cognitive, social and emotional development (Burdette & Whitaker, 2005; Frost, 1992; Frost et al., 2004; Ginsburg et al., 2007; Rivkin, 1995). Play also provides important social interactions, allowing children to develop and maintain the emotional capabilities necessary for self-esteem, flexibility and self-awareness (Burdette & Whitaker, 2005).

Play affects children's psychological health and reduces stress, anxiety, depression, aggression and improves emotional well-being (Burdette & Whitaker, 2005; Frost, Brown, Sutterby, & Thornton, 2004). Furthermore, play improves children's problem-solving skills, creativity and complex rationalization (Frost, 1992). A study by Hirsh-Pasek and Golinkoff (2002) and Perry (2003) as cited by Frost et al. (2004) states that research increasingly points to

the biological benefits of pretend play. According to Frost et al., if pretend play is deprived in childhood, children's "critical thinking, problem solving, and social functioning, as well as to academic areas such as literacy, mathematics, and science, may be diminished" (p.20).

Studies regard play as a spontaneous activity and emphasize play as an unstructured event (Burdette & Whitaker, 2005). Play is separate from 'physical fitness, physical activity, activities or sports' because of its spontaneity and lack of structure, both in reference to children's time and the materials used (Burdette & Whitaker, 2005). Louv (2006) found that children do not regard organized sports or extra-curricular activities as play because they involve structured time, while limiting children's independence and ability to manipulate the environment. Wilkinson (1980) on the other hand, states that play is what children choose it to be, whether it be an arts and crafts project, solitary activity or sports. Furthermore, equipment needed for these play activities can be simple, natural elements such as sand or water because children prefer materials that are common to their daily environment, not those that are purchased or man-made (Wilkinson, 1980).

Various researchers, including Frost (1992), discuss and recommend specific play area design for children of various age groups, ranging from infants through middle childhood. [ii] Kellert (2002) and Sobel (1993) refer to middle childhood, roughly the ages of six to 12 years of age, as being a time when children develop a curiosity and familiarity with natural settings. Speaking to children's sensory development, Ayers (1979) states "the third through seventh years are critical for sensory integration. Nature intended this to be the time when the brain is most receptive to sensations and most able to organize them" (p.23). Considering the work of

Kellert (2002), Sobel (1993) and Ayers (1979), the conclusions presented within this thesis are intended for children roughly three to 12 years of age.

CHAPTER THREE

INFLUENCES AND TRENDS OF PLAYGROUND DESIGN AND MATERIALS DURING THE 20TH CENTURY

Early 20th Century Play Areas: Pleasure Grounds and Streets

At the turn of the 20th century, urban public parks, known as *pleasure grounds*, integrated children's play areas throughout the landscape and park design (Cranz, 1982). Intended for passive use, pleasure grounds typically consisted of broad, sweeping areas of open space that allowed visitors to engage in a variety of activities such as bicycling, hopscotch, running and tennis (Cranz, 1982). Landscape features such as large lawns or curving paths served as the ground plane for children's play areas. New York City's Central Park served as such a destination- a place of tranquility and refuge from the noise, disease and structured life of New York City's factories. Central Park was a place for families, where members of the opposite sex exercised and played together in a naturalistic setting with lush vegetation, including abundant trees, curving paths and large grassy areas (Cranz, 1982).

The public viewed city streets, like pleasure grounds, as environments for children's play. In the early 1900's, streets were void of speeding automobiles and presented abundant supervision and assistance from nearby residents and business owners (Nasaw, 1985). As the occurrence of automobiles increased throughout subsequent decades, the issue of pedestrian safety and the need to keep children safe also grew. As an antidote to traffic-- related deaths and childhood delinquency, the public requested separate and official play areas away from city streets to help protect children (Wridt, 2004).

Traffic fears, combined with a desire for societal betterment, led to the playground movement of 1880 through 1930 (Azzarito, Munro, & Solmon, 2004). In 1906, the Playground Association of America was established. At that time, only 21 cities contained playgrounds, but by 1916, over 500 cities maintained playgrounds in the United States (Azzarito et al., 2004). By the 1920's, the public viewed playgrounds as an environment that could transform children into productive adults. Play on playgrounds was viewed as an institution that needed to be taught and controlled (Cranz, 1982; Frost, 1992). Professional play leaders were hired to lead and stimulate approved activities for youth on playgrounds (Cranz, 1982). These early play areas also separated the sexes, delineating the perceived differences between the physical activity requirements of boys and girls (Azzarito, Munro, & Solmon, 2004). [iii]

The 1920's: Functional Play Areas

By the end of the 1920's, American society favored the inclusion of planned playgrounds within existing parks, with the pretense that play areas were separated from the leisure and quiet zones in the park (Cranz, 1982). Play areas during this era were structured in accordance with society's goal of the time-- to create physically fit children that could assist and contribute to the national economy (Azzarito et al., 2004). The public supported industrious playgrounds, resulting in play areas that reflected the mechanical nature and assembly line of the industries at that time (Azzarito et al., 2004). Swimming pools were added not only for recreational purposes, but for general hygienic practices. Games with definitive beginnings and conclusions, taught by trained play leaders, were favored (Cranz, 1982). Playgrounds contained items such as 'teeter-totters, sand bins, large free games spaces, see saws, parallel bars and swings' (Cranz, 1982). Playground environments of the 1920's demonstrated a distinction that was beginning to take

shape: Natural areas were appropriate for quiet enjoyment while structured areas were designed for children's play.

The 1930's: Playground Movement Meets the Sculptural Movement

In the 1930's, the playground movement of the 1920's, met the opposition of landscape architects Garrett Eckbo, Daniel Kiley and Isamu Noguchi, who were interested in the integration of sculpture as a way to advance playground design. Eckbo and Kiley supported the use of free flowing space as opposition to the more mechanical design, reflective of society at that time (Solomon, 1995). Isamu Noguchi, also influenced by sculpture, created artistic adaptations of traditional equipment, including his "Spiral Slide" and "Contoured Playground. "[iv] Noguchi's "Contoured Playground," utilizing undulating ground and an abstract design, was opposed by the Mayor of New York of the time, Robert Moses (Solomon, 1995). Robert Moses brought a new dogma to his position, believing that park design no longer needed justification (Solomon, 1995). He believed cities were in need of large-scale parks emphasizing recreation and standardized outdoor sports areas, and opposed the pleasure grounds and the naturalistic aesthetics of the past (Cranz, 1982). Cranz describes this transition, from 'pleasure grounds' to functional parks, as a time when design rational declined, and as a result, design quality fell (Cranz, 1982). Play areas became synonymous with municipal recreational areas such as swimming pools and baseball fields. Several standard playground features, introduced for their low maintenance requirements and costs, are still found in playground environments today, such as wire fencing, metal benches and blacktop, (Cranz, 1982). The design of these large-scale play areas disregarded the playground site's sense of place, context or history (Cranz, 1982). The

move from pleasure ground aesthetics towards standardized and functional activity areas with low maintenance costs has proliferated within playground design to this day.

Safety Standards: Early Considerations

By the 1930's, years of maintenance neglect had led to a deterioration of American playgrounds (Cranz, 1982). As a result, the public grew concerned about children's safety and playground equipment itself. Responding to these safety concerns, the National Recreation Association created the Committee on Standards in Playgrounds to establish the first formal safety standards (Frost, 1992). The committee's safety report, considered a standard for playground design at that time, recommended that playgrounds include separate structures for each activity, such as swings, slides and balance beams, rather than a "multifaceted gymnasium frame," which was common at that time (Frost, 1992, p. 195). The committee further recommended that designers consider playground maintenance, surface materials and supervision requirements, as well as separate equipment for boys and girls (Frost, 1992). The committee found that most playgrounds used such hard surfaces as "sand-clay, clay-torpedo grave [sic]-sand mixture, crushed stone or concrete" (p. 197). However, seemingly contradictory to children's safety, the committee's recommended surface material was to be "torpedo grave and sand, rolled and compacted" (Frost, 1992, p. 197). Today, these hard surfaces are now found to be inadequate due to the extreme injury risks. Grass, a softer surface, was only recommended for major games and sports areas (Frost, 1992). Safety standards represented a desire to protect children, but like playground design of that time, focused on ease of maintenance, upkeep and cleanliness.

By the early 1950's, various manufactured playground equipment appeared on the market, reflecting the public's growing interest in safer playgrounds. Playground equipment during this time included slides, sandboxes, seesaws and swings, many of which would be deemed unsafe or out of favor in future decades (Solomon, 1995). School administrators also turned to the use of asphalt as the ideal playground surface material after decades of porous materials such as sand, gravel, clay and sawdust, as well as heavy use, had led to "dusty" playgrounds (Frost, 1992).

Progressive Design of the 1960s: Child Development Considerations Challenge Standard Playground Design

According to Susan Solomon, author of *American Playgrounds*, the sculptural movement of the 1930's continued to influence the perceptions of designers, planners and politicians, producing progressive playground designs aimed at child development. Tom Hess[v], an art critic with the Museum of Modern Art, had opposed Robert Moses' criticism of the sculptural playground movement. Hess noted that Moses was "not able to accept any form of progressive design" (Solomon, 1995, p. 25). The Museum of Modern Art stated that Isamu Noguchi's designs could stimulate "the child's sense of place and form through a playground designed as architectural sculpture" (Solomon, 1995, p. 25). Hess brought an appreciation for child development that had not been previously present in playground design. Hess opposed Moses because he would not consider alternatives to the functional park and play area design that had long dominated. In addition to Hess, other designers, such as Robert Royston, challenged Moses' version of playground design, hoping to elevate the importance of quality playground design.

Spurred by these progressive views, the psychological and developmental needs of children began to influence the design of playground environments. In the late 1960's, the Mayor of New York, Mayor John Lindsay introduced a "design revolution" to the New York park system (Cranz, 1982). Inspired by the work of Lady Allen of Hurtwood, author of *Planning for Play*[vi], Lindsay authorized an adventure playground in Central Park (Solomon, 1995). This playground introduced linked parts including slides and tunnels and incorporated water and malleable elements such as lumber, ropes and nails for children's self-directed activities. The adventure playground provided children with the opportunity to create their own micro play environments, manipulate materials, challenge themselves and make decisions, all of which had been previously absent from traditional American playgrounds.

Several other well-known and influential designers of the 1960s, including Isamu Noguchi and Louis Kahn viewed play as a learning and development activity, a progressive idea for their time (Solomon, 1995). Noguchi and Kahn developed Riverside Park in New York, a playground that utilized interconnected parts based on shape and form and departed from the more traditional model of independent play structures and elements (Solomon, 1995). Kahn believed that "play must be free and uninhibited; spaces are to be discovered with shapes not imitative of nature yet unrestrained in their making" (Solomon, 1995, p. 52).

M. Paul Friedberg, a landscape architect, and Richard Dattner, an architect, also challenged the traditional in playground design. Influenced by the work of the child development theorist, Jean Piaget, Friedberg and Dattner considered free play essential, believing playgrounds to be rich environments that could encourage social interaction and child development (Solomon, 1995). Although Friedberg and Dattner's designs were revolutionary in

terms of their consideration for child development, they used granite, timber, metal and few vegetative elements, leaving little for children's manipulation. However, their attention to child development was a positive counterargument to the standard playground equipment of their time. Even so, playground manufacturers and the public did not accept Kahn and Noguchi's design aesthetic; play areas continued to utilize standard playground equipment, failing to reflect this progressive mix of sculpture and design.

Corresponding to this renewed interest in children's play, development and the inclusion of adventure playgrounds in New York City, the United Nations included children's right to play in their U.N. Declaration of 1959 (Moore R. , 1989). The declaration states:

"The child shall have full opportunity for play and recreation which should be directed to the same purposes as education; society and the public authorities shall endeavor to promote the enjoyment of this right;" (International Play Association, 2007).

In 1961, the International Association for the Child's Right to Play (IPA) was established in Denmark. A US affiliate has since been recognized, promoting play as a fundamental right for all children (The US Affiliate of the Association).[vii]

1970's: Linked Play and the Birth of Modern Manufactured Playground Equipment

M. Paul Friedberg's artistic direction and interest in "linked play" influenced playground design throughout the late 1960's and 1970's (G. Moore, 1985). While working for the United States Department of Housing and Urban Development, Friedberg developed a playground that allowed for rapid construction and removal of the pieces (Solomon, 1995). Wood and logs, as

well as bars and steel, were joined to create a unified structure and design (Solomon, 1995). Friedberg's heavy wooden structures grew in popularity, replacing concrete as the primary material, which had been popular prior to the 1970's. Friedberg's design, termed "post-and-deck" or "post-and-platform" became the standard for playground equipment construction and is still the basis of manufactured playground equipment today. In the 1980's, the wooden elements within Friedberg's designs were replaced with metal parts due to concerns regarding splinters and cracking (Solomon, 1995). Friedberg's playground design, based on quick construction methods and platform structures, was later sold to a major playground manufacturer, and subsequently, has persisted throughout the decades[viii] (Solomon, 1995). Susan Solomon, author of *American Playgrounds* (1995) comments on Friedberg's transition from artistic expression to manufactured replicated design:

> It has been the ubiquitous American success story, far removed from the simplicity and elegance of Friedberg's early wood design. It is distressing to see how a fine concept has been eviscerated. There was no way to foretell how this revolutionary concept would be adapted by large-scale manufactures and eventually debased. (p. 61)

By the 1970s, the main objective of playground design was to provide structures that emphasized physical activity and appealing colors (Cranz, 1982; Frost, 1992). Manufacturers introduced fantasy structures, such as rockets, play houses themed areas such as "Dennis the Menace" or "nautical" playgrounds (Frost, 1992). Equipment utilized bright colors and durable materials such as steel and plastic (Frost, 1992). This standard aesthetic was repeated across the United States. A study by Ellis in 1970 stated, "Playgrounds in general are duplicated from site

to site in a monotony of stereotyped apparatus design to catch the adult's eye" (G. Moore, 1985, pp. 173-174). Frost (1992) has since commented that bright colors, used to enhance children's experiences, were actually used as a marketing tool targeting the aesthetic tastes of parents, rather than children's own preferences.

1970's Alternative Playgrounds: Researchers Introduce the Natural Environment into Play Areas

Researchers of the 1970's began to notice children's infrequent use of traditional playgrounds, justifying a need for more progressive design. A variety of studies in the late 1970's found that children used traditional playgrounds less frequently, for shorter durations of time, and with more limited use, than more contemporary playgrounds. Researchers noted that while recreation-focused playgrounds aided in children's motor development, playgrounds had not yet accounted for the cognitive, social and emotional developmental needs of children (G. Moore, 1985). It was during the 1970's when several influential authors responded to the need for more developmentally beneficial playground designs.

In 1971, Simon Nicholson, an English-born professor, developed the *theory of loose parts*, first described in his seminal piece: "How Not to Cheat Children, the Theory of Loose Parts." Nicholson's theory states that "in any environment, both the degree of inventiveness and creativity, and the possibility of discovery, are directly proportional to the number and kind of variables in it" (Nicholson, 1971, p. 30). According to Nicholson, conventional playground designs cheated children out of the possibility of creativity and enjoyment and needed an "immediate transformation" (Nicholson, 1971, p. 33).

In his highly influential article, Nicholson (1971) noted that years of traditional "vest-pocket parks, concrete plazas and adventure playgrounds" had failed to fully consider children's interests or the value of "loose parts" (p. 33). Based on behavioral psychology, Nicholson's theory promotes the inclusion of small, but important elements, such as soil, water, reflections or vegetation to stimulate children's imagination and creativity and to promote learning (Nicholson, 1971). Nicholson's theory is frequently referenced throughout playground literature and continues to influence the work of designers, educators and researchers today.

That same year, 1971, Robin Moore and Herbert Wong completed their work on the Environmental Yard at Washington Primary School, located in Berkeley, California. Like Nicholson, Moore and Wong wanted to connect play and learning within children's ecological play environments as a way to elevate the importance of learning during play. The Environmental Yard, which consisted of 1 ½ acres, was transformed from a flat asphalt school lot into a multi-zoned and ecologically reflective play area (R. Moore, 1980). The Environmental Yard contrasted in design to Friedberg and Dattner's east coast playgrounds, which were based around child development, but were more formal and not ecologically inspired. According to Solomon (1995), Moore and Wong "opened up the possibility that playgrounds of the future might be constructed without traditional equipment" (p.72)

Moore and Wong were inspired by the notion that "adults had great childhood memories of 'dirt, water, vegetation, and animals, rather than equipment made of invariant synthetic materials.'" (Solomon, 1995, p. 73). The Environmental Yard was designed to "recapture the ecology that might have inhabited this spot before it had been obliterated by asphalt surface" (Solomon, 1995, p. 73). The Yard included small, pond-like water areas, trees, bridges and

vegetation. Moore and Wong believed it was important for children to receive direct contact with naturalistic environments, and in doing so, gain crucial emotional, physical and cognitive developmental benefits (R. Moore, 1980). They celebrated nature's intrinsic qualities and loose parts, quoting Nicholson's theory as justification of the Environmental Yard's design. Moore believed that children's first-hand knowledge of nature and ecology, derived through direct experience must be gained before age of seven, or it would be "lost forever" (R. Moore, 1980, p. 57). R. Moore proposed a theory of an 'ideal childhood ecology,' which included a matrix of interconnected components reflective of a diverse childhood. This system (See Appendix A) included animals, sun, wind, plants, fire, soil, precipitation and gravity. The Environmental Yard diverged from the standard aesthetics of playground design of that time, acting as a proponent for ecological elements and the importance of child development within play areas.

Public Safety Fears Spur Reform: 1970's Standardization

While the Environmental School Yard and Nicholson's theory of loose parts gained appreciation among researchers, playground safety concerns increased dramatically as new injury and death reports were released in the 1970's (Solomon, 1995). In 1972, the National Electronic Injury Survey System was created, which monitored 119 hospitals for playground related injuries (Solomon, 1995). In 1972, this system reported 117,951 playground injuries, 60% of which had resulted from falls onto concrete, asphalt, sand or other equipment (Frost, 1992). In 1972 and 1973, the USDA Bureau of Product Safety (BPS) and the Consumer Product Safety Commission (CPSC), respectively, issued safety guidelines (Frost, 1992). Frost (1992) later noted that these standards were insufficient due to their overly technical wording and were difficult for the majority of consumers to understand. Frost (1992) felt that because these

guidelines lacked information regarding home playground equipment and included structures with dangerous heights, they were inaccurate and insufficient (Frost, 1992). The CPSC report intended these safety standards only as suggestions,[ix] but almost immediately, major playground manufactures voluntarily revised their products to meet these suggested safety standards (Frost, 1992). Manufacturers could justify the replacement of old equipment for the new structures finally completing the transition to manufactured equipment within schools, residences and parks.

Playground safety standards often cited playground equipment as the reason for playground injuries, when in fact it was playground surfacing, not the structures themselves, that contributed to the majority of playground injuries (Frost, 1992; Frost et al., 2004). In 2004, a study by Frost, Brown, Sutterby and Thornton found that 79 percent of all public playground injuries and 81 percent of home playground injuries resulted from insufficient playground surfacing. In the past, playground surfacing had included hard surfaces, such as asphalt or concrete, which proved dangerous for children but was cost effective and easy to maintain. With these new findings however, greater emphasis was placed on proper playground surfacing, especially directly under the equipment. As early as the 1970's, the use of rubber mats and rubber chips appeared under playground structures as a way to prevent serious child injury. Sufficient depths of these materials and regular maintenance produce safer playgrounds surfaces, significantly reducing injuries (Frost, 1992). However, as Frost (1992) reported, although surfacing is the easiest way to prevent serious injuries, the costs associated with long-term, proper maintenance of newer surface materials tend to hinder their installation. Schools instead choose the less expensive materials such as sand or concrete (Frost, 1992). Because safety

standards were created as voluntary recommendations, it was up to the schools or home owners to decide the best surface material for their budget and needs.

1980's-1990's: Researchers Study Children's Preferences and Behaviors in Play Area Design

In the 1980's and 1990's, a renewed interest in the study of child behavior led researchers to analyze how effectively manufactured play equipment initiates creative play and holds children's attention. Reports demonstrated that children were the most frequent users of public outdoor spaces, but only 15% of children's time was spent in playground environments (G. Moore, 1985). Children chose to play in other environments, especially after the second grade, when the use of traditional playground equipment decreased dramatically (G. Moore, 1985). Instead of playgrounds, children preferred informal neighborhood areas and natural environments (G. Moore, 1985). G. Moore (1985) found that children were attracted to those playgrounds that were located next to a park or vegetated area. Vegetation provided added interest within a playground environment and increased its popularity (R. Moore, 1989). As reports noted the relatively infrequent use of manufactured playgrounds and children's attraction to vegetated sites, it provided justification for non-traditional play settings with more naturalistic aesthetics (Frost, 1992; G. Moore, 1985).

