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Playgrounds

A 150-Year-Old Model

■ Summary

- Current playground design reflects changing recreational philosophies and institutional commitments over the last 150 years.
- Effective playgrounds provide a safe environment for active play, learning, exploration, and physical activity, which are crucial for healthy development.
- Mortality is extremely rare in school playgrounds. In contrast, injuries, although improved in some areas, continue to be a major concern. Falls from equipment remain the most frequent cause of injury on school grounds.
- In addition to playground equipment, designed landscape settings provide a viable strategy for safe, health-promoting playgrounds.
- Successful playground design or renovation is likely to result from a master plan and the collaboration of school and community. ■

Webster's defines a playground as "a piece of ground for and usually having special features for recreation, especially by children" (Gove 1961, p. 1737). This definition is helpful. Special recrea-

tional features, designed and constructed according to a plan, distinguish a children's playground from a vacant lot or a forest. The character and extent of those features and the type of recreation the area supports have taken many forms in the last 150 years, reflecting changing philosophies of children's recreation and varying institutional commitments to supporting children's recreational needs.

This chapter begins by tracing the history of playgrounds and exploring the philosophies behind the changes. Two major themes emerge. First, playgrounds should be places where children can play without incurring serious injury. Second, playgrounds should be spaces that support healthy child development through the process of active play, learning, and exploration. With regard to playground safety, this chapter reviews trends in injuries and fatalities and presents prevention strategies. Finally, case studies of community-based efforts to create playgrounds and school parks that meet both sets of goals are discussed. With a focus on elementary schools serving children 4–12 years of age (prekindergarten to sixth grade), the chapter offers suggestions on how to optimize playgrounds as educational and developmental settings that are safe for all children.

Playgrounds through History

Playgrounds as Pedagogy

Equipped playgrounds have a long history. The first fully illustrated publication of this concept appeared in 1848, authored by Henry Barnard (Brett et al. 1993). Barnard's playground was conceptually a pedagogical space centered on play. In the image from the original book (fig. 8.1), teachers are shown joining with students in traditional games as the core of childhood cultural transmission, and modern innovations such as wooden blocks are also introduced. Small carts are shown as toys to play with and as storage for blocks at the end of the day. There are large shade and fruit trees against a high wall surrounding the play yard. The only items of anchored equipment are two rotary swings—one for girls, the other for boys. Ropes hang from swivels on the top of tall poles. The children grab the ropes, run in a circle, and thrust themselves outward to ride airborne for a few moments propelled by centrifugal force—a pedagogical benefit.

By the end of the nineteenth century, variations on this model, influenced by German playground concepts developed in the 1880s, had spread to

schools and settlement houses in Boston, Chicago, and New York. The Playground Association of America, founded in 1906, helped promote the playground concept at a municipal level as a means of attracting young people to a safe place away from the perceived social and physical dangers of city streets. Organized playgrounds, informed by prevailing theories of child development, were used to socialize urban youth into prosocial, cooperative, physically active lifestyles in a community context away from the influence of parents.

Industrial versus Natural Settings

By the early twentieth century, playgrounds were increasingly outfitted with industrial products. Manufactured steel slides, swings, seesaws, and jungle gyms were anchored in threadbare turf and later in asphalt, the ultimate no-maintenance solution (fig. 8.2). Sometimes a covering of thin rubber tiles softened the surface immediately underneath the structures. However, severe injuries occurred with disturbing frequency when children fell from a height onto a hard surface or otherwise suffered the consequences of poorly designed and maintained equipment.

Over time, the approaches to manufactured

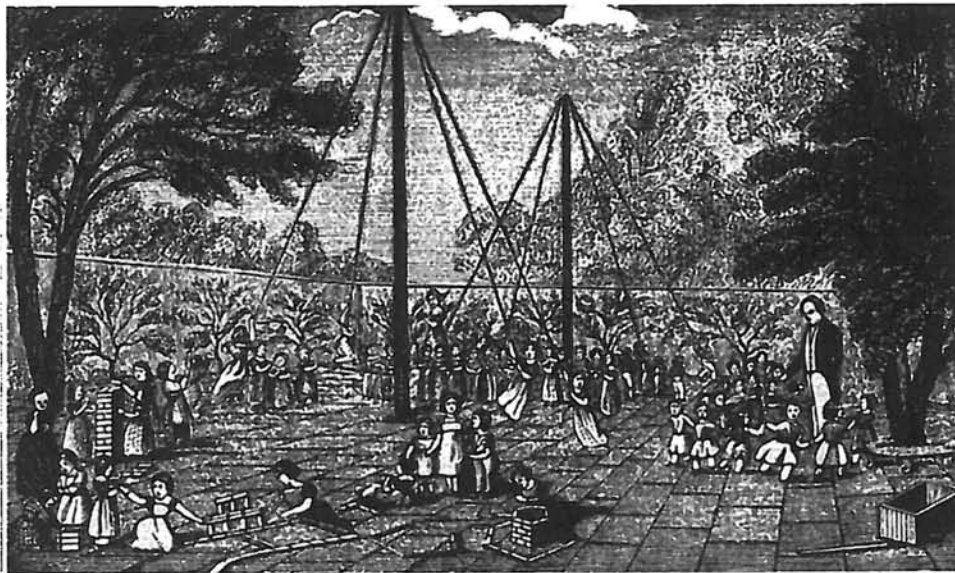


Figure 8.1. Nineteenth-century view of a playground for young children. (From H. Barnard, 1848. Courtesy of University of Michigan, Making of America.)



Figure 8.2. Typical, standardized, manufactured equipment playground. (Photo by Robin Moore.)

playground equipment evolved. Safety modifications were introduced, and individual structures—a swing set here, a jungle gym there—gave way to extensive composite structures, some approaching small play villages in complexity and size (fig. 8.3). Finally, some groups replaced conventional, boring equipment and asphalt with community-built structures. These areas included commercial playground equipment together with custom settings installed through a participatory community process. Natural settings were sometimes included, along with other expressions of local history, culture, and the arts.

In fact, the growing use of playground naturalization reflects a return to an earlier pedagogical approach. The schoolyard is viewed as a curricular resource—a multifaceted outdoor setting that supports mandated curricular objectives, as well as children's social and physical development. Such a naturalized schoolyard might include commercial



Figure 8.3. Extensive custom-designed playground equipment in a natural setting. (Photo by Robin Moore.)

playground equipment set within a larger area of open space planted with trees. Figures 8.4 and 8.5 show the transformation of rural and urban school play areas through naturalization.

Across the United States and Canada—and more strongly in Europe—a grassroots naturalization movement is growing in strength, including coalitions of educators, environmental advocacy groups, parents, and children involved in helping to define their own everyday environment. The most successful of these initiatives are substantial partnerships between school systems, university departments, natural science museums, botanical gardens, parent-teacher organizations (PTOs), wildlife organizations such as Audubon and the National Wildlife Federation, and a multitude of community-based organizations. A small but growing number of schoolyards are being deliberately designed to serve educational ends. Environmental educators see this as a key strategy for exposing urban children to the educational richness of the natural world through play, discovery, and formal learning.

The Concept of Recess

In addition to explicit curricular goals, some educators and parents have emphasized children's need to "let off steam" for short periods each day. The assumption is that school-aged children need to run around and clamber on structures to expend pent-up energy before returning to their classroom studies. In recent years, as academic performance accountability pressures have risen, many school systems have curtailed or abandoned recess altogether. Now, however, parent groups across the country are pressuring local school boards to restore recess. This counterattack puts forth three arguments: Children have a right to play, rest, and relaxation (United Nations 1989); recess helps children perform better academically; and recess is a significant factor in physical and mental health and healthy socialization (Clements 2000; American Association for the Child's Right to Play 2005).

Recess, at this basic level of consideration, means a minimum amount of time outside. It says nothing about the quality of that time, which for children is associated with the quality of the physical surroundings and the extent to which they provide a broad range of play and learning opportunities.