A Redefinition of Playgrounds: Utilization of Nature and "Loose Parts"

During the late 1980's and 1990's, researchers, such as R. Moore (1986) admitted that playgrounds needed to reflect children's preferences and developmental needs, and not simply a standard design created by adults, for adult aesthetics, as had been done in the past. Slowly, a

movement grew to elevate children's play areas into creative, developmentally productive and more naturalistic spaces.

Researchers such as R. Moore (1989), G. Moore (1985), Frost (1992) and Rivkin (1995) promoted through their research, the importance of naturalistic materials within children's play environments.[x] After Nicholson's (1971) theory of loose parts was released, researchers increasingly noted the value of natural materials and moved towards a greater emphasis of unrestricted play (R. Moore, 1986). R. Moore (1986) suggested the use of "rough ground" for children's play spaces. He described "rough ground" as relatively untouched and natural areas that provide for a variety of manipulative and diverse ecological experiences for children. The following year, Robin Moore, Susan Goltsman and Daniel Iacofano developed *Play for All Guidelines* (1987), a seminal guide for the development of play environments that promote natural elements and loose parts. Moore, Goltsman and Iacofano (1987) stressed the importance of *play props*-- fabricated and natural elements available for children's manipulation (Moore, Goltsman, & Iacofano, 1987). This study found manipulative elements to aid in the development of children's self-independence and confidence (Moore et al., 1987).

In 1985, Mary Rivkin published *The Great Outdoors: Restoring the Children's Right to Play Outside,* contributing to the growing body of work that moved away from traditional playground design and emphasized naturalistic elements within playground environments. Rivkin's seminal piece is frequently referenced for its emphasis on the importance of the outdoors in children's lives. She supports the inclusion of loose parts, and the role of manipulative elements such as sand, water, tools as well as "sticks, moss, grasses and insects" (Rivkin, 1995). Rivkin's research, referencing the work of Eriksen (1985), also addressed

simple play activities, such as digging, water play, risk taking, listening and exploring to promote physical, emotional, social and cognitive development in children (See Appendix B). Rivkin's research significantly contributed to the larger body of information generated during the 1980's and 1990's that stressed the components required for successful child development within outdoor play environments.

1990's: Public Safety Fears

Manufactured playground equipment continued to dominate playgrounds through the 1990's, even while researchers emphasized the importance of naturalistic elements and "loose parts." Public fears over playground safety escalated in the 1990's and the number of lawsuits increased dramatically (Frost, 1992). Manufacturers promoted their equipment because it met the suggested safety standards set forth by the CPSC and FDA Bureau of Product Safety, consequently, play equipment was replaced with standardized structures that met the new, albeit only recommended, safety standards.

The Current Relationship between Manufacturers and Landscape Architects

Safety recommendations created by the CPSC and FDA Bureau of Product Safety were, and continue to be, overwhelming complex and difficult to understand. As a result, landscape architects hired to design playground areas, turn designs over to safety consultants working for the major playground manufacturers (Jackson, 2006). With litigation fears in mind, firms outsource the role of playground designer to the manufacturer, giving full control of playground area design to playground manufacturers. Unfortunately, decisions are based on the project's budget and the manufacturer's product catalogue, not the developmental needs of the children,

site context, sense of place or other land considerations that landscape architects are trained to assess. (Jackson, 2006).

CHAPTER FOUR

A CHANGING CHILDHOOD: STRUCTURE AND FEARS REMOVE CHILDREN FROM THE NATURAL ENVIRONMENT

By the end of the 20th century children's lives were increasingly structured, resulting in a reduction of free time and exposure to natural environments (Burdette & Whitaker, 2005; Johnson & Hurley, 2002; Louv, 2006; Rivkin, 1995). Between 1981-1997, children's free time declined by 12%, from 56.5 hours down to 49 hours per week (Hofferth & Sandberg, 2001). More alarmingly, Rivkin (1995), found that during the same period (1981-1997), children's non-discretionary time dropped by 25%. These studies demonstrate that by the late 1990's, children's lives were more structured and with less available free time than had been available in previous decades. Multiple factors, including child safety fears, increasingly busy adult lives, television and video games, as well as an emphasis on academics, both inside and outside the school system, have caused these dramatic changes.

Parental Safety Fears

Children of the late 20th century have been denied access to the same level of personal time and exposure to the outdoors that previous generations had been afforded due to parental fears (Louv, 2006; R. Moore, 1986; Valentine & McKendrick, 1997). Louv (2006) reports that "56 percent of today's parents say that by the time they were ten years old they were allowed to walk or bike to school" (p.123). Today, only 36 percent of those same parents say their own kids should be allowed similar freedoms (Louv, 2006). A comparable study noted that in 1971, 80% of children were allowed to travel to school on their own; however, by 1990, this number had

plummeted to only 9% (Valentine & McKendrick, 1997). Some adult fears stem from the desire to protect children on their bikes or as pedestrians from speeding automobiles. According to Moore (1986), children are "twice as likely as any other age group to get hit by traffic" and "account for 40% of the pedestrians or cyclists killed or injured each year" (p. 207). However, if children are no longer walking or riding their bikes, they are transported by car, which restricts their territory of exploration to only those places which they can be driven to, reducing the beneficial experiences of spontaneous exploration and free play.

Fears of the bogeyman, child abductions and assaults also generate a great deal of parental fears.[xi] According to Louv (2006) parents prevent their children from the same level of freedom they experienced as children primarily due to a fear of strangers. Parental control differs between the sexes, as studies show that girls are required to play closer to home than boys (Valentine & McKendrick, 1997). R. Moore (1986) found that fathers in general know very little about the play territory of their children, with the exception of having limited knowledge about specific 'male' places like sports areas or fishing spots. Regardless, fathers tend to restrict the play territory of their daughters more than their sons (R. Moore, 1986). Although parents are primarily afraid of adult predators, studies show that children themselves are often most worried about child or teen 'bullies' on the playgrounds (R. Moore, 1986). Studies by Frost and Sunderlin (1985) reveal that children's negative or unruly behavior on playgrounds is linked to inadequate and non-challenging play areas. Research shows that play environments with more play equipment have lower rates of child aggression and undesirable behavior, such as hitting, arguing and teasing (Frost, 1992; Sutton-Smith, 1985).

Fears of child-related traffic accidents and child abductions have resulted in an increase of children transported via automobiles as a safer alternative to walking or biking (Rivkin, 1995). As a consequence, children have less opportunity for physical activity, contributing to childhood obesity. Childhood health will be discussed in subsequent paragraphs, but it is worth noting that parental fears of childhood abductions only harm children by restricting their access to physical activity.

Involvement in organized sport and art programs has increased since the 1980's, viewed as a safe, structured alternative to unstructured outdoor free play (Hofferth & Sandberg, 2001). A study by Hofferth and Sandberg (2001) revealed that between 1981-1997, children's participation in organized sports increased 21 percent. By 1997, 75% of all children, ages 3-12, were involved in sports (Hofferth & Sandberg, 2001). As parents provide organized activities for their children, rather than unstructured outdoor free-play, children miss valuable opportunities including the possibility to make their own decisions, manipulate their environment or get involved in creative, make-believe play. Studies demonstrate that children regard structured sports and recreation as work, not play (Louv, 2006); therefore children also need opportunities for play time without rules and structure.

Children's Electronic Time

Throughout the 1980's and 1990's, as children were restricted from outdoor free-play, they increasingly played inside the home, 'plugged-in' with television, video games and computers. In 1985, the *U.S. News and World Report* stated that children between the ages of 6-18, spent over 15,000 hours viewing television, compared to only 13,000 hours in school (Frost, 1992). As children's time turned to electronics, their direct exposure to the outdoors

reduced, affecting their awareness and knowledge of their local biotic environment (Orr, 2002). A study by Orr (2002), noted that children had the ability to recognize over 1000 logos, but only a few native plants and animals from their area. Another report found that eight year olds could identify 25% more Pokémon characters than they could wildlife species (Charles, Louv, Bodner, & Guns, 2008). These studies emphasize the point that children are becoming disconnected with the outdoors and natural environments. This trend is a leading concern by many predominant researchers today and speaks to the importance for more naturalistic play areas for children (Louv, 2006; Pyle, 2003; Rivkin, 1995).

Children's Academic Time

Since the 1980's, a social and political emphasis on children's academics has tightened classroom schedules and increased homework levels, further decreasing children's available free time (Hofferth & Sandberg, 2001). Between 1981-1997, weekly study time increased by 20% for children between the ages of 6-12 (Hofferth & Sandberg, 2001). Especially dramatic, is the increase for children ages 6-8, whose time spent studying increased from 52 minutes to over 2 hours per week (Hofferth & Sandberg, 2001). This rise in weekly homework can be attributed to increased academic pressure as the result of the No Child Left Behind act of 2001. The No Child Left Behind act forced schools to shift large portions of their class time away from science, art, recess and physical education and into math and the English language arts (ELA) to meet the testing demands of the No Child Left Behind act[xii] (CEP, 2008). According to the Center on Education Policy (CEP), a group that monitors the effects of No Child Left Behind, school districts who increased their time spent in ELA and math, increased instruction in these two subjects by 43% (CEP, 2008). Schools also decreased art instruction time by 35% per week (57

minutes), as well as physical education and recess by 63% per week combined (90 minutes) (CEP, 2008). In other words, by 2004, 40 percent of schools had reduced recess or eliminated recess to make more time available for instruction. As a result of this cut, children have had less time to run around, be active and socialize.

The trend to cut recess seems to be slowing and in some cases, is being reversed by a few schools districts within the United States. In September of 2008, the Tacoma, Washington School District voted to officially reinstate recess into the daily school curriculum, noting the trend of childhood obesity as a major reason for their decision.[xiii] Administrators such as these are beginning to recognize the importance of physical fitness as a means to not only fight childhood obesity but for its role in child development, including "conflict resolution, leadership, social interaction and play group" skills (Sherman, 2008). A study by Burdette & Whitaker in 2005, revealed that 90% of teachers and 86% of parents felt that when children were physically active, children's behavior in the classroom improved and children learned more effectively. However, these beliefs are currently not recognized or implemented into every school system and the absence of recess and physical education only further perpetuates children's structured lives and detrimental health consequences.

Children's Health and Obesity

Concerns about children's health are on the rise as children live increasingly structured lives inside the homes with less exposure to the outdoors (Frost, 1992; Frost et al., 2004). Between 1971-2004, obesity among children ages 6 to 11, rose from 4% to 18.8%, tripling since 1980 (CDC, 2008). Researchers note that as children's lives include more video games, computers and other sedentary behaviors, obesity will increase (Frost et al., 2004). Television

not only decreases physical activity, but it increases a child's exposure to commercials selling fast food, sweets, soda pop and other junk food. Orr (2002) estimates that two billion dollars are spent annually by corporations targeting the consumerism of youth.

As a result of this sedentary, indoor life style, children today experience a number of related health problems. Childhood obesity has increased children's risk of cardiovascular disease and high blood pressure (Charles, Louv, Bodner, & Guns, 2008). In addition to problems associated with obesity, researchers have also noticed a dramatic increase in the number of children experiencing symptoms of Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD) (Louv, 2006). According to Louv (2006), ADHD is one of the most common mental disorders today, affecting 8 million children in the United States alone. A study by Wells (2000) found that children's cognitive functioning improved when their home was surrounded by natural elements. Louv (2006) hypothesizes that a general reduction in children's exposure to naturalistic environments may be a contributor to what he defines as "nature deficit disorder." Louv (2006) emphasizes that this is not a clinical term, but a general description of children's "directed-attention fatigue" or inability to concentrate as a result of not being exposed to "restorative environments," namely, outdoor naturalistic environments (p.102). Louv strongly pushes the natural environment and the outdoors as an antidote to childhood health problems. With more activity, childhood obesity, and its associated health complications, is reduced. More exposure to naturalistic environments recharges children and provides calming effects (Louv, 2006). His work has influenced the child-nature movement, with aims to reconnect children with the outdoors as a way to combat childhood obesity and provide an alternative to the structure and technology-focused lives of many children today.

CHAPTER FIVE

RECONNECTING CHILDREN WITH NATURE: THE CURRENT MOVEMENT

A movement has recently developed that aims to reconnect children with natural environments as a means of reversing the current childhood trends of obesity, decline in free time and free play and a rise in indoor, technology-based activities. This momentum was influenced by the work of researchers such as R. Moore (1980), Frost (1992), Rivkin (1995) and Kaplan & Kaplan (2002). Additionally, in 2006, Richard Louv released *Last Child in the Woods*, describing his theory of nature-deficit disorder. Written as a parenting guide, Louv (2006) discusses the reasons why children are not experiencing nature directly (including television, parental safety fears, etc.) and urges parents to make a conscious decision to increase their children's exposure to outdoor activities within natural environments. Louv believes that alienation from the natural world affects children's sensory development, attention levels and leads to increased rates of physical and emotional illness (Louv, 2006).

Louv is Chairman of the Children & Nature Network, an organization aimed at reconnecting children with nature by providing parents, educators and the public with research and activities that link children with the natural environment (Charles et al., 2008). As a result of this agencies' work, numerous communities and state and local groups are working to reconnect children with nature through activities such as family activity days, family nature clubs and formal initiatives in local governments. In Washington State for example, the Children & Nature Network lists four local campaigns to reconnect children through environmental education including one at the outdoor school, Islandwood, located on Bainbridge Island, and two within

Seattle itself. The Seattle events, named "Family Low Tide Beach Walk" and "Full Moon Owl Prowl, aim to educate children on local biotic environments and species" (Charles et al., 2008).[xiv]

Within the past few years, a coalition of environmental, educational and public health organizations has come together, forming a movement called No Child Left Inside (The Chesapeak Bay Foundation, 2008). This bill was originally written as an amendment to the No Child Left Behind act of 2001, but was later attached to the National Environmental Education Act of 1965 to amend environmental education in our nation's schools (Washington Watch.com, 2008).[xv] The collaborative work of these organizations pushed the No Child Left Inside Bill, H.R. 3036 into the House, where it passed, and now awaits vote by the Senate and President of the U.S. (The Chesapeak Bay Foundation, 2008). This bill would provide funding for environmental education within school systems including additional training for teachers and educators. The No Child Left Inside Act would dictate that the environment is to be used as "an integrating theme or content throughout the curriculum," teaching children about a variety of issues ranging from general composting methods to environmental justice (Library of Congress Thomas, 2008). According to the Library of Congress, under section 12, Accountability, this bill intends to:

(1) enhance understanding of the natural and built environment;

(2) foster a better appreciation of the interdisciplinary nature of environmental issues and conditions;

(3) increase achievement in related areas of national interest, such as mathematics and science;

(4) increase understanding of the benefits of exposure to the natural environment;

(5) improve understanding of how human and natural systems interact together;

(6) broaden awareness of environmental issues; and

(7) include such other indicators as the Administrator, Secretary, or Foundation may develop.

Additionally, on the state level, three states, Washington, California and New Mexico, have also passed legislation which provides funding for outdoor education and recreation programs. On April 21, 2007, Washington State became the first of these three states to pass the bill called "Leave No Child Inside" (Library of Congress Thomas, 2008).[xvi] These federal and state initiatives acknowledge the concern of the United States' government for the disconnection between children and natural environments.

Within the field of Landscape Architecture, a similar movement is underway to organize design professionals in a new Professional Practice Network (PPN). Approved in 2009, the Children's Outdoor Environments PPN is a subgroup of the American Society of Landscape Architects (ASLA), designed to specifically address children's outdoor environments. The mission statement of the Children's Outdoor Environment PPN recognizes the need for designers, educators, planners and public officials to come together to develop successful children's environments. According to Rachel Shaw, head of the Professional Practice Networks at ASLA, the scope of this new PPN is as follows:

> The Children's Outdoor Environments PPN is intended to focus on topics including nature-based play and learning environments; safety considerations; educational settings; urban environments; health care trends (including obesity, ADHD, and autism); plant selection; networking with other professionals and like-minded national organizations;

and sharing literature, project examples, and experiences (Shaw, personal communication, September 10, 2008).

As landscape architect and design professionals recognize the role and importance of natural elements within children's play settings, these environments will increasingly reflect children's developmental, social and emotional needs. As designers, we have an opportunity to weave naturalistic elements into designated children's play spaces. The subsequent section of this thesis will review the developmental benefits of naturalistic environments, analyze specific naturalistic materials and suggest a means to incorporate these elements into children's designed play spaces.

CHAPTER SIX

CHILDREN'S RELATIONSHIP TO THE NATURAL ENVIRONMENT

When I was a child, my family and I lived outside Santa Cruz, California, in a small town set among the redwood forest of the Santa Cruz Mountain range. We had several neighbors close by, but the thick forest undergrowth and the varied terrain screened their yards, tall fences and other urban boundary markers. Our backyard was a large forest and grassland, rich for endless games and fort making.

Figure 1: Memory of childhood redwood tree fort

One of my favorite areas in the 'backyard' was tucked back into a dark corner of the woods beneath a very tall redwood tree. Although this fort area was relatively close to our home (only 100 feet or so) and across our little one lane road, the spot felt farther away from our home that it actually was. Encircling the redwood tree, the wide, green branches floated down and nearly touched the ground in every direction.

My brother and I would spend hours in our play spot under this giant redwood tree, building our teepee fort. Old redwood branches, needles and bark littered the ground around the tree, providing a dark brown and cushiony ground for our games and fort making. I remember the look of the dark, decaying redwood needles and bark as they started to decompose. A type of white mildew grew just under the surface of the litter and the forest floor

looked black in color and felt gritty to the touch. The mix of decaying redwood needles and bark had a musty but sweet smell and always reminds me of my childhood whenever I smell redwood trees today. Under the tree's canopy, we created a fort using only the branches and limbs we could find on the forest floor for both the strong vertical supports and the teepee wall coverings. I remember the fort was an adequate size, both in height and width to fit both of us. We finished the teepee after a few weeks, and probably played in it a few days, returning to it occasionally. As children, the real fun was finding the natural materials for our fort and figuring out how to construct it, rather than actually playing in the fort after it was finished.

My brother and I were fortunate to grow up in a diverse forest setting within our unconventional and naturalistic backyard. We had a variety of play props available to us from the redwood forest, including loose materials for fort building and outdoor mud pies. Both my parents enjoyed the outdoors themselves-we frequently went camping as a family and had a small vegetable garden at home. My mom had made the conscious decision early on to raise her son and daughter equally, allowing my brother and me to explore the 'dirty' outdoors regardless of our gender. So my brother and I explored, and in doing so, becoming aware of our immediate environment that surrounded our home, including the shrubs that made the best forts, where the edible wild strawberries grew and how to make 'cooking oil' for our mud pies out of the neighbor's cactus plant (See Appendix C). We explored our backyard forest using all of our senses: taste, touch, sight, sound and smell.

Children's Biophilic Attraction to Natural Environments

As children, my brother and I were drawn to the unstructured and sensory-rich character of nature. Research shows that as human beings, we are all innately attracted to natural

environments (Kahn., 2002; Kaplan & Kaplan, 2002; Kellert, 2005; Rivkin, 1995; Sebba, 1991; Sobel, 1993). Our genetics prompt us to interact with nature, not just as children, but throughout our lives (Kellert, 2005). Researchers describe our attraction to natural environments as biophilia (Kellert, 2002; Kellert, 2005; Pyle, 2003). However, in order for our attraction to nature to develop and persist into adulthood, we require positive exposure to naturalistic environments throughout childhood as well as adequate support from our family and social support system (Kellert, 2005).

Natural environments provide an extensive amount of sensory information for children (Carson, 1956; Kellert, 2002; Sebba, 1991). Within natural environments, a rich matrix of ground materials and physical forms including trees, shrubs, soil, animals, air, water, gravity, shadows and smells activate children's senses and provide information about their surroundings. It is during the years of early childhood that children are most receptive to this avalanche of sensory information (Kellert, 2002; Sebba, 1991). According to Ayers (1979), "The third through seventh years are critical for sensory integration. Nature intended this to be the time when the brain is most receptive to sensations and most able to organize them" (p.23). Parents tell their children 'don't touch' or 'don't put that in your mouth,' but what adults may not realize, is that children gain information about their surroundings through their senses. By adulthood, our ability to gather information using our senses diminishes (Sebba, 1991). Instead, adults place a greater emphasis on cognitive reasoning rather than on sensory exploration (Sebba, 1991). Research has found specifically, that proper cognitive development depends on exposure to natural environments during early childhood (Faber Taylor & Kuo, 2006; Kellert, 2002; Sebba, 1991). It is critical that a child's genetic and biophilic attraction to naturalistic

environments is properly supported, not only for their own cognitive development, but so that in adulthood, they will encourage other children to also explore natural environments.

Impacts on Children's Health

Natural environments have a regenerative affect on children, influencing their emotional and physical health (Faber Taylor & Kuo, 2006). Studies find that children who live close to natural areas demonstrate better overall health and lower levels of psychological disorders such as anxiety, depression and behavioral issues (Charles et al., 2008; Faber Taylor & Kuo, 2006). Research also indicates that exposure to natural environments may help reduce ADHD symptoms in children (Faber Taylor & Kuo, 2006; Louv, 2006). Nature's calming affects have been demonstrated in hospital settings. A study by Ulrich (1983) found that cholecystectomy patients that could see trees from their hospital windows had shorter hospital stays and "had fewer negative evaluative comments from nurses" (p. 421).