Figure 8.4. (Left) Bland, featureless, rural school grounds before renovation. (Right) The same school grounds after renovation. The manufactured equipment has been naturalized by the addition of a grove of shade trees and shrubs. (Photos by Robin Moore.)



Figure 8.5. (Left) Hard, asphalted, urban school yard before renovation. (Right) The same school yard after renovation. Asphalt has been replaced for diversified play and learning opportunities in naturalized settings. (Photos by Robin Moore.)

In recent years, obesity has reached epidemic proportions in the United States, and children are very much affected (Strauss and Pollack 2001). This epidemic relates to both gluttony and sloth—to excess consumption of calories and sedentary lifestyles that do not burn off sufficient calories (Prentice and Jebb 1995). Children need to be more physically active. Public health researchers have become increasingly aware that the school site is one of several community settings with potential for anti-obesity interventions (Baranowski et al. 2000). From this perspective, playgrounds that offer pleasurable and meaningful physical activity can be viewed as an intervention aimed at changing children's daily behavior.

Outdoor spaces are ideal for this purpose. Although school gymnasiums provide an alternative space for physical activity, they generally serve as

places for formal physical education classes and organized sports and are less likely to establish a life-long pattern of freely chosen physical activity.

Summary: Playgrounds That Serve Many Purposes

This brief history shows that the goals of playgrounds have evolved over the last 150 years. At the dawn of the twenty-first century, we can identify four crucial agendas for playgrounds:

- safety
- educational success through engagement with diverse, living environments
- healthy social and psychological development through deep, creative play
- active living (i.e., at least a minimal amount

of sustained physical activity during the school day).

Playgrounds and schoolyards should be designed, managed, and programmed to integrate all of these objectives. This implies an expanded view of playgrounds beyond mandated, structured time on manufactured equipment to creative time in non-traditional equipment and settings. This view of the playground as an educational resource can serve all four of these goals. Moreover, it offers the added advantage of engaging teaching staff in meaningful educational roles outdoors together with children. If the outdoor environment is designed to serve the needs of teachers, as well as those of children, they too will find the experience pleasurable and meaningful. This strategy can be effective (Moore and Wong 1997).

An irony in playground design is that both safety and risk, seemingly opposing goals, are desirable. Safety interventions can prevent serious injuries. However, in *Risk and Our Pedagogical Relations to Children: On the Playground and Beyond* (1998), Stephen Smith points out that taking chances (and therefore incurring risk) is a component of healthy development. The optimal balance of safety and risk is a pedagogical issue that implies intentional relationships between teachers and children. This is very different from the simplistic view of adult supervision, which places adults in the role of watchdogs that control behavior while doing little to teach children responsible behaviors. For Smith, play is about learning through risk-taking behaviors that motivate children continually to push the frontiers of their own development, not just physically, but psychologically and socially as well.

Jay Beckwith (2003), one of the pioneer industrial designers of the new breed of playground equipment, suggests that the balance of safety and risk has tipped too far toward safety. He cites two reasons: the constraints imposed by the Americans with Disabilities Act Guidelines for Play Areas (U.S. Access Board 2000) and the focus on legal liability. Beckwith argues that an unintended consequence of the Americans with Disabilities Act (ADA) may be the removal of appropriate levels of challenge from play environments for the large majority of able-bodied children. He also maintains that risk avoidance has seriously compromised the play value of playgrounds now being installed. A bal-

anced approach would reconcile the value of play in healthy child development, with choice of environmental accessibility and an appreciation of the importance of safety.

Elements of Playground Safety

Data on injuries in school playgrounds come from several sources, including death certificates, emergency room records, and surveys of health-care providers. Although the data are not perfect, they reveal a consistent pattern. Fatal injuries (mortality) on school playgrounds are extremely rare, but non-fatal injuries (morbidity) such as bruises, cuts, and broken bones are common.

Playground-related Mortality and Morbidity at School and Other Locations

Mortality

A major source of data regarding safety in schools is the comprehensive publication, *Risks to Students in School*, from the U.S. Congress, Office of Technology Assessment (1995), which analyzed unintentional, as well as intentional (homicide and fighting), injuries of children 5–19 years of age. Overall, the Office of Technology Assessment (OTA) study establishes the fact that schools are relatively safe places for children. The two leading causes of death to children overall are motor vehicles and firearms. Together with cancer, they account for more than eight in ten deaths in children. Very few deaths are associated with schools.

Tinsworth and McDonald (2001) analyzed the U.S. Consumer Product Safety Commission (CPSC) data files related to 147 deaths associated with playground equipment (the CPSC gathers only product-related data) that occurred between 1990 and 2000. Although these records did not include all playground-associated deaths and did not constitute a statistically valid sample, the data are a valuable source of information about the circumstances surrounding playground deaths. Sixty-eight percent of the deaths were of children 5–14 years of age, which represents about 10 deaths per year in all locations. Of the 128 cases where the location was specified, 38 incidents (30%) occurred at public playground equipment locations, and the remaining 70% occurred at home. This means that at

public playgrounds, including both schools and parks, about four deaths per year were reported over the 10-year period. One may assume that the bulk of these playgrounds were at schools, reflecting the estimate by Phelan et al. (2001) that approximately four times more nonfatal injuries occurred on school and daycare playgrounds than in parks. Three causes of death predominate: strangulation (54%), falls to nonresilient surfaces such as asphalt (21%), and tip-over or collapse of equipment (16%). Strangulation usually results from clothing or cords becoming entangled or caught on the equipment, especially slides. Given these fatality statistics, efforts at reducing death on playgrounds should focus on three areas: appropriate clothing (no protruding cords), adherence to the CPSC guidelines, and good maintenance of equipment.

The death of a child, particularly from unintended injury, is always a tragedy, but these four annual playground equipment deaths represent a far smaller toll than the estimated 37 children killed each year by vehicles while waiting for school buses, the 20 sports injury-related deaths each year, or the 44 school homicides annually (Office of Technology Assessment 1995).

Morbidity

Morbidity presents a somewhat different picture. There is a considerable body of research on playground-related injuries (MacKay 2003), but assembling a clear picture of these events is a challenge. Different studies use differing age and location categories and inconsistent definitions of injury and severity. Another problem is that the CPSC collects only equipment-related injury data, rather than data associated with whole play areas or school grounds. Despite these limitations, it is clear that playground injuries are a leading cause of injury to elementary and junior high students, ages 5–14 years, while at school. The policy task requires first establishing a sense of perspective on the issue by assessing the magnitude of playground injuries relative to other domains of childhood injury, then isolating school playground injuries and describing them in sufficient detail to guide appropriate responses.

Based on published studies, the OTA concluded that the most common locales for unintended school injuries were playgrounds, gymnasiums, and athletic fields. Injuries associated with

playgrounds were the most prevalent and accounted for 30–45% of unintended school injuries.

Using data gathered through the National Electronic Injury Surveillance System (NEISS), the CPSC study of playground deaths also analyzed playground equipment-related injury covering a 12-month period from November 1998 to October 1999 (Tinsworth and McDonald 2001). During the target year, an estimated 205,850 playground equipment-related injuries were treated in U.S. hospital emergency rooms. Of these, 156,040 (78.8%) were associated with equipment designed for public use, of which 70,218 (45%) were associated with playground equipment in schools. Figure 8.6 shows the distribution of the playground injury data by location.

In their study of injuries caused by playground falls, Phelan et al. (2001) used data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) gathered between 1992 and 1997 for children and youth under 20 years of age. Children 5–9 years of age (kindergarten to fourth grade) were three times more likely to visit the emergency room as the result of a playground fall than were 10- to 14-year-olds. The rate of playground fall injuries did not vary between girls and boys or between white and black children. The most frequent location of playground falls was at school; however, the data also included daycare locations. School and daycare playground falls accounted for 40% of such injuries, home playground falls for 25%, and public parks and other recreational areas for 9%. Playground falls accounted for a greater proportion of all falls at school.