Impacts on Children's Environmental Values

Direct contact with natural environments influences children's awareness and perceptions and can ultimately influence their environmental values as adults (Lohr & Pearson-Mims, 2004). Studies reveal a correlation between the amount of time children spend in natural environments and the value they place on these areas as adults (Chawla, 2002). Specifically, active involvement, as opposed to passive involvement with nature, produces a greater positive influence on adult values (Lohr & Pearson-Mims, 2005). A study by Lohr and Pearson-Mims (2004) revealed that growing up next to the 'woods or [a] forest' influenced adult 'attitudes on the personal meaning of trees.' Furthermore, Lohr and Pearson-Mims (2005) found that

children's participation in "organized activities to improve the local environment" had a strong affect on adult attitudes towards "the social and intrinsic values of trees" (p. 473). Adults who participate in nature activities as children are more likely to have pro-environmental values as adults, such as recycling (Chawla, 2006). Pyle (2002) explains that not all experiences with the natural environment produce conservation values in adults. Exposure to natural environments through nature television, for example, can produce a "discrepancy between apparent connection and real depth of contact" (Pyle, 2003, p. 207). A child's disconnect with natural environments creates artificial interests in conservation (Pyle, 2003).[xvii] Therefore, it is critical that children are provided opportunities to spend time in naturalistic environments so that as adults, they will perpetuate a cycle of care with subsequent generations.

Children's Extinction of Experience

Research suggests that it is through direct contact with natural environments, verses indirect contact such as television, books or classroom instruction, that children fully obtain the cognitive, social, emotional and physical benefits of natural environments (Kellert, 2002). Direct contact allows children to use their senses and the opportunity to challenge themselves, develop a basic understanding and a deeper awareness of the natural environment (Kellert, 2002; Sebba, 1991).

Researchers acknowledge that exposure to natural environments benefits children development, while at the same time, research also illustrates that children's opportunity to play in natural environments is diminishing, especially within cities (Faber Taylor & Kuo, 2006; Kellert, 2002; Louv, 2006; Pyle, 2002). As populations increase and more land is required for development, less land remains in an untouched and largely naturalistic state. Those naturalistic

areas that are available may be deemed unsafe for children because of concerns stemming from child abduction or injury fears. This has resulted in an overall decline in children's exposure to nature and has been termed an "extinction of experience" (Pyle, 2003). Robert Pyle (2003) states that as children lose opportunities for direct exposure with natural environments they also lose affection for natural environments and transfer this apathy to future generations (Pyle, 2003). Pyle describes:

> As the richness of the neighborhood diminishes the power of the neighborhood to fascinate, arouse, excite, and stimulate also passes into dullness, ennui, and apathy. Those who know and recognize less, care less, and therefore act less, leading to still more losses. So the extinction of experience precipitates a cycle of disaffection, degradation, and ultimate separation from nature (p. 209).

In Pyle's (2003) article entitled "Native Matrix: Reconnecting People with Nature," he critiques the use of parks or other manicured areas as an antidote to this nationwide separation of children and natural environments. Pyle (2003) describes parks, playgrounds and even natural reserves as inadequate because they are orderly and prevent children from changing the environment. As Pyle (2002) explains, "For special places to work their magic on kids, they need to be able to do some clamber and damage. They need to be free to climb trees, muck about, catch things, get wet-- above all, to leave the trail" (p. 319).

True undeveloped areas need to be designated and accessible for children's unstructured, creative discovery and play.

CHAPTER SEVEN

THE ROLE OF NATURALISTIC PLAY ENVIRONMENT'S IN CHILDREN'S ECOLOGICAL AWARENESS

Outdoor, naturalistic play environments can provide a rare and unique opportunity for children to explore the elements and materials reflective of the natural environment. As natural areas diminish, it will be crucial that children continue to have access to areas reflective of the natural environment so they can gain the invaluable developmental, social, physical, emotional and evaluative benefits of these environments.

The term *naturalistic environment* includes human-made landscapes whose structure and elements reflect degrees of landscape *health*, *integrity*, *structure*, *process* and *form*. Landscapes that are not human-made and reflect aspects of landscape health, integrity, process, structure and form, for the purposes of this thesis, are termed *natural*. While a naturalistic environment has the potential to reflect degrees of ecological health, integrity, process, structure and form, it is not my intention to create a play environment whose success is dependent on a demonstration of complete ecological functions. Naturalistic play environments are those areas that reflect and convey aspects of landscape health, integrity, process and structure, thereby communicating ecological concepts to children through their senses and the natural materials within that site.

The senses are the vehicle by which children experience, internalize and become more aware the natural environment (Sebba, 1991). I propose that incorporating natural materials that reflect concepts of landscape health, integrity, structure, process and form, creates environments reflective of the natural environment and activates children's senses, allowing children to gain a

greater awareness of elements and processes inherent to natural environments. Kellert (2002) describes children's awareness of natural elements and processes: "the child is not an ecologist, but he or she can discern how life relies on clean and abundant water, plants grow in the soil, animals eat plants and some times other animals…" (p. 140). I will refer to children's knowledge or perception of the natural environment as *ecological awareness*. Ecological awareness is defined as a child's awareness of the structures, forms and processes of the natural environment, generated through direct contact with the natural environment. As children interact with natural environments through their senses, they gain an awareness of "how the world works and their own capabilities" (Chawla, 2006, p. 68). Additionally, Meyer (2008) states that as humans experience a landscape, they 'become more aware of how their actions affect the environment' altering "an individual's consciousness and perhaps assist in restructuring her priorities and values" (Meyer, 2008, p. 10). As children's awareness of a particular naturalistic play environment increases, they gain a greater understanding, emotional respect and awareness for how their actions affect the larger natural environment (Meyer, 2008).

Through a Designer's Perspective

In this thesis, I aim to explore the concept of a naturalistic play environment from the standpoint of a landscape designer and the field of landscape architecture. As a designer, I will evaluate natural materials for their ability to reflect natural environments, activate children's senses and respond to theories of child development. I will not explicitly evaluate materials for their ability to provide habitat or recreate complete ecological unity. Instead, I focus my research on the materials required within a naturalistic play environment to activate children's senses, development and ecological awareness.

CHAPTER EIGHT

SPATIAL CONSIDERATIONS AND DESIGN QUALITITES OF NATURALISTIC PLAY ENVIRONMENTS

Unstructured, naturalistic areas provide children with opportunities for imagination, exploration and creative play. While the first portion of the literature review analyzed the history of materials and designs within *standard* playground equipment, the following section will analyze design materials and spatial considerations of *naturalistic environments* as they pertain to children's play. Chapter nine will discuss specific natural *materials* for naturalistic play environments and will determine which materials convey concepts of health, integrity, process, structure and form.

Spatial and experiential design considerations, including mystery, legibility, complexity, diversity, coherence and perception of safety, help to illuminate the physical design of a naturalistic play environment. While design literature often discusses these points in regards to public parks, rather than children's play areas, these considerations provide useful guidance in the development of a naturalistic play environment.

The *availability* of an outdoor space reflects how often that area will likely be used, and contributes to the overall success of that space (Johnson & Hurley, 2002). Studies find that children use parks and naturalistic areas more frequently when they are located closer to schools or within children's own neighborhoods (Johnson & Hurley, 2002; Thompson, Aspinall, & Montarzino, 2008). For the purposes of this discussion, proximity and accessibility are used interchangeably to describe the distance of a play area from a child's home or school. Johnson

and Hurley (2002), suggest ways to integrate naturalistic areas into children's territories as a means of providing safe and informational ecological experiences. Johnson and Hurley (2002) suggest renovated school grounds, community center back yards or open public lands as locations to reintegrate natural elements into children's territories and provide them with the opportunity to explore elements of natural environments. According to Johnson and Hurley (2002), the proximity or availability of these locations makes them readily accessible to children and increases that play area's success. Although school grounds and community centers are educational locations, this article emphasizes that the proximity of a children's outdoor environment is critical to its success. As urban environments typically have little open and naturalistic or undeveloped land, locations such as school yards can potentially reunite children with the elements and processes of naturalistic environments.

In addition to the concept of availability, visitor perception of park safety also affects his/her decision to use that space (Kaplan, Kaplan, & Ryan, 1998). Research demonstrates that parents perceive naturalistic areas, such as naturalistic parks, to be dangerous environments for children, generated by fears of child abductions and physical safety concerns (Louv, 2006). Literature demonstrates that these safety concerns may be reduced through education programs which provide the public with information on park history or park layout. Other educational methods used to increase visitor familiarity and safety perception include park rangers or signage (Hayward, 1989). When parents have a greater sense of security, it increases the likelihood that they will allow their children to use that space (Hayward, 1989). As parents and children return to the park over time, their perception of safety within that particular area increases further (Kaplan, Kaplan, & Ryan, 1998). Like adults, children visit spaces that are well known to them

(Thompson, Aspinall, & Montarzino, 2008). Research on visitor use of public spaces emphasizes that public awareness and visitor perception of safety are linked. Therefore, it is important that children's outdoor play areas are not only accessible to children, but that they are perceived as safe. If visitor education techniques are applied to naturalistic play environments, encouraging familiarity of the outdoor environment for parents and children, perhaps parental safety concerns associated with naturalistic areas would decrease and children's use of naturalistic play environments would increase.

Our perception of public space is also influenced by the degree of landscape legibility and coherence within that site (Kaplan, Kaplan, & Ryan, 1998). Kaplan, Kaplan and Ryan's seminal piece, *With People in Mind* (1998), explains that legibility and coherence can be represented within a landscape through the presence of uniform or repetitive features such as vegetation, geological features or topography. Uniform and repetitive landscape features allow a visitor to read a landscape like a map, helping the individual determine their path or specific location within the larger site. Applying this information to a naturalistic play environment, Kaplan and Kaplan's theory of legibility and coherence demonstrates that when children's outdoor play areas account for legibility and coherence children will have a greater understanding of that space. When children are aware of an environment, they may feel safer within that space, which will increase the likelihood that they will use that play environment in the future.

In addition to legibility and coherence, children's naturalistic environments should integrate landscape variation and diversity (Moore, Goltsman, & Iacofano, 1987). For the purposes of this paper, landscape diversity is defined as a variety of materials and spatial

characteristics. Research stresses the importance of landscape diversity to stimulate children's learning and development (Fjortoft & Sageie, 2000; R. Moore, 1986). *Loose parts* such as sticks, water and vegetation, are emblematic of environmental variation and provide for diverse play opportunities (R. Moore, 1980; Moore, Goltsman, & Iacofano, 1987). Landscape diversity provides children greater opportunities to utilize their senses due to the complex and changing state of naturalistic environments (Sebba, 1991). When play areas reflect a diverse and varied landscape, these spaces will enhance children's sensual experiences and opportunities for learning and development.

Complexity and mystery, according to Kaplan, Kaplan and Ryan (1998) like coherence and legibility, influence a visitor's use and exploration of a site. Landscape complexity has the power to increase the mystery of setting. For example, if vegetation partially blocks or hides the view of a visitor, she is likely to become interested in what is just beyond her sight line. On the other hand, a landscape high in complexity, such as a forest, can be perceived as less coherent because its parts are not manicured or organized. In regards to naturalistic play spaces for children, the concept of mystery can be applied with a child's eye level in mind. For example, a particular shrub or hide-out may be mysterious and feel hidden from a child's point of view, but it may actually be visible for a taller adult. Children are drawn to small sheltered areas hidden from view, such as those surrounded by rich vegetation (Sobel, 1993). The characteristics of complexity and mystery provide designers with another tool to generate diverse naturalistic settings, specifically designed for children.

The design techniques of landscape diversity and complexity, when integrated into a naturalistic play environment, have the ability to create areas of prospect and refuge within the

landscape. Jay Appleton describes his "Prospect-Refuge Theory" in *The Experience of Landscape* (1975). According to Appleton (1975), a human's opportunity to hide (refuge) while still being able to lookout (prospect), and not be seen while doing so, is a biological need. An environment that provides opportunities for these actions demonstrates "aesthetic satisfaction" for the user (Appleton, 1975). In terms of a play area, Appleton's theory explains why children prefer small spaces, such as tree houses, forts, shelters or topographic depressions (Johnson & Hurley, 2002). Refuge areas, like tree houses, provide a sense of safety and allow children to experience control over that space (Johnson & Hurley, 2002). Topographic depressions provide small hiding areas for children while allowing parents to maintain sight of their children without the children realizing that they are being watched.

Integrating the element of time within a play space can create landscapes that reveal themselves gradually, extending children's experiences and memories (R. Moore, 1986). Time allows for process and change to occur, both within the physical landscape and within the perceptions of those who use the space. Within today's manufactured playgrounds, the element of time is addressed, but only to prevent decay and increase the durability of materials. In naturalistic play environments the element of time is constantly visible, both in the short term such as changing seasons or weather events and in the long-term within landscape structure, wildlife generations or migration patterns.

Integrating spatial and experiential design techniques, including mystery, legibility and coherence into a naturalistic play environment may influence adult and child perceptions of safety for that landscape, which may in turn influence a child's frequency of use for that naturalistic play environment.

The subsequent section presents those frequently mentioned landscape materials from children's playground literature. I introduce the characteristics, sensory qualities and the positive and negative attributes of landscape materials suggested for children's play environments. This discussion will ultimately provide landscape materials for the ground plane, vertical plane and overhead plane for children's naturalistic play environments. Subsequent sections of my thesis will determine which of these landscape materials reflect concepts of landscape health, integrity, process, structure and form; meet theories of children's development; and activate children's senses.

CHAPTER NINE

MATERIALS OF NATURALISTIC OUTDOOR PLAY ENVIRONMENTS

Research suggests that physical natural materials and landscape structure have the ability to influence children's behavior (Fjortoft, 2001). Children utilize natural materials or loose parts within outdoor activities, creating manipulative and imaginative games (Moore et al., 1987). This chapter discusses the characteristics and attributes of those natural materials frequently referenced within the literature review or described during my childhood memories, creating a list of natural materials for naturalistic play environments. Safety issues surrounding each material will also be introduced. To visually demonstrate the physical characteristics and tactile qualities of these natural materials, illustrative watercolors are provided for each material. Each of the sixteen landscape materials watercolor illustrations presented here represent my adult recollection and sensory impression of each of these childhood play materials. Therefore, my memory acts as a filter, depicting not literal representations of these materials based on strict scientific research, but illustrative depictions based on my own ecological awareness. In chapter 10, the materials within each of the three visual planes will be combined, resulting in a visual description of the ground plane, vertical plane and overhead plane of a naturalistic play environment.

Vegetation

Figure 2: Ground Plane-Shrubs

Figure 3: Ground Plane-Vegetative groundcover

Figure 4: Vertical Plane-Trees

Figure 5: Ground Plane- Logs/Timber

Shrubbery, undergrowth and trees are typically found with naturalistic areas; however, these materials are largely omitted within children's playground areas (R. Moore, 1989). Public playgrounds today typically consist of structured manufactured equipment within open, flat landscapes with little variation in materials (Big Toys, 2006; GameTime, 2007). Researchers on the other hand, express the importance of diverse vegetation to increase the benefits of children's play areas (R. Moore, 1980). Vegetation provides children with *play props*, such as berries, leaves, sticks and leaves, and allows for diverse play activities and games[xviii] (R. Moore, 1989). Shrubs, trees and other forms of vegetation teach children about changing seasons, decomposition and growth (R. Moore, 1989). Vegetation presents areas for prospect and refuge, forts and hide-and-seek games (Moore et al., 1987). Vegetation activates the senses of sight and touch and can integrate the sense of sound, taste and smell (Carson, 1956). Children develop an

understanding of their environment through their senses and vegetation provides abundant opportunities for children to engage each of their senses especially taste and smell, in ways that other materials, such as plastic playground equipment, cannot.

Although vegetation provides abundant positive qualities for children's play areas, the issue of children's safety becomes evident. The use of edible vegetation can activate children's senses but may also create potential risks for children's safety; therefore, the inclusion of edible vegetation should be carefully considered. If edible vegetation is incorporated within a play environment, designers may want to refer to R. Moore's *Plants for Play* (1993) or other references that specifically address considerations associated with edible and poisonous plants. Robin Moore states that "the actual risk of children being harmed by plants outdoors can be minimized if reasonable precautions are taken when selecting plant species and locating them in children's outdoor play environments" (R. Moore R, 1993, p. 70). R. Moore (1993) suggests that to minimize the safety risks associated with edible vegetation, designers should consider the age of the children using the space. Play environments for younger children may want to consider the choking hazards associated with small berries. However, R. Moore (1993) states that the integration of toxic plants into a play area provides children with the opportunity to distinguish toxic plants and the dangers associated with them. R. Moore (1993) suggests that adults teach children how to identify plants and to teach children "not to put any plant or plant part into their mouth that they cannot positively identify as good, wholesome food" (p. 71).

A study by Fjortoft and Sageie (2000) examined the effects of landscape vegetation on children's play activities and found that children's play reflects the landscape structure of that area (See Appendix D). For example, shelter making and fantasy play, such as pirates or playing

house, were most prevalent in areas with scattered shrub cover, (Fjortoft & Sageie, 2000). Open areas with scattered shrubs were preferred areas for running games (Fjortoft & Sageie, 2000). Juniper shrubs were specifically found to provide flexible play areas for children because they could easily get in and out from the shrub's inner cavity (Fjortoft, 2001). Due to children's small size, vegetation can also provide secret hiding places, allowing children to feel hidden even when adults can see them (Bell, 2001).

Vegetation areas pose a second safety risk, creating visual barriers between children and adults. Children who are hidden within thick vegetation or in a grove of trees may not be visible to the adult eye. However, slope, topography and vegetation within a naturalistic play area can be used to create areas that appear hidden and 'secret' to the children, while actually staying visible to the adult. For example, a small ravine or concave space within the ground plane, vegetated with high grasses, provides an area that makes the children feel enclosed, while providing an accessible view for adults.

In addition to shrub vegetation, Fjortoft and Sageie (2000) found that children preferred specific trees species for the purposes of climbing, constructive and symbolic play. For example, pine trees were the most popular climbing trees. In summer months, rope swings were attached to pine trees for swinging. However, deciduous trees were overwhelmingly more popular for constructive play (i.e. fort making) and symbolic play (ie: playing house) because their materials were easier to obtain and use in shelters (Fjortoft & Sageie, 2000). In the winter, when snow cover partially buried the trees, deciduous trees such as birch and sallow were most popular overall because their limbs became accessible for climbing due to the snow depth (Fjortoft & Sageie, 2000). The research of Fjortoft and Sageie (2000) offers a potential list of vegetative

elements for play areas. When utilized in the context of a naturalistic play environment, these vegetative elements provide a basis for play area design.

The inclusion of trees within a naturalistic play environment poses additional safety considerations due to the risk of children climbing or falling out of tall trees. Bell (2001) states that a tree within a natural setting is "far less dangerous… with soft earth and dead leaves beneath it" (p. 87). Surface materials, such as wood chips, dry leaves or bark therefore, become important safety considerations within a naturalistic play environment. Moore, Goltsman and Iacofano (1987) state that wood chips, dry leaves or bark do provide a safe surface material for a play environment if they are installed at proper depths and well maintained (See Appendix E). Surface material types and depths are discussed at greater length in the subsequent section. Although safety risks exist, Bell (2001) and Moore, Goltsman and Iacofano (1987) advocate the use of trees within children's play environments due to the overwhelming physical development and sensory benefits associated with both conifer and deciduous trees. Moore et al. (1987) state that trees improve play settings because they provide additional play opportunities, such as hide-and-seek, climbing, swinging and exploration.

Surface Materials and Weather

Figure 6: Ground Plane- Soil

Figure 7: Ground Plane- Bark

Figure 8: Ground Plane- Wood chips

Figure 9: Ground Plane- Sand

Figure 10: Overhead Plane- Weather

Figure 11: Overhead Plane- Sunlight

The issue of child safety typically guides design considerations within standard playgrounds environments. A major determinant of child safety within a play area depends on the type of surface material used within that space. Insufficient playground surfacing is the leading contributor to playground injuries but ironically, surface materials are the easiest component to control in terms of protecting children from potential injuries (Frost, 1992). In the past, playground surfacing has included wood chips, asphalt, cinder blocks with a cover of sand, and most recently, rubber chips or rubber mats (Frost, 1992). Today, researchers analyze surface materials for children's safety with a behavioral and developmental perspective, specifically addressing how surface materials may play a role in children's development (R. Moore, 1989).