Phelan et al. (2001) analyzed data for motor vehicle and bicycle emergency room visits to compare them with playground falls. In the 6-year period of the study, motor vehicle-related visits were 10 times more frequent than playground fall visits. Schwebel et al. (2002) used diaries completed each day by 6- and 8-year-olds and their parents to gather information about commonly occurring minor injuries. They found that twice as many injuries occurred at home as on playgrounds, in the streets, or on athletic fields. The vast majority of injuries were either cuts and scrapes or bumps and bruises in roughly equal proportions. The authors found that relatively few injuries occurred at school. Logically, injuries occur in places where children spend the majority of their time. Children spend 15–20% of their waking hours in school. Homes and motor

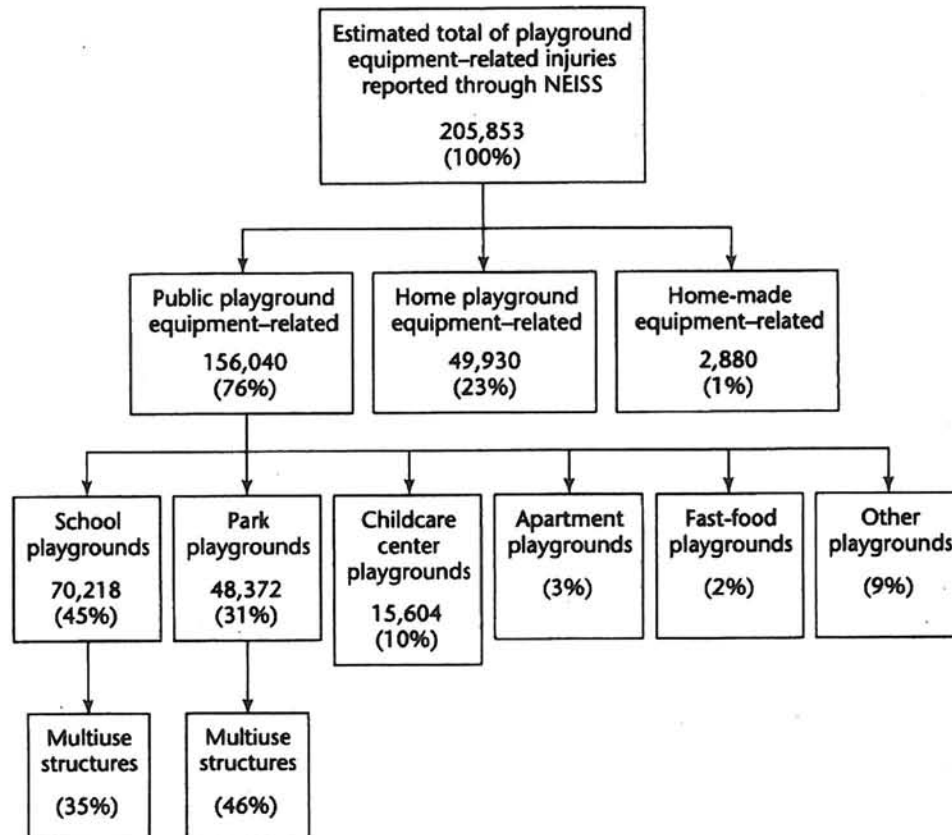


Figure 8.6. Distribution of playground equipment injuries by location. (From Tinsworth and McDonald 2001.)

vehicles expose children to far more risk of injury than do schools (Schwebel et al. 2002). However, within the school setting, playgrounds expose children to more risk of injury than other school locations. In other words, playground safety is a logical focus for efforts to reduce school-related injuries.

An earlier CPSC study, using 1988 adjusted data, estimated that about 170,000 playground equipment-related injuries resulted in emergency room visits (Office of Technology Assessment 1995). Of these, 70% (about 120,000) involved public playground equipment. The OTA (1995) calculated that approximately 30% (36,000) of these injuries occurred on school playgrounds. Of these, only 36% (approximately 13,000) occurred during school hours, representing about 8% of all

public playground equipment injuries. This finding is an important reminder that school playgrounds function as significant play locations for children even outside of school hours. Most of the injuries sustained on school playgrounds occur outside of school hours.

Tinsworth and McDonald (2001) compared the 1988 and 1998–1999 NEISS/CPSC data (though neither data set is directly comparable to the 1988 OTA data just discussed). Comparison between the 1988 and 1999 data shows an increase in public playground equipment-related injuries from 70% of playground injuries requiring emergency room care in 1988 to 76% in 1999, despite the substantial advances in safety standards. Falls accounted for 79% of injuries related to public play equipment in 1999, compared with 74% in 1988. This in-

crease may reflect a proportional drop in other injuries such as impact with moving or stationary equipment and contact with hardware, pinch points, and sharp edges, reflecting substantial design improvements made by the play equipment industry during the last 10 years. The difference may also indicate the additional exposure resulting from increases in after-school care. Moreover, it may reflect the propensity of children to take greater risks in play environments that they perceive as being safe.

Types of Playground Injury and Parts of the Body Affected

The types of playground injuries (all ages) reported by Tinsworth and McDonald (2001) were fractures (39%), lacerations (22%), contusions and abrasions (20%), and strains and sprains (11%). The large majority of fractures (almost 80%) involved the elbow, lower arm, or wrist. Body areas most frequently affected (school-aged children only) were the arm and hand (43%) and head and face (34%). About 15% of injuries to the face and head were diagnosed as concussions, internal injuries, and fractures. These injuries accounted for only about 5% of all surface fall-related wounds.

Types of Injury and Playground Equipment

An analysis of NEISS data for 1990–1994 concluded that, for the 5- to 14-year age group, “approximately 35% of injuries associated with public playground equipment were severe (concussions, dislocations, fractures, internal injuries, amputations, crushing injuries). Seventeen percent were moderately severe (ingestions, foreign bodies, hematoma, dental injuries, punctures, strains, sprains, hemorrhage, avulsion, dermatitis, conjunctivitis), and 48% were relatively minor” (Mack et al. 1997, p. 101).

Tinsworth and McDonald (2001) reported that 79% of injuries that occurred on all public equipment involved falls. Falls to the surface below accounted for 68%. Falls to other parts of the equipment (steps, rungs, horizontal climbing bars, or vertical poles) accounted for 10%. They indicated that the great majority of public playground-related injuries were associated with just three types of equipment: climbers (53%), swings (19%), and slides (17%). Eighty-six percent of injuries associ-

ated with climbers were fall related. Equivalent rates for swings and slides were 80% and 69%, respectively (fig. 8.7). Fifty-nine percent of the injuries associated with other equipment (seesaws, merry-go-rounds, etc.) were falls. All injuries that required hospitalization (although they constituted only 3% of all playground injuries) resulted from falls. Falls thus present the greatest risk to children using playground equipment and account for a disproportionate number of severe injuries. Injuries to the arms and hands are the most frequent.

Looking more closely at injuries associated with climbers, of the 75% of records that included details of the type of element, 60% were associated with horizontal ladders, 6% with hand-over-hand rings or triangles, and 2% with arch climbers. In other words, two-thirds (68%) of injuries associated with climbers involved elements of overhead equipment (Tinsworth and McDonald 2001).

The most frequently reported causes of falls were the children losing their grip (40%; most often related to climbing bars or swing chains), skipping or tripping (16%; most often on slides), and jumping or dismounting intentionally (10%; most often on swings). The types of falls that were least often reported occurred when a child was pushed by another child or reached for a part of the equipment and missed the grip. Tinsworth and McDonald (2001) note that in school settings, more than a quarter (28%) of play equipment incidents involved other children.

The 1988 and 1999 CPSC studies show that falls continue to account for the majority of injuries associated with public playground equipment. In 1988, the conditions of safety surfaces were not reported. The OTA (1995) reported that, in every study of safety surfacing on public playgrounds, high proportions of unsafe conditions were found, some as high as 99%. In contrast, the 1999 CPSC special study reported that, in locations where public equipment was installed, 80% had a protective surface under the equipment, most often bark mulch or wood chips. Dramatic improvements in safety surfacing under play equipment have apparently been achieved. The few cases of falls involving serious head injury occurred where either there was no protective surface or it was too shallow.