Simon Bell, author of *Design for Outdoor Recreation* (2001) finds that wood chips, bark and sand, which are soft ground surfaces, not only activate children's senses, but provide beneficial manipulative experiences for children. Wood chips, a durable and naturalistic material, providing olfactory experiences when heated by the sun (Moore et al., 1987). Bark also releases rich 'natural' forest-like smells when heated (Bell, 2001). In colder weather conditions, Bell (2001) notes that bark and wood chips tend to freeze and ferment, which releases tannins and a strong odor. Perhaps the process of heating and freezing, then subsequent odor release could be a design intention within children's play areas. Additionally, according to Moore et al., (1987), wood chips contain bacteria, which can increase their decomposition. In a naturalistic playground, wood chip bacteria could be showcased and utilized as a time-based learning experience for children. Bark and wood chips are two materials that can intentionally provide cycles of decomposition and olfactory experiences, whereby communicating information about naturally occurring processes to children.

According to Moore et al. (1987) in *Play for all Guidelines*, wood chips and bark also inherently contain a number of safety considerations, deterring their use on standard playgrounds. Overtime, wood chips and bark become compacted when rain or foot traffic causes a reduction in air spaces between the particles (Moore et al., 1987). High humidity also causes these materials to absorb moisture and can lead to further compaction. These are important considerations for playground equipment areas because compacted surface materials have a reduced ability to absorb weight, or a child's fall (Frost, 1992). Compaction is one of the leading reasons for surface material failure, in addition to insufficient maintenance (Frost, 1992). This information is intended for formal playgrounds with tall equipment, not naturalistic play environments, and therefore, surface depths need to be addressed for low play features such as

shrubs. Within a naturalistic play environment, perhaps tuft grasses or deciduous tree material could provide a new blanket of grass or leaf cushion each year. The use of alternative surface materials, such as fallen leaves or grasses requires additional research for appropriate safety depths.

Sand is the iconic surface material of playgrounds. Classified as an inorganic material, sand presents a variety of manipulative qualities, especially when combined with water and found materials such as rocks or sticks. The combination of sand and found materials supports children's imagination and creative play (R. Moore, 1989). Unlike other natural materials, such as wood chips, sand avails itself to be molded, poured, dripped, sifted, broken-up, dug into, built-up and knocked down. Researchers note however, the down side to these qualities. Because sand is so malleable, potentially dangerous objects, such as sticks or broken glass, can be lost under the surface and create child injuries (Frost, 1992; Moore, et al., 1987). Researchers often comment on the inconvenience of cats and sand boxes. According to Frost (1992), health concerns associated with animal fecal contamination are exaggerated. Frost (1992) notes, quoting a physician, the "health risks from chewing on pencils or playing on indoor classroom carpets are greater than playing in sand, which is exposed to natural cleansing agents, wind, rain and sunshine" (p. 102).

Based on my own experience, I know that sand can retain heat extremely well, making it a difficult surface to walk through with bare feet. While some would consider this a negative attribute, as I child, I believed it was 'nature' and learned how to maneuver through it.

Growing up in California, my family visited the beach frequently on weekends. I spent hours there, learning how to boogey board, find sand crabs and duck under crashing waves

before they tumbled me into the surf. But before I could get into to the water, I had to figure out how to get from my beach towel, through the hot California sand to the cool ocean water. To prevent burning my feet, I looked for the little divots in the sand where people left their footsteps. As I quickly ran to the ocean from my towel, I stepped into these divots to keep my own feel cool. Even so, the sand was so intensely hot that I could not make it down to the surf in one shot. Oftentimes, as I sprinted towards the ocean and my feet got too hot, I would have to stop and madly turn my feet side to side, digging them into the cool sand just under the surface. With this movement, my feet quickly reached cooler sand, giving me a minute to ease the pain so that I could once again run towards the breaking surf.

Much like sand, soil allows for a variety of manipulation techniques, and provides a rich and diverse pallet of uses. Soil can be carved and dug into, revealing insects, decaying materials, crevices, underground water sources and buried materials. It provides endless opportunities for discovery. Soil can display evidence of precipitation, wind and snow events. Erosion teaches children about weather cycles, the cause and effect relationship between precipitation and wind and our own human-impact on ground surfaces.

My childhood home was situated on the edge of a redwood forest, backing up against a large hill. Our backyard was not the typical flat, grass expanse. Along the entire length of our house ran a wide concrete walkway and a 10' high concrete wall behind that, holding a hillside of oak trees and shrubs. When I was young, and before it was retained by the wall, a heavy rainstorm saturated the soil, causing the hillside to slide into the back of our home. Fortunately only the mud flowed down the hill into our back walkway, not any of the major trees or the road beyond. The mudslide, as troubling as it was for my parents, created a wonderful new place for

my brother and I to dig and explore. For weeks we climbed up the mountain of dry mud-- which served as a direct path into our favorite play areas at the far end of our backyard. As a child, I had never seen such a large hillside erode and I remember how fascinated I was with the power and size of this mudslide.

Although soil is inherently malleable and provides rich sensory experiences, it is not a recommended surface material under playground equipment because it can become compacted and does not provide adequate shock absorption (Moore et al., 1987). Today playground manufacturers recommend using plastic chips, plastic mats or synthetic wood chips (See Appendix F.1 and Appendix F.2) as the safest and best choices for surface materials. The Consumer Product Safety Council (CPSC) provides information regarding the proper safety depths of loose surface materials based on the shock-absorption and Critical Heights of the playground equipment (See Appendix E). Materials, such as sand or wood chips, may meet these safety depths when installed, but once these have been compacted, their absorption qualities are greatly reduced, causing them to be listed as unsafe for playground equipment. However, these depths are dictated by the critical height of the playground equipment. Therefore, if play elements do not exceed these heights, these requirements do not apply.

Topography and Slope

Figure 12: Ground Plane- Topography

Figure 13: Vertical Plane- Geological features

Figure 14: Ground Plane-Slope

Within the discussion of naturalistic design materials, I have discussed two manipulative resources: vegetation and surface materials. The underlying landscape structure of these elements, topography, slope and geological features, provides yet another physical level of materials and necessitates consideration. Topography and slope have the ability to elicit specific play activities in children and provide for a variety of play types (Fjortoft & Sageie, 2000). Fjortoft and Sageie (2000) consider topography and slope as natural structures that are linked to play activities. Fjortoft and Sangeie (2000) found that higher slopes (15-30%) encourage children to take on more challenging activities, such as climbing and sliding. Moore, et al., discuss the use of varying landform for the high play value- providing opportunities for large muscle activities and places for hiding. Topographic features such as hill, berms, small concave areas, combined with vegetation further create areas for children's individual and social play (Moore, et al. 1987). Fjortoft and Sageie's (2000) demonstrate that a diverse landscape, including slope, utilized as an integral element of naturalistic play settings also encourages children's motor development.

Wildlife

Figure 15: Ground Plane- Wildlife

The integration of wildlife habitats within children's play settings has the opportunity to provide a unique and developmentally enriching experience for children (R. Moore R, 1989; Moore et al., 1987; Rivkin, 1995). R. Moore (1989) in *Playgrounds at the Crossroads* promotes the addition of insects, birdlife, aquatic life and amphibians within children's play areas. Wildlife provide a biotic layer, offering a richer and more diverse environment for learning, wonder and exploration (R. Moore, 1989). If animals are not already present on site, vegetation and landscape structure can be incorporated in the design to respond to the habitat needs of these species. For example, R. Moore (1989) states that to encourage bird life, designers need to provide appropriate food sources, high nesting spots and nesting materials. Tall grasses offer habitat for small animals and birds, but also provide hiding spots for children. According to Rivkin (1995), author of *The Great Outdoors: Restoring Children's Right to Play Outside*, streams that have vegetated slopes provide an excellent habitat for wildlife, more so than other bodies of water such as wetlands and ponds. Rivkin promotes the integration of "salamanders, toads, frogs, turtles, insects, crayfish, squirrels, lizards and butterflies" into children's play areas and suggests the use of edible vegetation like berries and fruit trees. Robin Moore's (1993)

Plants for Play provides designers with a guide for plant materials of children's spaces. *Plants for Play* lists vegetation according to the inherent functional or sensual qualities of each species. In regards to wildlife settings, R. Moore (1993) suggests highbush, blueberry (*Vaccinium corymbosum*) and flowering dogwood (*Cornus florida*), among other trees and shrubs, as examples of vegetation that have high wildlife value and are suggested for children's spaces (See Appendix G). While the dogwood and highbrush, blueberry are not native to the Northwest, this book serves as an informational starting point for designers who wish to encourage wildlife into play areas, whereby creating a richer environment for children and a more diverse landscape overall.[xix]

Water

Figure 16: Ground Plane- Water areas

Figure 17: Overhead Plane- Shadows

Each year, my family embarked on a traditional 2-week camping trip up and down the Pacific Northwest Coast. Of all the lakes, streams and campgrounds we visited, our favorite and most beloved location, was Lake Odell is Southern Oregon. Camping spots were limited at Odell, but the 20 or so that were available hugged the water line, allowing us to park the family cab-over-camper within 15-20 feet of the sparkling blue lake. I felt as though the lake was ours.

My brother and I treasured this campground. One of our favorite activities was catching fresh water crawfish. We didn't catch them for eating, but just for the simple pleasure of catching them and then releasing them. We would use our dad's fishing gear and raid our cab-over-camper's mini refrigerator for the next day's turkey or ham sandwich meat for our bait. The crawfish seemed to favor these two meat varieties particularly well. We baited hooks, sticks or maybe even hand-made traps. The small grass tufts that grew on the lake edge wrapped around the lip of the bank and almost into the water, creating little shadowy caves just above the water line. Under the lip of the bank, in these small concave areas the crawfish hid between rocks and sticks in the shallow water. Mornings were a better time for 'fishing' than the afternoon hours. In the evening, the wind usually picked up. When it blew, the waves became rougher and higher, making our prime fishing areas more difficult to use.

Each time we visited Lake Odell we tried our luck at catching crawfish. My brother and I would place our baited contraptions into the water and wait. It didn't take very long for several little crawfish to crawl out of the shadows underwater and onto our turkey meat. Although it looked like they always bit right down on the bait, each time we pulled up the line they quickly released and swam away. The crawfish were often too quick for us-- so it became a game. My brother and I tried to bring up the crawfish before they realized they were being caught, but we only won about half the time. Like I mentioned earlier, if we successfully brought them up to the surface, it wasn't to eat them, it was just for fun.

In addition to the benefits wildlife habitats provide within play settings, aquatic areas offer elements of richness and diversity, exciting children's curiosity and creating habitat for local wildlife. Children are inherently attracted to naturalistic settings, including water bodies

(R. Moore, 1989). Ponds, marshes, wetlands, creeks and streams are examples of aquatic areas that provide multisensory experiences, attract wildlife and provide exciting play opportunities for children (R. Moore, 1989).

Stephen Trimble and Gary Paul Nabhan recall their childhoods in *The Geography of Childhood* (1994), a memoir that argues for the importance of children's exposure to 'wild places.' One chapter, which reflected my own childhood curiosity, describes Trimble's childhood frog catching days back in Idaho. Of all the places around his home, he fondly describes the ditches in his town- where the frogs lived. The excitement of the water, the frogs and the thrill of the catch reads especially memorable for him:

> The frogs were tiny-young leopard frogs. Adult frogs must have lived nearby, but I remember only the delicate animals an inch long. I lay on the banks and peered under the plank bridges where footpaths crossed the ditches. The silver surface of the water mirrored the hazy cloudless summer sky. With luck, a small amphibious head would break the surface, two bulbous eyes peering off to the sides. I lay in wait, then lunged. I harassed far more individuals than I caught, but the captures excited me as much as the first kill must for a boy in a hunting culture. I plunked the little frogs into empty coffee cans to take them home for a night, and then returned them in the mornings, sluggish but surviving. (p. 24)

Trimble's childhood memory reflects my own. His curiosity for something as simple as a drainage ditch mirrors my own childhood experiences at Lake Odell. These naturalistic areas are special for children. They can include wildlife, natural processes and uncontrollable elements and provide the opportunity for creative, spontaneous games with natural play props that

traditional playgrounds do not provide. Just as adults seek out bodies of water for relaxing vacations, children should be given the opportunity to play in local water areas and travel, if only theoretically to a place of discovery, calm or excitement.

The design materials of vegetation, surface materials, slope, wildlife habitat and water, were discussed for their naturalistic qualities and high play value. Naturalistic environments are necessary for children's well-being and development. Direct contact with naturalistic environments through an engagement of the senses, provides children with a deeper awareness of landscape structure and processes. The following section outlines and analyzes natural materials, such as sand, water and bark, for their ability to reflect ecological concepts of health, integrity, process, structure and form within a naturalistic play environment.

Children's safety regarding water areas needs to be carefully considered. According to Moore, et al., (1987), the surface material surrounding the water area should be "nonskid and well drained" (p. 148). Water depths should also be carefully considered and adult supervision should be maintained (Moore, et al., 1987).

CHAPTER TEN

ANALYSIS OF NATURAL MATERIALS USING THE CONCEPTS OF LANDSCAPE HEALTH, INTEGRITY, PROCESS, STRUCTURE AND FORM

To determine the materials to be analyzed for children's naturalistic play environments, I draw from three texts that discuss the use of natural materials within children's outdoor spaces. The three texts are: *Design for Outdoor Recreation* by Bell (2001); "The Natural Environment as a Playground for Children: Landscape Description and Analyses of a Natural Playscape" by Fjortoft and Sageie (2000); and *Play for All Guidelines* by Moore, Goltsman and Iacofano (1987). Each of these works repeatedly discusses materials that are suggested for children's play spaces and are reflective of natural environments. The work by Bell (2001), Fjortoft and Sageie (2000) and Moore, Goltsman and Iacofano (1987) specifically addresses those materials that are suitable for an outdoor naturalistic play environment. Sixteen of more frequently addressed materials are listed within Table 1 and are organized according to the visual planes: ground plane, vertical plane and overhead plane.

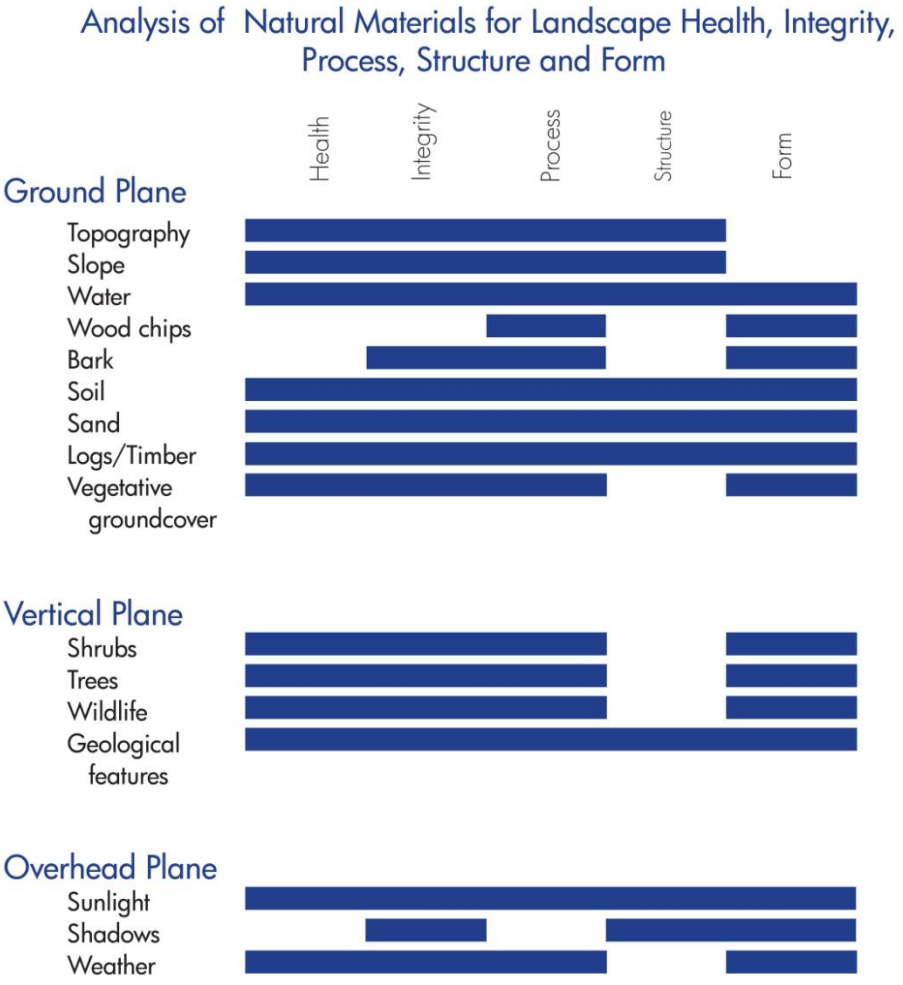
The materials are as follows: Topography, slope, water, wood chips, bark, soil, sand, logs/timber/ vegetative groundcover, shrubs, trees, wildlife, geological features, sunlight, shadows and weather. The term 'material' is used loosely to describe both physical materials as well as elements such as topography, slope, sunlight and weather. For the purposes of this thesis, each of these sixteen items will be referred to as a material. For clarity, topography is defined as the physical terrain of the landscape; slope is defined as the degree to which the ground rises or falls. Water areas include common aquatic features as presented in Moore, et al. (1987), such as

marshes, ponds, pools, streams, creeks or channels. Bark and wood chips materials represent both naturally occurring and introduced materials that consist entirely of wood or bark. Logs and timber are defined as those logs or timber that could be found within a natural environment-separate or attached to a tree, shrub or other vegetation. Wildlife includes those as recommended and discussed by Moore, et al. (1987), including insects, birds, small animals, amphibians, reptiles, aquatic life, or domesticated and farmyard animals. A geological feature refers to geologically-based landforms such as permanent rock structures, caves and individual, smaller rocks.

To qualify each of these sixteen materials as *natural* and reflective of the natural environment, my research evaluates each material for its ability to elicit ecological concepts thereby creating an environment that reflects, to a degree, the natural environment. If materials are found to reflect ecological concepts, reflective of the natural environment, they may convey ecological concepts within the landscape, providing the possibility that these materials can influence children's ecological awareness. Each material was considered for its ability to reflect the concepts of landscape health, integrity, process, structure and form. Determination of landscape health, integrity, process, structure and form are based on the definitions of each ecological concept, my own ecological awareness of the processes and relationships among materials within the natural environment and the ecological concepts presented in *Ecology and Design* by Johnson and Hill (2002). My research is based on the recommendations presented by Johnson and Hill (2002), and is therefore a compilation of material, not intended to be research determined by specific controlled studies.

Using the definitions and concepts of landscape health, integrity, process, structure and form, as presented by Johnson and Hill (2002), I identified landscape *integrity* in those materials that aid in landscape biodiversity and contribute to future ecological conditions (Johnson, et al., 2002, p. 322). Those materials that contribute to a "vitality and flourishing condition" reflect landscape *health* (Karr, 2002, p. 148). Using the research determined in the literature review and my understanding of material processes, I determined which materials reflect ecological *processes*, based on their ability to reflect a biological or physical process reflective of the natural environment (Karr, 2002, p. 150). Landscape *structure* was determined in those materials that reflect the physical structure or "aggregate landforms" of the natural landscape (Karr, 2002, p. 148). Landscape *form* was found in those materials that represent elements, separate from the physical structure of the landscape, such as the biotic flora or fauna.

TABLE 1



This analysis reveals which natural materials, found within the ground plane, vertical plane and overhead plane may reflect and convey ecological concepts of landscape health, integrity, process, structure and form. My discussion reveals that water, soil, sand, logs/timber, geological features and sunlight integrate all five ecological health concepts. My discussion also demonstrates that other materials, such as topography, slope, vegetative groundcover, shrubs,

trees, wildlife and weather intenerate all but one ecological concept. The combination of wood chips and topography, for example, communicates to children the ecological concepts of health, integrity, structure, process and form. However, in order to more accurately reflect a natural environment and showcase the inherent qualities of a variety of materials, I suggest that designers integrate several material combinations. For example, the combination of water and wildlife with a second combination of slope, soil and weather provides a more dynamic environment for children's play, integrating all five ecological concepts multiple times.

Designers should utilize material combinations that reflect a sense of place and the ecological requirements of their site. Because this thesis is not site specific, I do not provide specific examples of vegetation or wildlife species for a naturalistic play environment. This research is intended to provide only general considerations of a naturalistic play environment, while demonstrating how natural material combinations may effectively convey ecological concepts reflective of the natural environment.

Visual Exploration of Landscape Health, Integrity, Process, Structure and Form

To apply the qualitative research obtained in Table 1 to my watercolor renderings, I have altered each of the sixteen watercolors using a series of Photoshop filters representative of the concepts of landscape health, integrity, structure, process and form. The Photoshop filters and their respective ecological concepts used during this process are as follows: landscape health (concept) and wind (filter); landscape integrity (concept) and paint daubs (filter); landscape process (concept) and posterize (filter); landscape structure (concept) and threshold (filter); and landscape form (concept) and film grain (filter). Each Photoshop filter was chosen for a specific

ecological concept because it visually reflected the definition of that particular concept. In other words, the visual impact of each filter was chosen because it symbolically represented a ecological concept. Both the watercolor paintings and the chosen Photoshop filters are an expression and representation of my own ecological awareness and knowledge of these materials. Therefore, if repeated by another researcher, their artistic representations of these materials would represent an alternative ecological awareness and artistic style.