Rigorous maintenance protocols for safety surfacing and playground equipment must remain a top priority. However, in almost 80% of the inci-

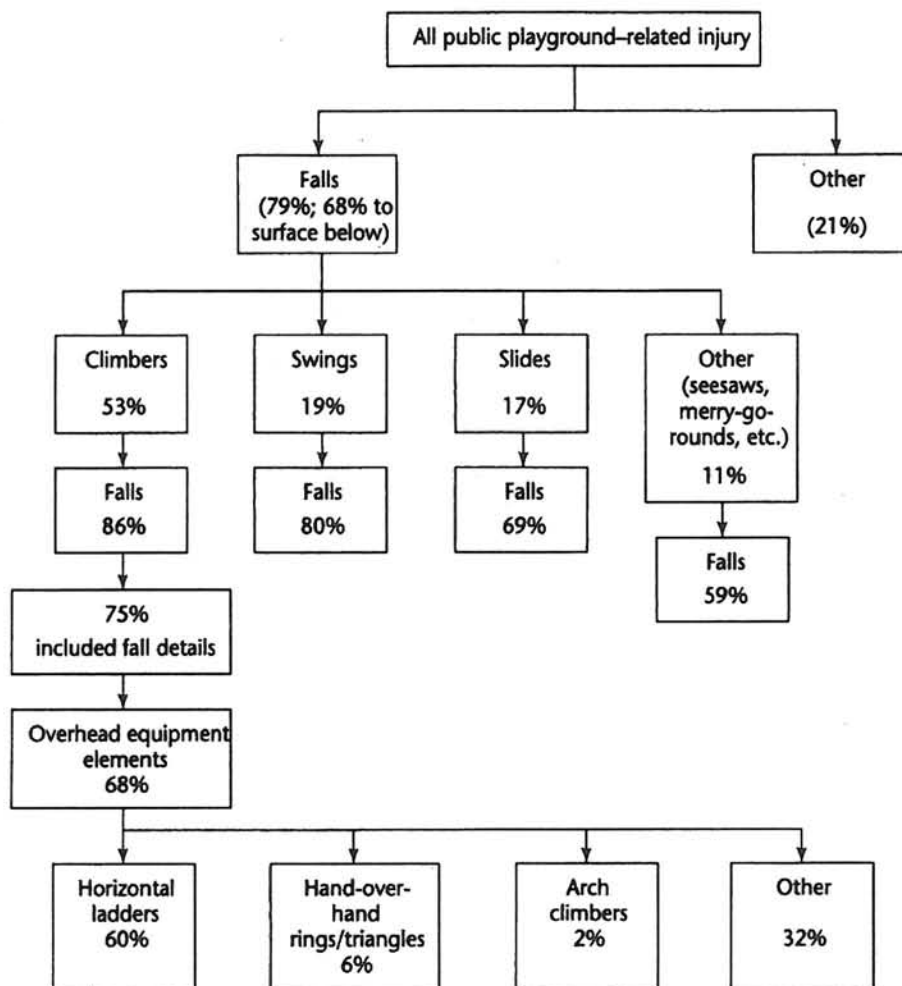


Figure 8.7. Distribution of public playground equipment fall injuries by type of equipment. (From Tinsworth and McDonald 2001.)

dents involving public playground equipment, no information was available concerning regular maintenance or safety inspection programs.

Playground Injury by Age and Gender

Tinsworth and McDonald (2001) reported the distribution of playground injuries by age and incidence by age group per 10,000 for the 1999 U.S. population as a whole (table 8.1).