Each illustrative watercolor was altered logically, based on the results of Table 1. For example, wood chips were found to convey two ecological concepts of process and form. Therefore, two Photoshop filters (posterize and film grain) reflective of process and form, were used to alter this image. This sequential process provided a new visual representation for each natural material, based on the ecological concepts determined in Table 1.

After altering each of the sixteen materials based on the results of Table 1, the materials within each visual plane were combined to further explore the visual landscape within a naturalistic play environment. Figures 18, 19 and 20 illustratively combine the natural materials from each of the three visual planes and illustratively represent the ecological concepts of a naturalistic play environment. This blending of materials within each of the three visual planes brings my artistic exploration of a naturalistic play environment one step closer to complete representation. Within the following chapters, these illustrations will be further combined, leading to a comprehensive illustrative rending of a naturalistic play environment.

Figure 18: Overhead Plane Combined

Figure 19: Vertical Plane Combined

Figure 20: Ground Plane Combined

CHAPTER ELEVEN

ILLUMINATING THE FORM OF A NATURALISTIC PLAY ENVIRONMENT USING CHILDREN'S DEVELOPMENTAL THEORIES

The natural materials within naturalistic play environments allow children to gain a greater awareness for the processes, cycles and forms of the natural environment. As children experience nature directly, rather than through indirect or vicarious contact, children's senses and development are stimulated (Eriksen, 1985; Kellert, 2002). Within this section, I analyze how a child's cognitive, emotional, evaluative, physical and social development is activated within naturalistic environments using a designer's standpoint and contemporary theories of child development. To describe the cognitive, emotional and evaluative developmental benefits children receive from natural environments, I utilize developmental theories by Kellert (2002) (2005). I use the works of Frost (1992) and Eriksen (1985) to describe the physical and social developmental benefits of children's contact with natural environments. Following a description of each of the five types of child development associated with natural environments, I provide examples of specific children's play activities that promote each form of development. The play activities provided are derived from Eriksen's (1985) research on children's play and development (See Appendix B). All play activities can easily occur within a naturalistic play environment without outside play equipment. For example, naturalistic environments may provide the opportunity for running or hiding, whereas activities, such as music making or ball play, require play props. Only those activities which children can perform in a naturalistic setting, without outside props, are included within the activity lists.

Naturalistic environments activate children's cognitive, emotional, evaluative, social and physical development. According to Kellert (2002), children's cognitive development progresses through six stages: *knowledge, comprehension, application, analysis, synthesis* and *evaluation*. During the first stage of children's cognitive development, *knowledge,* children begin to identify and categorize the rudimentary features and behaviors of the natural environment such as trees, plants, flowers and the physical structure of the earth (Kellert, 2002). Kellert (2002) explains that due to the variability of landscape features, the first stage of children's cognitive development, *knowledge,* is the stage when children begin to categorize and articulate the natural environment as "challenging and stimulating" (p. 122). Successful knowledge acquisition of the natural environment allows children to name and sort environment related information and provides children with a sense of accomplishment (Kellert, 2002). In my childhood, for example, the ability to discern one plant species from another enabled me to determine which plants were edible and which plants were best for fort-making. This knowledge allowed me to sort and organize plants and other materials into categories, informing me of their uses and expanding my awareness and knowledge of the natural environment.

The second stage of children's cognitive development, *comprehension*, allows children to reflect on their experiences within natural environments. During the comprehension stage, children learn "translation, interpretation, and extrapolation of facts and ideas" (Kellert, 2002, p. 124). Children combine their factual understanding of the natural environment with their experiential understanding. For example, the comprehension stage is a time when children link air temperatures with weather events, such as the idea that snow falls only at certain temperatures.

Following the comprehension state, children learn how to *apply* their knowledge and general concepts concerning the natural environment to other circumstances and situations. As children's cognitive development furthers, children begin to *analyze* their knowledge of the natural environment and discern specific underlying structures and relationships. Once children identify and understand relationships within the natural environment, they *synthesize* their knowledge into patterns, further identifying organization and structure. During the sixth and final stage of children's cognitive development, children *evaluate* their understanding of the natural environment and judge the significance of elements and functions found in natural environments.

According to Eriksen (1985), activities support children's awareness of the natural environment and cognitive development. As children experience, experiment with and manipulate materials within the landscape they gain a deeper understanding of the natural environment, increasing their cognitive development. From Eriksen's (1985) expanded list of cognitive activities (See Appendix B), I have selected activities that are achievable within a naturalistic setting. According to Eriksen (1985), the following activities promote children's cognitive development and reveal the physical landscape that would be necessary to support these activities:

Hiding	Sitting/passive activity
Manipulating	Collecting
Imagining	Exploring/seeking
Digging	Making things

The second type of children's development impacted through direct contact with the natural environment is *emotional development*. Krathwohl, Bloom, & Masia's study (1964), as cited in Kellert (2002), describes five stages of children's emotional development: *receiving*, *responding*, *valuing*, *organizing* and *characterization*.

Receiving, the first stage within children's evaluative development, describes children's receptivity and willingness to learn about the natural environment (Kellert, 2002). Parental and family support fosters children's experiences in natural environments and allows children to become more receptive and interested in natural areas (Kellert, 2002).

As a child, because my brother and I played outside frequently, I developed emotional ties to the play areas in the woods near our home such as our teepee fort under the large redwood tree in the backyard. My positive emotions connected to the natural environment reflected the first stage of affective development, *receiving*. According to Kellert (2002), these positive emotional experiences, encouraged by my parents, contributed to my childhood emotional development.

Children's emotional development progresses as children *respond* to the information and awareness they have gained of the natural environment (Kellert, 2002). As children begin to *value* their own experiences in nature, they place an importance on these situations (Kellert, 2002). When children continue to experience positive emotional experiences within the natural environment, they then *organize* their values and beliefs regarding the worth and importance of nature (Kellert, 2002). During the final stage of children's emotional development, children construct their larger world view and belief system based on their previously developed feelings for the natural environment (Kellert, 2002).

According to Eriksen (1985), the following activities promote children's emotional development. These activities are selected from Eriksen's (1985) expanded list (See Appendix B) and represent those activities that foster emotional development *and* are achievable in a naturalistic play environment:

Homemaking	Group participation
Solitary play	Fantasy play
Experimenting	Handling objects
Rebuilding/Reconstructing	

The third type of children's development, according to Kellert (2002), is *evaluative (values-related) development*. Kellert (2002) describes that children's evaluative development is dependent on a relationship with natural environments. Kellert (2002) maintains that humans are innately attracted to the natural environment and as a result, we hold a set of emotional values toward the natural environment (Kellert, 2002). These values are collectively termed *biophilia*.

The nine values which humans hold for the natural environment are: *aesthetic*, *dominionistic*, *humanistic*, *moralistic*, *naturalistic*, *negativistic*, *scientific*, *symbolic* and *utilitarian*.[xx] These nine values describe our attraction to and emotional bond with natural environments. Children's attraction to nature is a weak genetic tendency, according to Kellert (2002) and therefore, needs to be properly supported by children's social system. With positive support, children develop an emotional relationship with natural environments that influence their ability to develop social relationships, intimacy, "spiritual conviction, inquisitiveness, self-

confidence and self-esteem, critical thinking, problem-solving abilities, and enhanced capacities for empirical observation and analysis" (Kellert, 2002, pp. 130-131).

According to Lohr (2004) and Lohr and Pearson-Mims (2005) and based on my own research, the following activities promote children's evaluative development:

Gardening	Picking flowers
Planting trees, seed or plants	Bird watching

Natural environments promote children's social development in addition to their cognitive, emotional and evaluative development. Social development is stimulated by "dramatic role-playing, games, group projects, observation, or simply conversation" (Eriksen, 1985, p. 78). Group activities provide children with an opportunity to interact with a variety of age groups, understand their role and actions within larger social groups and empathize with other children's feelings (Eriksen, 1985). When a naturalistic play environment promotes social activities, children's social development is activated.

The following list of activities promotes children's social development. Drawn from the work of Eriksen (1985), these social activities inform the physical landscape structure required within a naturalistic environment:

Handling objects	Cooperative projects
Group fantasy play	Exploring

Children's contact with the natural environment influences a fifth type of development, *physical development*. Children's gross-motor skills, large-muscle and fine-motor development,

dexterity, object manipulation and rhythmic skills are aspects of children's physical development (Eriksen, 1985). Non-structured games, fort-making and hand/eye/foot coordination activities also stimulate children's physical development (Eriksen, 1985). Children's physical development, according to Frost (1992) also includes physcial fitness, or the "functional capacities of the body (heart and lung or cardiovascular endurance, muscular strenth, and flexibility)" (p. 43). The need to improve children's physical fitness is a current concern among schools and researchers as childhood obesity rates increase. Natural environments provide a space for children to engage in creative and challenging activities that stimulate children's physical development (Fjortoft, 2001).

According to Eriksen (1985) The following list provides examples of physical activities that promote physical development within naturalistic environments:

Building/constructing	Sliding
Water play	Climbing
Hiding	Manipulating
Exploring	Cooperative games

CHAPTER TWELVE

ILLUMINATING THE PHYSICAL LANDSCAPE OF A NATURALISTIC PLAY ENVIRONMENT: EVALUATION OF CHILDREN'S DEVELOPMENTAL ACTIVITIES AGAINST NATURAL MATERIALS

I define naturalistic play environments as play environments that are constructed by humans and promote children's awareness of ecological health and integrity, process, structure and form. My discussion of landscape materials in chapter 9, revealed which natural landscape materials (wood chips, water, shrubs, wildlife, etc.) reflect concepts of health and integrity, process, structure and form. I have also examined children's developmental theories and from these, generated lists of children's play activities that activate children's cognitive, evaluative, emotional, social and physical development. Like ecological concepts, children's activities illuminate the physical materials that would be required within a naturalistic play environment.

The following tables represent my analysis of natural materials against children's activities. The results were determined using the work of Bell (2001), Fjortoft (2001), Fjortoft and Sageie (2000), Frost (1992), Moore, et al., (1987) and Rivkin (1995). These authors discussed natural materials and the corresponding activities which those materials initiate. Using only those activities that were presented by Eriksen (1985) as activating children's cognitive, emotional, physical or social, I complied the Tables 2-6. The evaluative activities presented in Table 4 were determined from the work of Lohr (2004), Lohr and Pearson-Mims (2004), Lohr and Pearson-Mims (2005). The results of this research reveals which materials influence or can be utilized during children's cognitive, evaluative, emotional, social and physical activities. This

analysis reveals that not all landscape materials are utilized during each activity and not all landscape materials support multiple types of children's development. Therefore, naturalistic play environments should integrate several materials to ensure that each of the five types of development are activated. The results of this analysis are subsequently used within watercolor vignettes to further illustratively reveal the physical landscape of a naturalistic play environment required to support children's cognitive, evaluative, emotional, social and physical activities.

TABLE 2

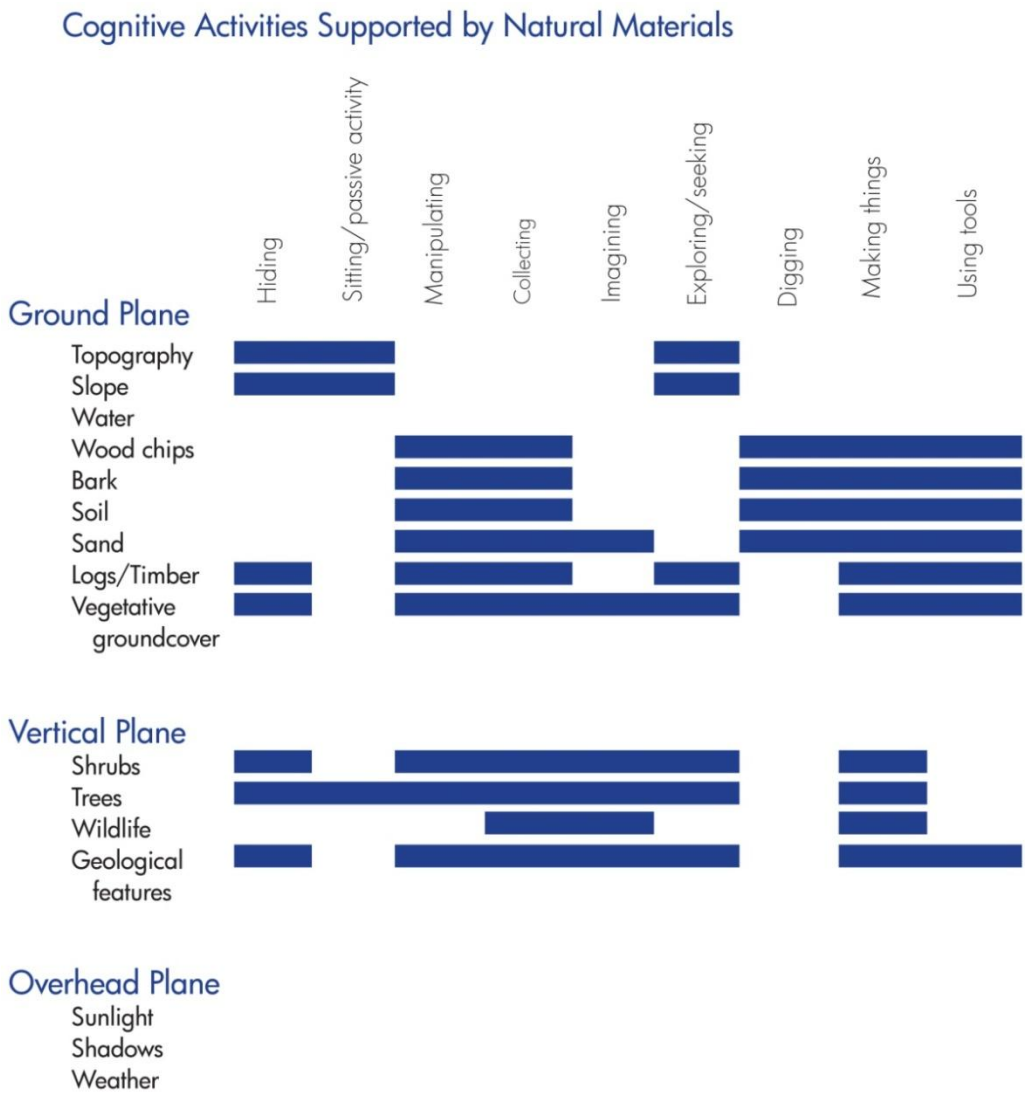


TABLE 3

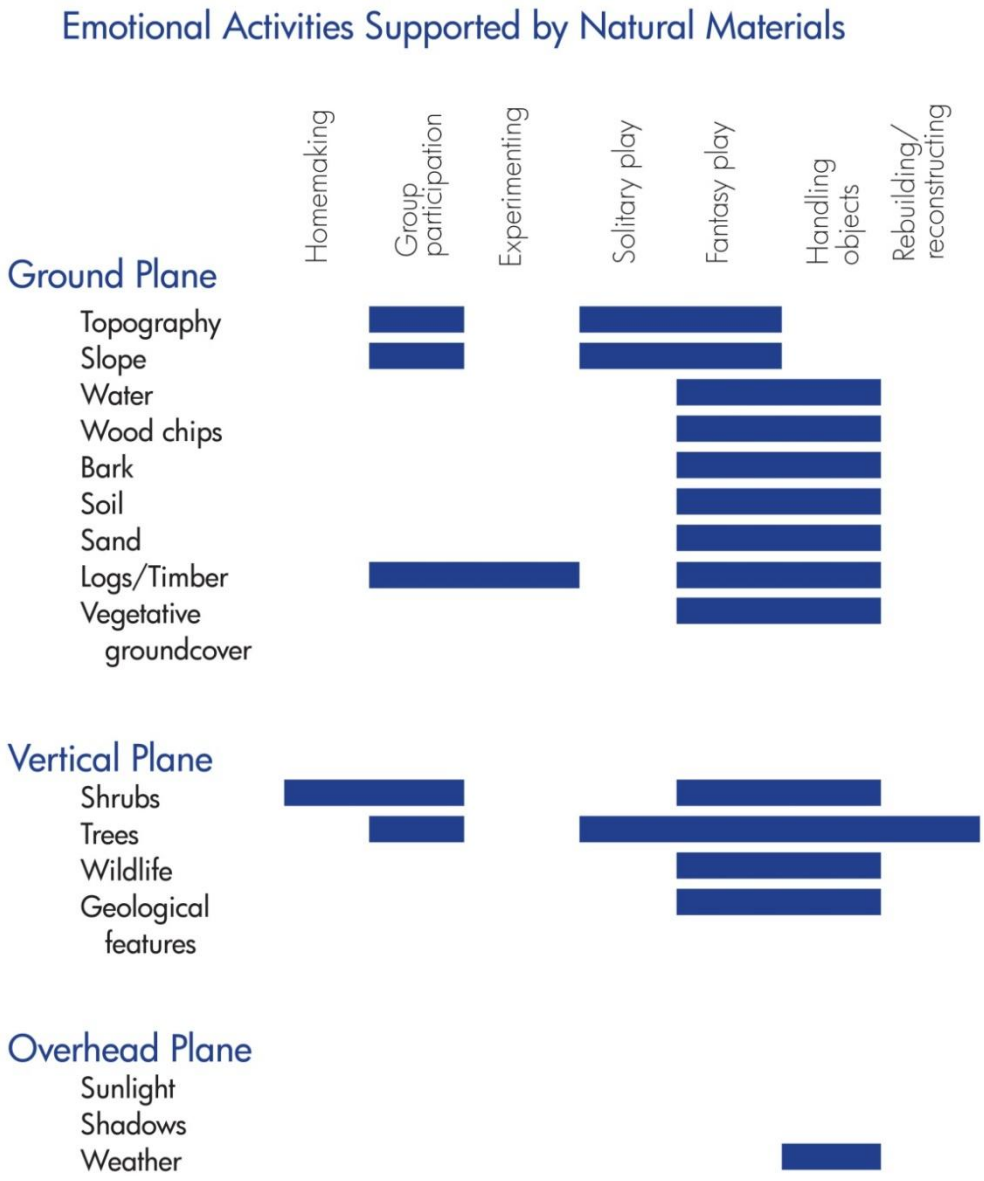

Emotional Activities Supported by Natural Materials
Homemaking
Group participation
Experimenting
Solitary play
Fantasy play
Handling objects
Rebuilding/ reconstructing
Ground Plane
Topography
Slope
Water
Wood chips
Bark
Soil
Sand
Logs/Timber
Vegetative groundcover
Vertical Plane
Shrubs
Trees
Wildlife
Geological features
Overhead Plane
Sunlight
Shadows
Weather

TABLE 4

Evaluative Activities Supported by Natural Materials

	Gardening	Planting trees, seeds or plants	Picking flowers	Bird watching
Ground Plane				
Topography				
Slope				
Water	■	■		
Wood chips				
Bark				
Soil	■	■		
Sand				
Logs/Timber				
Vegetative groundcover	■	■	■	
Vertical Plane				
Shrubs	■	■	■	
Trees	■	■	■	
Wildlife				■
Geological features				
Overhead Plane				
Sunlight	■	■	■	■
Shadows				
Weather	■	■	■	■

TABLE 5

Social Activities Supported by Natural Materials

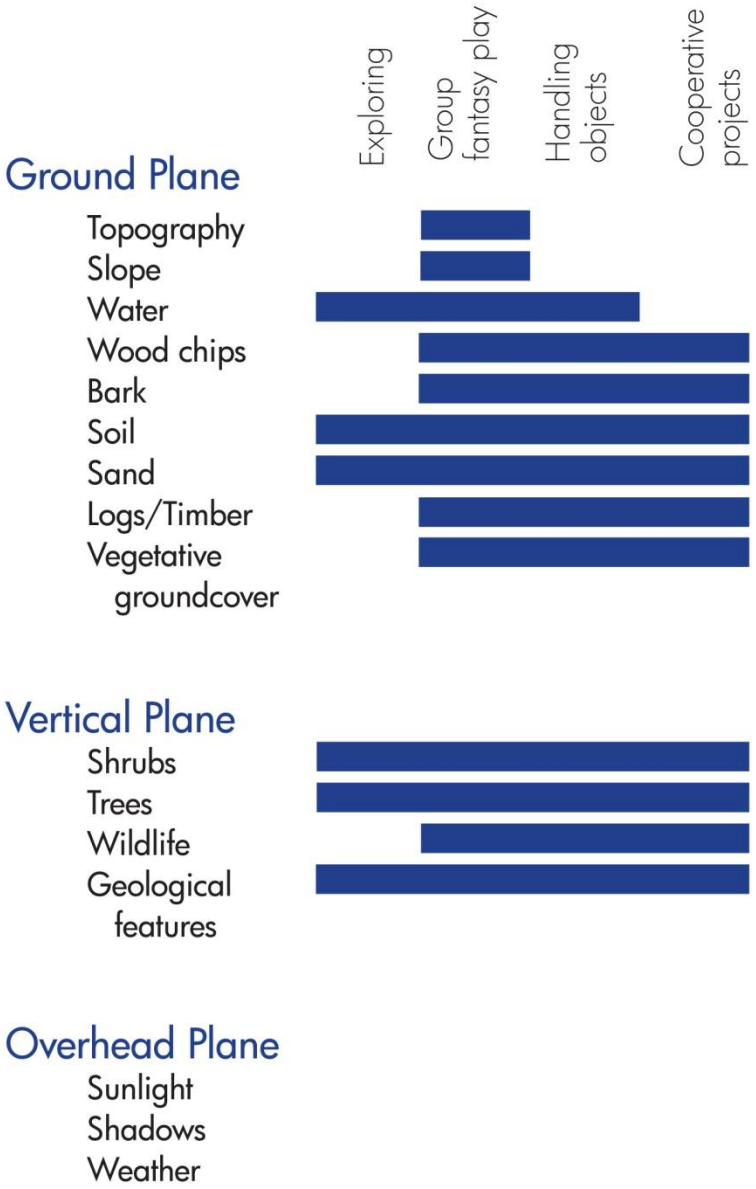


TABLE 6

Physical Activities Supported by Natural Materials

	Building/ constructing	Sliding	Water play	Manipulating	Climbing	Hiding	Exploring	Cooperative games
Ground Plane								
Topography		■	■	■	■	■		
Slope		■	■	■	■	■		
Water			■	■			■	■
Wood chips	■		■	■				■
Bark	■		■	■				■
Soil	■		■	■			■	■
Sand	■		■	■			■	■
Logs/Timber	■		■	■			■	■
Vegetative groundcover	■		■	■			■	■
Vertical Plane								
Shrubs	■		■	■	■	■	■	■
Trees	■		■	■	■	■	■	■
Wildlife	■		■					■
Geological features	■		■	■	■	■		■
Overhead Plane								
Sunlight				■				
Shadows								
Weather		■		■				

Visual Exploration of Tables 2-6

Children's cognitive, emotional, evaluative, physical and social activities stimulate a visual representation of the physical landscape within a naturalistic play environment. Children's activities such as hiding, climbing or sliding require specific physical features within the landscape in order for these activities to occur. To illustratively translate children's activities into the physical landscape of a naturalistic play environment, the three watercolor images presented in Chapter 10, representing the ground plane, vertical plane and overhead plane of a naturalistic play environment are combined.

Figure 21 combines the ground plane and vertical plane, revealing a visual depiction of the natural materials, ecological concepts and developmental theories and activities associated within these two visual planes.

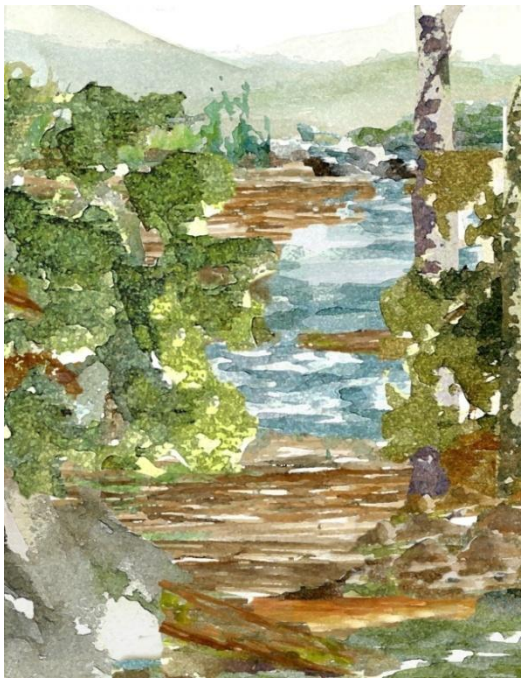


Figure 21: Ground Plane and Vertical Plane Combined

Figure 22 combines the natural materials within the vertical plane and overhead plane, illuminating the physical forms and visual characteristics of these visual planes within a naturalistic play environment.

Figure 22: Vertical Plane and Overhead Plane Combined

Figures 21 and 22 explore the possible representation of the physical forms and tactile qualities of a naturalistic play environment. These illustrations were developed with consideration of the spatial design concepts presented in Chapter 8, including complexity, coherence, mystery and prospect and refuge. Each of these concepts further informed the physical composition and characteristics of Figures 21 and 22. Following a discussion of the senses, all three visual planes will be combined, creating a comprehensive and illustrative description of a naturalistic play environment.

CHAPTER THIRTEEN

ENGAGING THE SENSES: AN ANALYSIS OF HUMAN PERCEPTION AND SENSATION

Children gain an awareness of the natural environment through their sense of touch, taste, smell, sound and sight. The natural environment provides continual, multi-sensory experiences for children. Rachel Sebba (1991) describes the natural environment as "wind, temperature, and various textures [that] assault the skin, changing light and colors and different distances [that] stimulate the eyes, changing smells [that] stimulate the sense of smell…" (p. 416). "There is a continuous progression from light to dark, from cold to hot, from near to far, from one texture to another, from wet to dry" (Sebba, 1991, p. 417). As children develop an understanding of their environment, their ecological awareness expands and children recognize how their actions affect the processes, materials and components of the natural environment. In this chapter, I will briefly describe each of the human senses and the physical reactions and processes that occur when the eyes, ears, mouth, nose and skin receive a stimulus. I will describe societal influences that have the potential to affect a child's perception of an environmental stimulus. Examination of the sensory systems will inform how natural landscape materials, utilized within the design of a naturalistic play environment, activate children's senses.

The human senses are a complex network of interrelated perceptual systems. The senses provide children with information regarding the elements, forms, processes and events within their environment. Human senses are active receptors of information, functioning independently or in combination with other sense organs to receive and respond to environmental stimuli

(Gibson, 1966; Rodaway, 1994). The term *sense* describes both our ability to 'make sense' of the environment-- our cognitive understanding, and our 'senses'-- our ability to touch, smell, sight, sound and taste and receive information from the environment. To analyze the human senses, as both a cognitive understanding and a sensation, I will refer to the work of two authors: James J. Gibson, a prominent American physiologist of the 20th century who specializes in visual perception (Wikipedia contributors, 2008), and Paul Rodaway, a British Phenomenologist and cultural historian, author of *Sensuous Geographies* (The Art Institute of Chicago, 2008).

Gibson (1966) describes the natural environment as a dynamic, animate environment that provides continual and ever-changing stimuli for the human sense organs. Gibson (1966) defines the term *stimulus* as the energy or information, such as heat, light or sound that is transmitted from a source, such as a rock, water or the sun. The term stimulus does not refer to a source or object, but rather, a stimulus is the energy that emanates from a source (Gibson, 1966).

Not all environmental stimuli are perceived by humans (Gibson, 1966). Our perception of a stimulus is dependent on our social preconditioning and how effective our sense organs function. Human perception is both a sensation and a cognitive understanding of a stimulus (Rodaway, 1994). Perception, or our cognitive understanding of a stimulus, engages our "remembering, recognition, [and] association" of previous experiences and stimuli (Rodaway, 1994, p. 11). Perception as a sensation, concerns our sense organs (Rodaway, 1994). Perception will be defined in this thesis using both definitions: a sensation using the sense organs and our cognitive understanding of stimuli. According to Rodaway (1994), these two definitions of perception are interchangable.[xxi]

Children's Sense of Touch

My childhood home in Santa Cruz, CA, was situated among a redwood forest, sand areas and open grasslands. Thousands of years ago, however, the whole area was under water. As a result, the Santa Cruz area now contains large, sandy hills that hold sharks teeth, buried and petrified within the sand. My dad would take my brother and me out to these areas so we could dig our own shark teeth treasures. The sand was hard and usually warm to the touch in the hot California sun. To find a shark's tooth, my brother and I would look for a large block of hard sand. Then we would break it into little pieces, letting the sand fall between our fingers with the hopes of finding one small tooth.

In terms of proximity, the sense of touch is the most intimate of the human senses, limited to only the distance of our reach (Rodaway, 1994). As the largest organ of the human body, the skin continually perceives and receives information from the environment (Rodaway, 1994). The human sense of touch or the 'haptic system' is the ability to feel "an object relative to the body and the body relative to an object. It is a perceptual system by which animals and men are literally in touch with the environment" (Gibson, 1966, p. 97). According to Rodaway (1994), human skin contains "50 receptors per 100 square millimetres" (p. 43). Through the skin, humans perceive temperature, weather, pain, movement and proximity information. The sense of touch allows children to gain a tactile experience of the environment, identify their proximity to objects and perceive movement within their location.

Touch is the first sense to recognize environmental stimuli after birth. When an infant is born, the skin immediately adapts from a liquid-based environment to an arid environment (Rodaway, 1994). Throughout childhood, children continue to utilize their sense of touch as they explore materials, items and food in order to develop an understanding for their surroundings (Hall, 1969).

According to Hall (1969), Americans undervalue and underemphasize the sense of touch. Adults tell children 'not to touch' objects, asking them instead to utilize their visual sense as means of understanding the object (Sebba, 1991). Rodaway (1994) states that tactile stimulation "plays an important role in the development of the young child" (p. 51). Children utilize their sense of touch to gain information about an object, develop coordination skills and gain an awareness of their place within the world (Rodaway, 1994).

Children's tactile experiences extend beyond the means of their own limbs with the use of tools or materials, such as a tree limb, water or telescope. Rodaway (1994) explains that such extended touch can combine several senses and provide a child with a wider sensory experience. For example, if a child uses a stick to touch an object in water, the child will experience not only tactile sensations, but also visual and auditory stimuli when the stick hits the water and creates a sound.

Each of the three visual planes within naturalistic play environments has the ability to activate children's sense of touch. For example, soil, wood chips, bark or vegetative ground cover has inherent tactile qualities that may also change throughout the seasons and years as they experience processes of compaction or decomposition. Sand has the ability to retain heat, creating a hotter surface than other ground plane materials. Shrubs, trees and geological features

within the vertical plane, provide ever-changing tactile qualities, also affected by seasons and weather. Within the overhead plane, weather provides precipitation, snow, hail, fog, or other events which are perceived by the skin. Shadows and sunlight, although not tangible objects, are again perceived by the skin as temperature fluctuations.

Children's Sense of Smell

Excerpt from Nabhan & Trimble's (1994) *The Geography of Childhood*:

> We spent a morning scrambling on the slopes behind the former Wilson home. Side-stepping our way through a narrow passage at one point, Caroline rubbed up against a shrub, and stopped. She crushed a few leaves from a big sagebrush in her hands. "That smell!" she cried. "It's the one I grew up with, the one that means home to me!" A few minutes later, the bruised leaves of wild rosemary mint gave her much the same welcome (p. 13).

The sense of smell can activate memories and emotions from our past and create emotional bonds with previous experiences or locations (Rodaway, 1994). We attach emotions to specific smells, such as nostalgia, based on the memories associated with that smell. For example, people born in the 1920's through 1940's, find the smell of 'baking bread, hay, tweed, split-pea soup and petunias" as nostalgic (Rivkin, 1995) (See Appendix H).

The human olfactory system is triggered when odors enter the nasal cavity and travel to the cells within "the uppermost nasal cavity. The tiny chemoreceptors there are connected to the olfactory nerve" in the brain (Gibson, 1966, p. 136). We can also detect smells through our mouths when an odor is diffused in saliva, detected by chemoreceptors that then transmitted by

electronic messages to the brain (Beach, personal communication, February 20, 2009; Gibson, 1966). When a smell lingers, our ability to detect that odor diminishes when olfactory membranes adapt to the frequency of that smell (Rodaway, 1994).

There currently exists a lack of terminology to describe environmental smells (Rodaway, 1994). When children detect an odor, the smell is described by how it 'smells like' another object or location. For example, children might describe an odor as 'smelling like grandma's house' or 'like rotten eggs.' Our language to describe smells is therefore limited to our knowledge of visual objects (Rodaway, 1994). Smells do have their own distinct language (Rodaway, 1994). The words associated with our olfactory sense: odor, smell and aroma are weighted with both positive and negative connotations (Rodaway, 1994). For example, the word 'odor' is often used to refer to a poor or unsatisfactory smell; whereas 'aroma' is typically associated with a positive or appreciated smell, such as turkey dinner or morning coffee.

Cultural influences affect how we perceive and categorize smells (Rodaway, 1994). According to Rodaway (1994) "we see, hear, smell, taste and touch the world through the mediation, the filter, or lens, of our social milieu, the context within which we have become socialized, educated and familiarized" (p. 23). Social interactions, education and personal experiences affect how we perceive and understand our environment. Therefore, humans develop an awareness or sensitivity to certain smells, such as body odor or cigarette smoke, based on their social environment and culture (Rodaway, 1994).

Olfactory sensations create an emotional bond between a child and the surrounding environment. This bond then allows the child to gain a spatial awareness and memory of the environment (Rodaway, 1994). Rodaway (1994) explains that olfactory memories, unlike visual

or verbal memories, are developed over long periods of time. New odors excite a child's olfactory senses and have the potential to create new emotional experiences and memories. Reoccurring odors on the other hand, may dull a child's sensitivity to a particular odor and can reduce recognition of that smell over time (Rodaway, 1994). But childhood olfactory memories can last lifetimes and have the potential to conjure vivid, emotional laden associations for life.[xxii] Naturalistic play environments have the potential to create positive emotional memories for children, influence their sensitivity of natural environments and impact their ecological awareness.

Wood chips, soil, sand and bark have the potential to release odors as the result of temperature changes, moisture and decomposition. Shrubs, trees and ground cover can potentially transmit odors at varying levels depending on the season and their specie characteristics. And although sunlight and weather may not have a smell of their own, their presence creates smells when in combination with other physical elements. For example, as sunlight warms a forest floor or rain moistens soil, smells may be created and omitted.

Children's Sense of Taste

Figure 23: Memory of wild strawberries

During the spring and summer months, my brother and I enjoyed the edible landscape within the backyard of our childhood home. Behind our home and beneath a large oak tree, grew edible wild strawberries. There were never very many, but my brother and I ate the little round red strawberries with delight. They were sweeter and more special than those from the store because we had found them by ourselves, without our

Figure 24: Memory of honeysuckle

parent's help. At that time, our parents did not know about our natural dessert. Also growing in our backyard was a trailing mat of honeysuckle. As kids, my dad had showed my brother and me how to eat the small drop of honey resting inside the petals. To get to the honeysuckle honey, we learned to pull out the middle sepal and lick the end, whereby retrieving a drop of wild sweetness. It was a small victory, but the freedom to eat wild plants from our backyard felt exciting and rebellious.

The human sense of taste is closely connected to the process by which we decipher olfactory sensations (Gibson, 1966; Rodaway, 1994). When food enters the mouth and crosses over the tongue, tiny chemoreceptors in our taste buds are activated. The chemoreceptors in our tongue then transmit taste information in the form of electronic messages to the brain, producing a sensation of *both* taste and smell (Gibson, 1966). As food is chewed, we evaluate it on a variety of chemical and sensation tests (Gibson, 1966). Humans can detect a range of tastes including sweet, sour, salty and bitter. Mouths also provide humans with a sense of the *feeling* or the textural qualities of substances (Gibson, 1966). Once the food is found to be satisfactory, it is consumed.

Gibson (1966) describes the sense of taste as having a reputation for playing a minor role in human lives, when in fact, it is a "major perceptual system, and a principal concern of life for many persons" (p. 137). Gibson (1966) explains that as children, we place objects in our mouths, not to taste, but as a way of exploring that object. As children grow, society favors the

mouth to be used as a means of eating and less as a method of gaining information. "Putting things in the mouth is tabooed after a certain age. Nevertheless this organ retains the ability to discriminate the shape, size, and solid geometry of objects without ever seeing them-an ability which the fingers also have" (Gibson, 1966, p. 143).

The sense of taste is perhaps the most difficult of all the human senses to integrate into a naturalistic play environment. As Gibson (1966) explains, children instinctually use their mouths as a perceptual system, but this is taboo after a certain age. Even before the 'taboo' age, I believe society discourages children's impulse to explore environments with their mouth as a means of precautionary safety. Contemporary playgrounds do not incorporate the sense of taste into play equipment or the surrounding landscape. For many children today, the possibility of consuming food found in the natural environment is not available. Providing a variety of edible vegetation, such as berries, fruits and herbs would provide children the opportunity to utilize their sense of taste within a play environment.

Children's Sense of Vision

The human sense of vision receives information about the environment and perceives our location within that environment. Vision enables us to perceive textures, object details, distances, depth and the relationship between objects in space (Rodaway, 1994). The human eye receives light information and transmits this information through an optic nerve to the brain. Inside the eye, the retina is composed of light sensitive cells that capture light information and transform the light into electrical signals that are then transmitted to the brain through nerve impulses (Beach, personal communication, February 17, 2009; Rodaway, 1994). Muscles

surrounding the eyes allow the eyes to follow light information within an environment (Rodaway, 1994).

Our visual sense is activated only when light information, illuminated from a source, bounces off an object and into our visual field. Light sources, including the sun, light bulbs and fire emit light at varying footcandles and angles of illumination. Objects and surfaces within the environment continually reflect and deflect light for our eyes to register. Darker colors reflect less light than soft colors and surfaces with textures transmit information differently than smooth surfaces (Rodaway, 1994). Within a naturalistic environment, materials with matte surfaces, such as wood chips or soil, reflect light differently than does a body of water. The illumination of an object within a naturalistic environment may vary depending on the angle of the sun, the season of the year, the time of day, topography or climate factors. Shadows will appear more defined on brighter days than during a cloudy or rainy day. Rachel Sebba describes this changing appearance as "instability" and requires children's "alertness and attention" (p. 417). Sebba (1991) explains that "changes in temperature, intensity and quality of light, and color during the day and throughout the year; the changing of the surface, textures, color, and hardness of the ground" capture children's awareness and activate their senses (p. 417). Materials within a naturalistic environment experience natural processes, such as decomposition, that can further alter their texture, color or surface and affect the light information that object reflects. When materials within naturalistic play environments change or decompose over time, light information illuminated from these materials will also vary. Naturalistic play environments have the potential to not only provide visually stimulating objects, but objects which innately

transform over time, producing shifting visual light information and new visual experiences for children.

Children's Sense of Sound

The sense of sound represents our passive experience of hearing as well as our active experience of listening. Sounds emanate through our surroundings and into our auditory system, where our ears interpret the volume, frequency, pitch, distance, direction and duration of that noise (Rodaway, 1994). According to Gibson (1966), sounds have specific origins and durations that occupy specific lengths of time. When our ears register a sound, the sound travels into our ear canal, past the membrane of our eardrum and into the inner ear cavity where our ear converts the sound vibrations into nerve impulses that are then sent to the brain (Gibson, 1966; Rodaway, 1994). The human ear continually receives sound information and discerns the location of that sound in relation to the body (Rodaway, 1994).

Materials within a natural environment have the potential to influence the pitch of sounds traveling within that space. Rodaway (1994) explains that forms, wind and climate can block or change the direction of a sound, affecting the range which that sound travels and can even create sound "shadows" where the sound can not reach. Sound is measured in decibels; the louder the decibel, the farther that sound will travel. For example, the sound of leaves rustling emits 10 decibels of sound and may only travel about 65 feet (See Appendix I).

Within the ground plane of a naturalistic play environment, water can provide both continual and infrequent sounds within the landscape. Infrequent sounds may be a child skipping rocks or swimming. Precipitation or wave movement could provide a reoccurring

background noise for a naturalistic play environment. Sounds which are common to a specific area, such as the sound of rain in the Pacific Northwest, are classified according to Gibson (1966) as "keynote" sounds. Keynotes are noises which are frequently heard within a specific area and those living in that area will hear that sound as background noise to other, less frequent sounds (Rodaway, 1994). Keynotes may not be consciously heard at all times, but influence the intensity of other sounds in that area (Rodaway, 1994).[xxiii]

Soil, sand and other ground materials may not transmit sound information as frequently or easily as other materials; however, when combined with other materials such as water, sounds can be produced. During a sandstorm or a mudslide, sand and soil have the potential to produce sound.

Shrubs, trees and geological features, like ground materials, may not transmit sound information unless they are affected by weather events or human activity. During a windstorm for example, tree limbs or boulders may fall or rustle the leaves, creating a sound. However, without the addition of other materials or events, these features are generally silent.

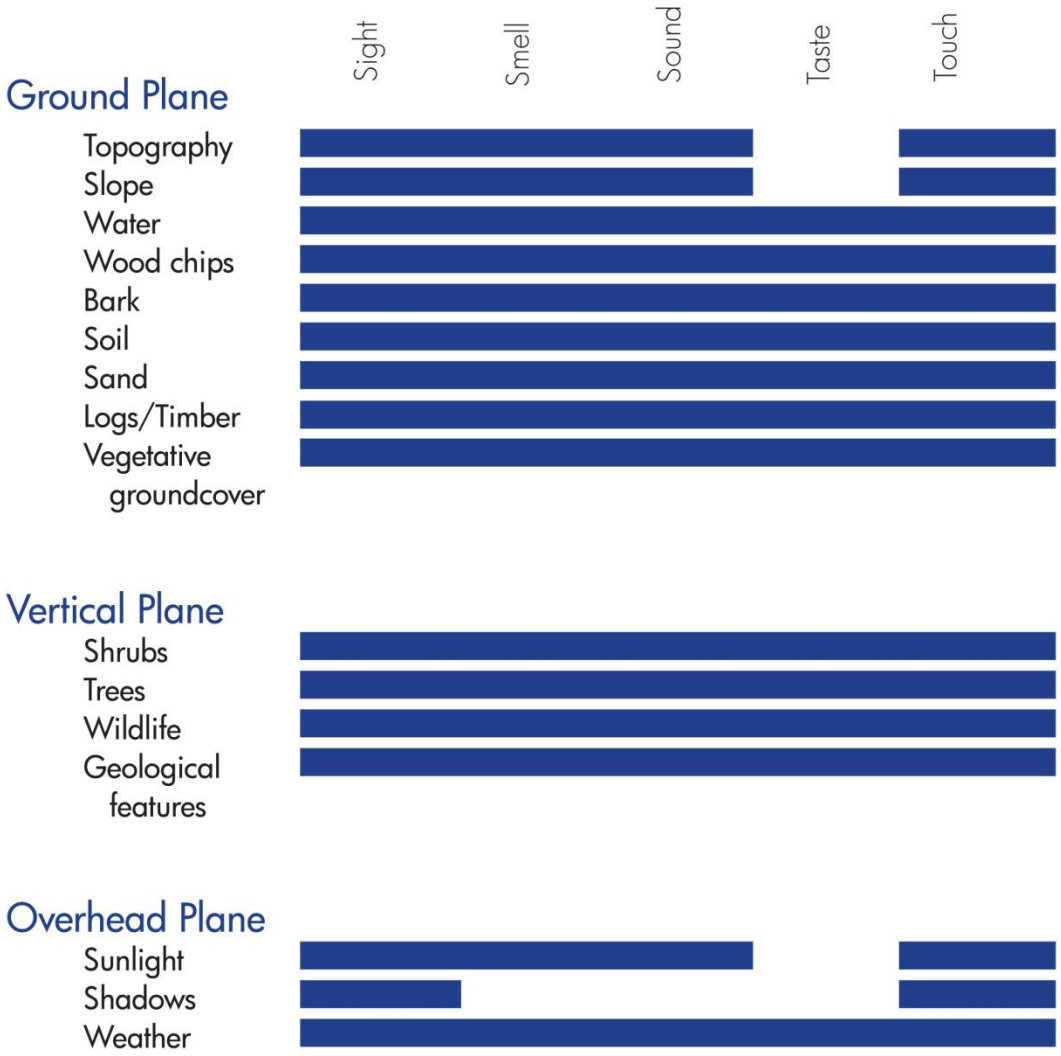
CHAPTER FOURTEEN

EXAMINATION OF THE SENSES AND NATURAL MATERIALS

The following table represents an examination of the human senses, demonstrating which natural materials activate children's senses. My evaluation is informed by the research conducted through the literature review, my examination of material characteristics, analysis of human sensory systems, my personal ecological awareness and design experience using these landscape materials.

TABLE 7

Sensory Stimulation in Natural Materials



Analysis of natural materials against each of the five senses reveals that natural materials actively engage a range of children's senses. Table 7 demonstrates that twelve of the sixteen natural materials activate each of the five senses. Utilizing a combination of several materials within an outdoor play environment will ensure that that space will more accurately reflect the natural environment and activate all five senses, providing an environment for children's awareness and development.

Visual Exploration of Tables 1-7

The following illustrative watercolor (Figure 25) visually combines natural materials within the ground plane, vertical plane and overhead plane, revealing the physical landscape of a naturalistic play environment. Visually complimenting my analytical research, Figure 25 depicts a naturalistic play environment, comprised of sixteen natural materials that activate children's senses, development and ecological awareness.

Figure 25: Naturalistic Play Environment

CHAPTER FIFTEEN

CONCLUSION

Developing a naturalistic play environment using the natural landscape materials outlined in this thesis will activate children's senses; promote children's cognitive, emotional, evaluative, social and physical development; and convey ecological concepts of landscape health, integrity, process, structure and form, informing children's ecological awareness. Not all natural materials will activate each of the senses, stimulate the five types of child development or convey each ecological concept of landscape health, integrity, process, structure and form. A play environment that combines only one or two natural materials will therefore, only integrate a limited number of senses, developmental activities and ecological concepts. Naturalistic play environments that incorporate several natural materials will promote a greater range of children's physical activities, convey more ecological concepts and properly stimulate children's senses.

Incorporating natural material combinations within the design of a naturalistic play environment will effectively provide outdoor natural landscapes for children's spontaneous, creative unstructured free play. Table 1 details which natural materials convey ecological concepts. Tables 2-6 determine which natural materials encourage children's cognitive, emotional, evaluative, physical and social activities within a naturalistic play environment. Conversely, Tables 2-6 identify which play activities will be supported in a naturalistic play environment based on the materials within that site. If designers of children's naturalistic play area wish to encourage climbing, they will need to incorporate topography, slope, shrubs, trees or geological features. If the play environment would also like to promote hiding activities, it will

need to include topography, slope, logs/timber, vegetative groundcover, trees, shrubs or geological features. Table 7 demonstrates which senses are activated by each of the natural materials, allowing designers to predetermine which senses they can activate based on the materials within that landscape. Used in combination, the results demonstrated in Tables 1-7, allow designers to consciously choose and be aware of the play activities, senses and ecological concepts they can stimulate within a naturalistic play environment.

The research provided within this thesis is presented for general considerations, not specific to any location or ecological environment. Further research is necessary to determine which specific natural materials, plant and wildlife species are most effective for an individual region or environment. Results presented throughout this thesis were influenced by the author's own ecological awareness and childhood memories. Therefore, future results may vary according to a researcher's own memories and childhood experiences with natural environments.

Natural materials provide rich, dynamic environments for children's learning, development and free play. Incorporating natural materials into play environments that are built to specifically promote children's learning, development and ecological awareness provides children with the opportunity to reconnect to natural environments and gain invaluable benefits associated with nature. My thesis provides detailed information on natural materials such that when incorporated into a naturalistic play environment, designers can determine which types of development the landscape promotes, which senses will be activated and which ecological concepts will be conveyed. It is my hope that as children reconnect to natural environments and the materials within them during play, children will not only gain crucial developmental benefits,

but also expand their awareness and appreciation for the natural environment and encourage future generations to do the same.

BIBLIOGRAPHY

Allen, Lady of Hurtwood. (1968). *Planning for play.* Cambridge: The MIT Press.

Altman, I., & Zube, E. H. (Eds.). (1989). *Human behavior and environment: Vol. 10. Public places and spaces.* New York: Plenum Press.

Apostol, D., & Sinclair, M. (Eds.). (2006). *Restoring the Pacific Northwest.* Washington, DC: Island Press.

Appleton, J. (1975). *The experience of landscape.* London: John Wiley & Sons.

Ayers, A. J. (1979). *Sensory integration and the child.* Los Angeles: Western Psychological services.

Azzarito, L., Munro, P., & Solmon, M. A. (2004). Unsettling the body: The institutionalization of physical activity at the turn of the 20th Century. *Quest , 56,* 377-396.

Bell, S. (2001). *Design for outdoor recreation.* London: Spon Press.

Big Toys. (2006). Big Toys product catalogue.

Bloom, B., Engelhart, M., Furst, E., Hill, W., & Krathwohl, D. (1956). *Taxonomy of educational objectives, handbook I: The classification of educational goals-cognitive domain.* New York: Longman.

Bower, T. (1977). *The perceptual world of the child.* Cambridge: Harvard University Press.

Burdette, H. L., & Whitaker, R. M. (2005). Resurrecting free play in young children [Electronic Version]. *Archives of Pediatric Adolescent Medicine , 159*, 46-50.

Carson, R. (1956). *The sense of wonder.* New York: HarperCollins Publishers, Inc. .

Center on Education Policy. (2008, February). *Instructional time in elementary schools: A closer look at changes for specific subjects.* Retrieved September 9, 2008, from www.cep-dc.org

Centers for Disease Control and Prevention . (2008). *Overweight and obesity: Childhood overweight.* Retrieved January 30, 2008, from Centers for Disease Control and Prevention: http://www.cdc.gov/nccdphp/dnpa/obesity/childhood/index.htm

Charles, C., Louv, R., Bodner, L., & Guns, B. (2008, January). *Children and nature 2008: A report on the movement to reconnect children to the natural world*. Retrieved September 9, 2008, from Children and nature network: www.childrenandnature.org

Chawla, L. (2002). Spots of Time: Manifold ways of being in nature in childhood. In P. H. kahn, & S. R. Kellert, *Children and Nature* (pp. 199-225). Cambridge: The MIT Press.

Chawla, L. (2006). *Learning to love the natural world enough to protect it. Barn, 2*, 57-78. Retrieved September 18, 20008, from Children and Nature Network : http://www.childrenandnature.org/uploads/Chawla_LearningtoLove.pdf

Clements, R. (2004). An investigation of the status of outdoor play. *Contemporary Issues in Early Childhood , 5*, 68-80.

Consumer Product Safety Commission. (2009). *Voluntary Standards*. Retrieved March 23, 2009 from http://www.cpsc.gov/volstd/standards.html

Cranz, G. (1982). *The politics of park design: A history of urban parks in America.* Cambridge: The MIT Press.

Eriksen, A. (1985). *Playground design.* New York: Van Nostrand Reinhold Company.

Faber Taylor, A., & Kuo, F. E. (2006). Is contact with nature important for healthy child development? State of the evidence. In C. Spence, & M. Blades (Eds.), *Children and their environments* (pp. 124-140). Cambridge: Cambridge University Press.

Fjortoft, I. (2001). The natural environment as a playground for children: The impact of outdoor play activities in pre-primary school children [Electronic Version]. *Early Childhood Education Journal, 29*, 111-117.

Fjortoft, I., & Sageie, J. (2000). The natural environment as a playground for children: Landscape description and analyses of a natural playscape [Electronic Version]. *Landscape and Urban Planning, 48*, 83-97.

Frost. J.L. (1992). *Play and playscapes.* Albany, NY: Delmar Publishers, Inc.

Frost, J. L., Brown, P.-S., Sutterby, J. A., & Thornton, C. D. (2004). *The developmental benefits of playgrounds.* Olney, MD: Association for Childhood Education International.

Frost, J. L., & Klein, B. L. (1979). *Children's play and playgrounds.* Boston: Allyn and Bacon, Inc.

Frost, J. L., & Sunderlin, S. (1985). *When children play.* (J. Frost, & S. Sunderlin, Eds.) Wheaton, MD: Association for Childhood Education International.

GameTime. (2007). GameTime product catalogue.

Gibson, J. J. (1966). *The senses considered as perceptual systems.* Boston : Houghton Mifflin Company.

Gibson, J. J. (1986). *The ecological approach to visual perception.* Hillsdale, NJ: Lawrence Erlbaum Assoicates.

Ginsburg, Keneth R.,MD, MSEd; Communication; Committee on Communications; Committee of Psychosocial Aspects of Child and Family. (2007). The importance of play in promoting healthy child development and maintaining strong parent-child bonds. *Pediatrics , 119*, 182-191.

Hall, E. T. (1969). *The hidden dimension.* Garden City, NY: Anchor Books.

Hartle, L., & Johnson, J. E. (1993). Historical and contemporary influences of outdoor play environments. In C. H. Hart (Ed.), *Children on playgrounds* (pp. 14-42). Albany, NY: State University of New York Press.

Hayward, J. (1989). Urban parks: Research, planning and socal change. In I. Altman, & E. H. Zube (Eds.), *Human behavior and environment : Vol. 10. Public places and spaces* (pp. 193-216). New York: Plenum Press.

Heerwagen, J. H., & Orians, G. H. (2002). The ecological world of children. In P. H. Kahn, & S. R. Kellert (Eds.), *Children and nature* (pp. 35-63). Cambridge: The MIT Press.

Hill, K., White, D., Maupin, M., Ryder, B., Karr, J. R., Freemark, K., et al. (2002). In expectation of relationships: Centering theories around ecological understanding. In B. R. Johnson, & K. Hill (Eds.), *Ecology and design* (pp. 271-304). Washington, DC: Island Press.

Hirsch-Pasek, K., & Golinkoff, R. (2002). *Einstein never used flash cards: How our children really learn and why they need to play more and memorize less.* New York: Rodale.

Hofferth, S. L., & Curtin, S. (2006, January 28). *Changes in children's time, 1997-2002/3: An update.* Retrieved January 30, 2008, from Children and nature network: www.childrenandnature.org

Hofferth, S. L., & Owens, T. J. (Eds.). (2001). *Children at the millennium: Where have we come from, where are we going?* (Vol. 6). Amsterdam: JAI.

Hofferth, S. L., & Sandberg, J. F. (2001). Changes in american children's time, 1981-1997. In S. L. Hofferth, & T. J. Owens (Eds.), *Advances in life course research*: *Vol. 6. Children at the millennium: Where have we come from, where are we going?* (pp. 193-229). Amsterdam: JAI.

International Play Association. (2007). *International play association: Promoting the child's right to play*. Retrieved September 2, 2008, from http://www.ipaworld.org/home.html

Jackson, E. (2006). Current trends within playground design: The perspectives of manufacturers, schools, academic researchers and designers. Unpublished manuscript, Washington State University.

Johnson, B. R., & Hill, K. (Eds.). (2002). *Ecology and design: Frameworks for learning.* Washington, DC: Island Press.

Johnson, B. R., Silbernagel, J., Hostetler, M., Mills, A., Ndubisi, F., Fife, E., et al. (2002). The nature of dialogue and the dialogue of nature: Designers and ecologists in collaboration. In B. R. Johnson, & K. Hill (Eds.), *Ecology and design* (pp. 305-256). Washington, DC: Island Press.

Johnson, J. M., & Hurley, J. (2002). A future ecolgoy of urban parks: Reconnecting nature and community in the landscape of children. *Landscape Journal , 21*, 110-115.

Kahn., P. H. (2002). Children's affiliations with nature: Structure, development, and the problem of environmental generational amnesia. In P. H. Kahn, & S. R. Kellert (Eds.), *Children and nature* (pp. 111-116). Cambridge: The MIT Press.

Kahn, P. H., & Kellert, S. R. (Eds.). (2002). *Children and nature.* Cambridge: The MIT Press.

Kaplan, R., & Kaplan, S. (2002). Adolescents and the natural environment: A time out? In P. H. Kahn (Ed.), *Children and nature: Psychological, sociocultural, and evolutionary investigations* (pp. 227-257). Cambridge: MIT Press.

Kaplan, R., Kaplan, S., & Ryan, R. L. (1998). *With people in mind.* Washington, DC: Island Press.

Karr, J. R. (2002). What from ecology is relevant to design and planning? In B. R. Johnson, & K. Hill (Eds.), *Ecology and design* (pp. 133-172). Washington, DC: Island Press.

Kellert, S. R. (2002). Experiencing nature: Affective, cogniting, and evaluative development in children. In P. H. Kahn, & S. R. Kellert (Eds.), *Children and nature* (pp. 117-151). Cambridge: The MIT Press.

Kellert, S. R. (2005). *Building for life: Designing and understanding the human-nature connection.* Washington, DC: Island Press.

Kellert, S. R., & Wilson, E. O. (1993). *The biophilia hypothesis.* Washington, DC: Island Press.

Krathwohl, D., Bloom, B., & Masia, B. (1964). *Taxonomy of educational objectives: The classification of educational goals, Handbook 2, Affective domain.* Washington, DC: Island Press.

Library of Congress Thomas. (2008, July 10). *H.R. 3036 no child left inside act of 2008 (Reported in House).* Retrieved October 12, 2008, from http://thomas.loc.gov/cgi-bin/query/F?c110:2:./temp/~c110XTj8FP:e9468:

Lohr, V. I. (2004). Effect of childhood experiences with nature, including planting trees, on adult understanding of trees in cities. *Acta Horticulture , 643*, 183-187.

Lohr, V. I., & Pearson-Mims, C. H. (2004). The relative influence of childhood activities and demographics on adult appreciation for the role of trees in human well-being. *Acta Horticulture , 639*, 253-259.

Lohr, V. I., & Pearson-Mims, C. H. (2005). Children's active and passive interactions with plants influence their attitudes and actions toward trees and gardening as adults. *Hort Technology, 15*, 472-476.

Louv, R. (2006). *Last child in the woods.* Chapel Hill, NC: Algonquin Books of Chapel Hill.

Meyer, E. K. (2008). Sustaining beauty. The performance of appearance. A manifesto in three parts [Electronic Version]. *Journal of Landscape Architecture*, 6-23.

Moore, G. (1985). State of the art in play environment. In J. L. Frost, & S. Sunderlin (Eds.), *When children play* (pp. 171-189). Wheaton: Association for Childhood Education International.

Moore, R. (1980). Generating relevant urban childhood places: Learning from the 'yard'. In P. F. Wilkinson (Ed.), *Innovation in play environments* (pp. 45-75). New York: St. Martin's Press.

Moore, R. (1986). *Childhood's domain.* London: Croom Helm.

Moore, R. (1989). Playgrounds at the crossroads. In I. Altman, & E. H. Zube (Eds.), *Human behavior and environment*: *Vol. 10. Public places and spaces.* (pp. 84-120). New York: Plenum Press.

Moore, R. (1993). *Plants for play.* Berkeley, CA: MIG Communications.

Moore, R., Goltsman, S. M., & Iacofano, D. S. (Eds.). (1987). *Play for all guidelines* (2nd ed.). Berkeley, CA: MIG Communications.

Myers, J. (1985). Percieved and actual playground equipment choices of children. In J. L. Frost, & S. Suderlin (Eds.), *When children play* (pp. 157-162). Wheaton, MD: Association for Childhood Education International.

Nabhan, G. P., & Trimble, S. (1994). *The geography of childhood.* Boston : Beacon Press.

Nasaw, D. (1985). *Children of the city.* Garden City, NY: Anchor Press/Doubleday.

Nicholson, S. (1971). How not to cheat children: The theory of loose parts. *Landscape Architecture* , 30-34.

Orr, D. W. (2002). Political economy and the ecology of childhood. In P. H. Kahn, & S. R. Kellert (Eds.), *Children and nature: Psychological, sociocultural, and evolutionary investigations* (pp. 279-303). Cambridge: MIT Press.

Perry, J. P. (2003). Making sense of outdoor pretend play. *Young Children , 58* (3), 26-30.

Pyle, R.M. (2002). Eden in a vacant lot. In P. H. Kahn, & S. R. Kellert (Eds.), *Children and nature* (pp. 305-327). Cambridge: The MIT Press.

Pyle, R. M. (2003). Nature matrix: Reconnecting people and nature. *Oryx, 37*, 206-214.

Rivkin, M. S. (1995). *The great outdoors: Restoring children's right to play outside.* Washington, DC: National Association for the Education of Young Children.

Rodaway, P. (1994). *Sensuous geographies.* London: Routledge.

Sanderson, J. P., & Harris, L. D. (Eds.). (2000). *Landscape ecology.* Boca Raton, FL: Lewis Publishers.

Sebba, R. (1991). The landscapes of childhood: The reflection of childhood's environment in adult memories and in children's attitudes [Electronic Version]. *Environment and Behavior, 23,* 395-422.

Sherman, K. (2008, August 28). *School board expected to restore recess.* Retrieved September 08, 2008, from Children & Nature Network: http://www.childrenandnature.org/

Sobel, D. (1993). *Children's special places: Exploring the role of forts, dens, and bush houses in middle childhood.* Detroit, MI: Wayne State University Press.

Solomon, S. (1995). *American playgrounds.* Lebanon, NH: University Press of New England.

State of Washington Legislature. (n.d.). *HB 1677 2007-2008: Creating the outdoor education and recreation grant program for schools and others.* Retrieved September 9, 2008, from http://apps.leg.wa.gov/billinfo/summary.aspx?bill=1677&year=2007

Sutton-Smith, B. (1985). Play research: State of the art. In J. L. Frost, & S. Sunderlin (Eds.), *When Children Play* (pp. 9-16). Wheaton, MD: Association for Childhood Education International.

The Art Institute of Chicago. (2008). *Paul Rodaway*. Retrieved November 18, 2008, from The Art Institute of Chicago: http://www.artic.edu/webspaces/touch/q-rodaway.html

The Chesapeak Bay Foundation. (2008). *No child left inside*. Retrieved October 12, 2008, from http://www.cbf.org/site/PageServer?pagename=act_sub_actioncenter_federal_NCLB

The International Play Association. (n.d.). Retrieved September 2, 2008, from http://www.ipaworld.org/home.html

Thompson, C. W., Aspinall, P., & Montarzino, A. (2008). The childhood factor: Adult visits to green places and the significance of childhood experience. *Environment and Behavior* , *40*, 111-143.

Ulrich, R.S. (1983). View through a window may influence recovery from surgery. *Science*, *224*, 420-421.

Valentine, G., & McKendrick, J. (1997). Children's outdoor play: Exploring parental concerns about children's safety and the changing nature of childhood [Electronic Version]. *Geoforum* , *28*, 219-235.

Washington Watch.com. (2008). *H.R. 3036, The no child left inside act of 2007*. Retrieved October 12, 2008, from http://www.washingtonwatch.com/bills/show/110_HR_3036.html#toc1

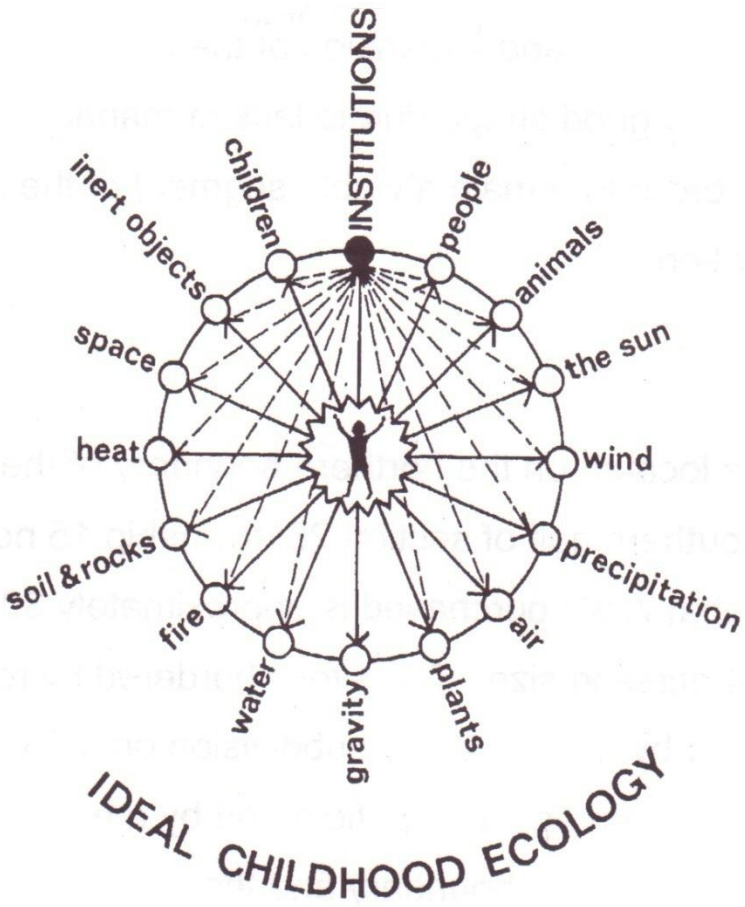
Wells, N. M. (2000). At home with nature: Effects of "greenness" on children's cognitive functioning. *Environment and Behavior*, *32*, 775.

Wikipedia contributors. (2008). *J.J. Gibson*. Retrieved November 18, 2008, from Wikipedia: http://en.wikipedia.org/wiki/J.J._Gibson

Wilkinson, P. F. (Ed.). (1980). *Innovation in play environments.* New York: St. Martin's Press, Inc.

Wridt, P. J. (2004). An historical analysis of young people's use of public space, parks and playgrounds in New York City. *Children, Youth and Environments, 14* (1), 86-106.

APPENDIX A



From *Innovation in Play Environments* by P. Wilkinson, 1980, p. 60. Copyright 1980 by St. Martin's Press.

APPENDIX B

Activities that promote physical growth are:

Sliding	Ordering
Swinging	Manipulating
Rocking	Molding
Climbing	Feeling/handling
Balancing	Sitting/passive activity
Crawling	Observing
Jumping	Digging
Rolling/tumbling	Planting
Pushing/pulling	Exploring/seeking
Hopping/skipping	Water play
Running	Sand play
Throwing/catching	Ball play
Cooperative games	Toy play
Competitive games	Doll play
Building/constructing	Drilling
Walking	Local games
Collecting	
Distributing	
Arranging	
Hiding	

Activities that contribute to emotional growth are:

Homemaking	Handling objects
Creative self-expression	Role-playing
Solitary play	Rebuilding/reconstruction
Personal care	Fantasy play
Risk taking	Ordering
Music making	Experimenting
Group participation	Responding to personal needs

Activities that promote social growth are:

Cooperative games	Singing/creative noise making
Cooperative problem solving	Obeying rules
Listening	Fact learning
Dancing	Displaying/explaining
Group exploring	Questioning/investigating
Verbal intercourse	Ordering/arranging
Sharing	Group fantasy play
Copying	Experimenting with games
Cooperative projects	Interpersonal care/caring
Planning	Experimenting with objects

Activities that promote cognitive development are:

Listening	Creative self-expression
Problem solving	Rhythmic movement
Observing (intergroup)	Rhythmic noise making
Observing (natural processes)	Imaging/symbolizing
Using tools	Imagining
Making things	Solitary play
Matching, naming, identifying	Mimicking
Spatial orientation	Reading
Drawing	Manipulating
Exploring	Describing
Experimenting (socially)	Writing
Experimenting (nature/materials)	

From *Playground Design* by A. Eriksen, 1985, p. 79-80. Copyright 1985 by Van Nostrand Reinhold Company Inc.

APPENDIX C

Recipe for Cactus Cooking 'Oil'

1 jar, can or other receptacle

3 cups water

1 sizable piece of Prickly Pear type cactus

Once you have located a Prickly Pear type cactus, rip, cut or separate a piece of the cactus leaf from the plant without touching the prickly spikes. Knocking the 'leaves' with a branch can work well and if you think ahead, bring a pair of dad's work glove to help prevent injuring yourself on the plant's spikes. As a final option and only if you are careful, place your fingers in between the little spikes on the 'leaf.' Once you have taken a sizable piece of 'leaf' off the cactus, take it back to the fort and cut off a strip, again using your removal method of choice. Sharp rocks or one of mom's least favorite butter knives can cut the cactus 'leaf' well. Then insert the long cactus piece (about 3 inches wide) into your jar and fill the jar with water. Let it soak for 1-2 days, covered. When you return, the water will have turned into oil, providing an excellent addition to your outdoor mud pie and other cooking recipes.

APPENDIX D

Play activities related to landscape characters[a]

Landscape characters		Play activities						
Vegetation	Class	Climbing rocks	Climbing trees	Running	Sliding	Skiing	Symbol play	Construction play
Physiognomy trees	Deciduous	–	28%	–	–	–	35%	40%
	Spruce	–	–	–	–	–	18%	–
	Pine	–	34%	–	–	–	20%	–
	Mixed	–	7%	–	–	–	6%	14%
	Pine/spruce	–	20%	–	–	–	11%	38%
Physiognomy shrubs	Deciduous	–	–	–	–	–	46%	48%
	Mixed	–	–	–	–	–	48%	53%
	Pine/spruce	–	–	–	–	–	–	–
Density of shrubs	Open	13%	–	–	12%	98%	7%	–
	Scattered	79%	–	100%	79%	–	86%	96%
	Dense	9%	–	–	9%	–	8%	4%
Topography (slope)	Mean degree	22.5	–	11.6	22.3	7.0	17.2	10.3
	(S.D.)	(7.8)	–	(4.1)	(7.7)	(8.3)	(7.7)	(3.4)
Topography (roughness)	Mean value	−0.8	–	−0.2	−0.8	0.2	0.2	−0.1
	(S.D.)	(4.8)	–	(2.4)	(4.8)	(2.3)	(4.0)	(1.5)

[a] Physiognomy of vegetation reported in % playscape area, topography reported as mean values and (S.D.) of slope (degrees) and roughness (second derivative of height).

From "The natural environment as a playground for children: Landscape description and analyses of a natural playscape," by I. Fjortoft & J. Sageie, 2000, *Landscape and Urban Planning, 48*, p. 91. Copyright 2000 by Elsevier Science B.V.

APPENDIX E

Type of Material	6 "Depth	9 " Depth	12" Depth
Double Shredded Bark Mulch	6	10	11
Wood Chips	7	10	11
Fine Sand	5	5	9
Fine Gravel	6	7	10

Loose-Fill Materials

- Maintain a minimum depth of 9 inches of loose-fill materials such as wood mulch/chips, engineered wood fiber (EWF), or shredded/recycled rubber mulch for equipment up to 8 feet high; and 9 inches of sand or pea gravel for equipment up to 5 feet high. NOTE: An initial fill level of 12 inches will compress to about a 9-inch depth of surfacing over time. The surfacing will also compact, displace, and settle, and should be periodically refilled to maintain at least a 9-inch depth.
- Use a minimum of 6 inches of protective surfacing for play equipment less than 4 feet in height. If maintained properly, this should be adequate. (At depths less than 6 inches, the protective material is too easily displaced or compacted.)
- Use containment, such as digging out around the perimeter and/or lining the perimeter with landscape edging. Don't forget to account for water drainage.
- Check and maintain the depth of the loose-fill surfacing material. To maintain the right amount of loose-fill materials, mark the correct level on play equipment support posts. That way you can easily see when to replenish and/or redistribute the surfacing.

From Consumer Product Safety Commission, 2009, Retrieved from

http://www.cpsc.gov/volstd/standards.html.

APPENDIX F.1

GT IMPAX FIBER

Engineered Wood Fiber Surfacing

Engineered wood fiber is a popular choice for budget challenged playgrounds. Engineered wood fiber will require on-going maintenance and occasional topping off during its lifetime. This maintenance will help to maintain the recommended compacted material depth, thus keeping the surface compliant with applicable standards and warranty.

Once the newly installed product has settled, it forms a "knitted" compacted layer that will support a variety of mobility devices including wheelchairs, gait trainers, crutches, and walkers. Providing adequate drainage is an important preventative measure, because wet engineered wood fiber may freeze in sudden climate changes.

From Game Time, A PlayCore Company, 2007, p. 168. Copyright by Game Time 2007.

APPENDIX F.2

GT IMPAX LOOSE FILL™

Recycled Shredded Rubber Surfacing

Loose fill rubber is a superior surface made from clean, recycled tires. A unique rubber granule, it offers the most superior impact absorbing properties of all the loose fill surfaces.

Available in several colors, it provides an aesthetically pleasing, functional surface for your play area. Recycled loose fill rubber can be more economical than loose fill wood products since it doesn't decompose, requiring lower maintenance, top offs, and replacement than many other loose fill choices. It is unique among loose fill surfaces, because of the color choices that are available.

GT Impax Loose Fill Rubber drains well after a rain and will not attract insects or animals. It also helps eliminate the growing waste pile of used tires in the world, by recycling them into a useful, long lasting, beneficial product!

GT IMPAX BONDED™

Recycled Bonded Rubber Surfacing

GT Impax Bonded Rubber is an attractive, seamless surface that recycles clean, shredded rubber tires into a useful and environmentally responsible safety surfacing. In many regions, bonded rubber provides a lower cost option than other seamless surfaces. It does not absorb water, and with proper drainage will not freeze. It's a great option for paths and walkways.

Installation must be performed by technically trained, GameTime certified installers, and requires specific depth, slope, and tolerance of the base materials. Thicknesses are varied to meet specified play equipment critical fall heights per the ASTM F1487 standard. The product is porous to allow free flow of water, so it doesn't puddle, and is always ready for play.

From Game Time, A PlayCore Company, 2007, p.169. Copyright by Game Time 2007.

APPENDIX G

Wildlife Enhancement

Common Name	Botanical Name	Zone	Wildlife Users
Very High Wildlife Value			
Abelia	*Abelia chinensis*	5 - 9	butterflies
Birch			
Gray	*Betula populifolia*	4 - 7	song & water birds, small mammals, browsers
Paper (White)	*Betula papyrifera*	2 - 6	song & upland groundbirds, small mammals, hoofed browsers
River	*Betula nigra*	4 - 9	songbirds, waterfowl, small mammals, browsers
Sweet	*Betula lenta*	4 - 9	song & upland groundbirds, small mammals, browsers
Blueberry			
Highbush	*Vaccinium corymbosum*	4 - 8	song & upland gamebirds, waterfowl, small mammals, browsers, waterfowl
Lowbush	*Vaccinium angustifolium*	3 - 7	songbirds, waterfowl, upland gamebirds, marshbirds, large & small mammals
Butterfly bush	*Buddleia davidii*	5 - 9	hummingbirds and butterflies
Cedar, Eastern Red	*Juniperus virginiana*	3 - 9	song & upland groundbirds, small mammals, hoofed browsers
Dogwood, Flowering	*Cornus florida*	5 - 9	song & upland groundbirds, small mammals, hoofed browsers, waterbirds, large mammals
Maple			
Red	*Acer rubrum*	4 - 9	song & waterbirds, small mammals, browsers
Sugar	*Acer saccharum*	3 - 8	song & upland groundbirds, small mammals, hoofed browsers
Oak, White	*Quercus alba*	5 - 9	song & upland groundbirds, small mammals, hoofed browsers
Very High Wildlife Value (contd.)			
Pine			
Eastern White	*Pinus strobus*	4 - 9	song & upland groundbirds, small mammals, hoofed browsers
Red	*Pinus resinosa*	3 - 6	song & upland groundbirds, small mammals, hoofed browsers
Spicebush	*Lindera benzoin*	4 - 9	song & upland gamebirds, white-tail deer
Sumac, Fragrant	*Rhus aromatica*	3 - 9	upland gamebirds, large & small mammals, hoofed browsers
High Wildlife Value			
Fir			
Balsam	*Abies balsamea*	2 - 5	songbirds, small mammals, hoofed browsers
White	*Abies concolor*	4 - 7	songbirds, small mammals, hoofed browsers
Spruce			
Black	*Picea mariana*	2 - 7	songbirds, small mammals, hoofed browsers
White	*Picea glauca*	2 - 6	songbirds, small mammals, hoofed browsers
Viburnum, Double-file	*Viburnum plicatum tomentosum*	5 - 8	upland gamebirds, songbirds
Intermediate Wildlife Value			
Fringe tree	*Chionanthus virginicus*	3 - 9	small mammals, songbirds
Hemlock, Canada	*Tsuga canadensis*	3 - 7	small mammals, songbirds
Pecan	*Carya illinoinensis*	5 - 9	songbirds

Note: Wildlife species prefer indigenous plants but will gradually grow accustomed to non-natives.

From *Plants for Play* by R. Moore, 1993, p. 58-59. Copyright 1993 by MIG Communications.

APPENDIX H

"What Odor Causes You to Become Nostalgic?"

Nostalgic odors for people born in the 1920s, 1930s, and 1940s

pine	Cracker Jack	hay
roses	baking bread	clover
hot chocolate	soap	petunias
fish	figs	tweed
lilies	cut grass	meatballs
manure	blueberries	split-pea soup
honeysuckle	cinnamon	fresh air
violets	ocean air	burning leaves
attics	meadows	

Nostalgic odors for people born during the 1960s and 1970s

Play-Doh	motor oil	baby aspirin
chlorine	tacos	feet
crayons	SweeTARTS	mothballs
rubber fish bait	Cocoa Puffs	exhaust
marijuana	urine	mosquito repellent
tuna casserole	garbage	factories
Downy fabric softener	Windex	nail polish
dirt	hair spray	enchiladas
smoke	plastic	candy cigarettes
airplane fuel	ferns	suntan oil
disinfectant	old socks	scented magic markers
refineries	dog waste	burning tires

From *The Great Outdoors: Restoring Children's Right to Play Outside* by M. Rivkin, 1995, p. 10. Copyright 1995 by the National Association for the Education of Young Children.

APPENDIX I

Decibels of common sound intensities

Intensity (dB)*	*Sound***
130	4-engined jet aircraft at 120ft
120	threshold of pain; pneumatic hammer at 3ft
110	boilermaker's shop; typical 'rock' band
100	car horn at 15ft; and symphony orchestra playing fortissimo
90	pneumatic drill at 4ft; lorry at 15ft;
80	noisy tube train; loud radio music
75	telephone bell at 10ft
70	very busy London traffic at 10ft
60	conversation at 3ft; a car at 30ft
50	a quiet office
40	residential area with no traffic; and subdued conversation
30	a quiet garden; whispered conversation
20	ticking of a watch when held to the ear and 'silence' of a broadcast studio
10	the rustle of leaves
0	threshold of audibility

* Over 90 decibels can lead to damage to the human ear.
** Approximations which give only a general impression of relative sound intensities.

From *Sensuous Geographies* by P.Rodaway, 1994, p. 93. Copyright 1994 by Routledge.

FOOTNOTES

[i] For more information on various theories of play see Play and Playscapes by Joe L. Frost (1992).

[ii] For more information on play area recommendations for specific age groups, see Frost (1992).

[iii] For further discussion on the types of activities promoted for boys and girls, see *Unsettling the Body: The Institutionalization of Physical Activity at the Turn of the 20th Century* by Azzarito, Muro and Solmon (2004).

[iv] For more information on Isamu Noguchi's design, see Susan Solomon's *American Playgrounds* (1995) including pictures and descriptions of playground pieces.

[v] Thomas Hess was married to Audrey Hess, granddaughter of Sears Roebuck chairman, Julius Rosenwald.

[vi] Lady Allen of Hurtwood, author of *Planning for Play* (1968), challenged the traditional in playground design, speaking to the dynamics and importance of children's play. She believed that the public can restore this lost freedom in children's lives. She advocated for adventure playgrounds, describing the unique qualities and benefits of an unrestricted, undesigned play area. She stressed the importance of such design considerations as seclusion, scale, surface texture, topography, water and vegetation. *Planning for Play* asked designers and individuals to increase their awareness and sensitivity to the design of public spaces.

[vii] Currently, the US Affiliate of the IPA is promoting several projects to further promote play, including recess advocates, organized play days and play workers. See http://www.ipausa.org/playwork.html for more information.

[viii] Friedberg himself currently works for one of the major playground manufacturers.

[ix] Today, the only mandatory playground guidelines are in regard to the Americans with Disabilities Act (ADA); no general playground safety guidelines are required by law.

[x] Multiple researchers in the 1980's published extensive design criteria for play areas, geared towards developers and were intended to increase the value and benefits of playground design. Paul Wilkinson, author of *Innovation in Play Environments* (1980) intended his work to be used by designers, researchers, parents, politicians or others involved in play environments as a guide to increase the importance of play and assist in the development of more innovative play environments. Gary Moore, in *State of the Art in Play Environments* (1985) developed a

list of new approaches to the planning and design of play environments. *Play for All* by Moore, Goltsman, & Iacofano (1987) also acted as design criteria for the planning, design and management of outdoor play settings.

[xi] In *Last Child in the Woods* (2006), Louv describes what he calls the "Bogeyman Syndrome," a fear of the unknown, reinforced by everything from tainted Halloween candy to heavy media coverage on child abduction cases.

[xii] English language arts (ELA) is a common term within school districts referring to reading and writing of the English language.

[xiv] See http://www.childrenandnature.org/movement/info more contact information regarding these activities.

[xv] For more information, see the website for Washington Watch, http://www.washingtonwatch.com/bills/show/110_HR_3036.html#toc1

[xvi] Washington State legislature passed the bill, HB1677 by a unanimous vote in both the House and Senate. As of the distribution of this thesis, only two other states, New Mexico and California had also passed similar legislation, authorizing funding for outdoor education and recreation programs. For more information see http://www.childrenandnature.org/newsletter/news0402.html and http://apps.leg.wa.gov/billinfo/summary.aspx?bill=1677&year=2007

[xvii] For more information on Pyle's theory of "Extinction of Experience," see Pyle, *Nature matrix: Reconnecting people and nature* (2003).

[xviii] For more information regarding play props see Moore, Goltsman, & Iacofano (1987).

[xix] Plants for Play, by Robin C. Moore (1993) provides a starting point for designers, but is not specialized for the Northwest. Other resources, such as Restoring the Pacific Northwest by Dean Apostol and Marcia Sinclair (2006) are recommended for specific native Northwest plants that provide the necessary resources for the wildlife of this area.

[xx] For detailed information the nine values of biophilia, see The Biophilia Hypothesis by Kellert and Wilson (Eds.) (1993)

[xxi] For more information on Rodaway's theory of perception, see *Sensuous Geographies* (1994) by Paul Rodaway, p. 10.

[xxii] Many prominent authors utilize their own childhood memories as support for their viewpoints, including Edith Cobb and Rachel Carson. Rodaway (1994) specifically describes how many novelists and poets include emotional memories, associated with the sense of smell, in their writing.

[xxiii] For more information on keynote sounds, see *Sensuous Geographies* (1994) by Paul Rodaway, p. 87.