Girls were injured somewhat more frequently than boys (55% vs. 45%). Because of the dominance of the 5- to 14-year-old group, the Tinsworth and McDonald data (2001) were adjusted for this chapter to show the association between this age

Table 8.1 Distribution of playground injuries by age and by incidence, United States, 1999

Age group	% of injuries	Incidence per 10,000 injuries/year
All children	100	7.5
< 5 years	30	29
5–9 years	56	
5–14 years		35
10–14 years	14	
> 15 years		1

Table 8.2. Type of equipment and associated injuries for children age 5–14 years

Type of equipment	Number (percentage of total injuries)
Climbers	66,161 (57)
Swings	26,980 (23)
Slides	12,998 (11)
Seesaws	4,541 (4)
Merry-go-rounds	187 (1)
Other	4,590 (4)
	115,457 (100)

Data from Tinsworth and McDonald (2001).

group and specific items of playground equipment (table 8.2). More than half (57%) of all public playground equipment-associated injuries were related to climbers; about one-quarter (23%) were related to swings; one-tenth (11%) were related to slides, 4% were related to seesaws, and 1% to merry-go-rounds. Other injuries (4%) were related to other equipment such as sandboxes, trapeze bars, ball pits, and track rides.

Children with Disabilities

None of the playground equipment safety studies mention safety issues related to children with disabilities. Common sense tells us that children with disabilities are playground users, especially given the energetic push in recent years toward educational integration, social inclusion, and accessible playgrounds.

Adaptive physical education is now integrated into the general school curriculum and should be used in all aspects of the playground. Children with and without disabilities should interact within the same setting, enhancing socialization and increased acceptance of children with different strengths and limitations. Playground equipment builds muscle tone, provides kinesthetic movement, and improves coordination and balance, all of which are beneficial. Because the playground may also serve as a community recreation area, it affords all children, with and without disabilities, access to well-designed equipment.

Every school playground should be accessible to all students. Within the playground, there should be some well-designed play equipment available for use by able-bodied children, as well as

by children using wheelchairs or other supportive devices.

Prekindergarten Programs on School Sites

Prekindergarten programs are increasingly available. Children between 3 and 5 years of age are attending these programs, either because they are recognized as being at high risk for developmental disabilities or because they are part of a comprehensive program to increase school achievement. The elementary school setting in use for pre-K programs may or may not have been renovated to meet the needs of smaller children. No guidelines have been established that specifically address playgrounds for children of this age group. However, the use of poorly implemented play yards, defined by chain-link fencing, surfaced with turf or mulch, and furnished with plastic play items, clearly does not meet the program goals for these children. These children, many of whom come into pre-K programs already labeled "at risk," need environments with a health-promoting focus that offers the sensory, physical, and social stimulation that has been lacking in these children's lives.

Applicable Standards and Guidelines

Key government publications and other sources of standards and guidelines for the design and management of school grounds are described below.

- U.S. Consumer Product Safety Commission Handbook for Public Playground Safety (1981). This document presents a set of guidelines that covers most items of manufactured playground equipment, safety surfacing, and maintenance protocol recommendations. The handbook was first issued in 1981 and is the most commonly referenced and applied standard of care for manufactured playground equipment. The intended audience includes playground designers, purchasers, installers, and consumers.
- American Society for Testing and Materials, ASTM F 1487 Standard Consumer Safety Performance Specification for Playground Equipment in Public Use (1993). This more technical publication is intended as a guideline for manufacturers and represents a voluntary

standard. The ASTM also publishes relevant voluntary standards for surface systems under and around playground equipment (ASTM F 1212, 1991) and for drawstrings on children's upper outerwear (ASTM F 1816, 1997). Falls from equipment remain the most frequent cause of injury. The most important protection against injury from falls is the presence of a shock-absorbing safety surface below the equipment within the use zone. These ASTM voluntary standards describe appropriate safety surfaces for playgrounds.

- Rigorous maintenance protocols for safety surfacing must remain a top priority. Kutska et al. (1998) provide guidance on the development of public playground safety and maintenance programs.
- *Play for All Guidelines: Planning, Design, and Management of Outdoor Play Settings for All Children* (Moore et al. 1992). First published in 1987 as the result of an extensive national consultation and interdisciplinary conference, this volume has become a standard reference for playground designers by combining best practices for safety and accessibility with designs that support the developmental needs of school-aged children. The book covers site planning, design of specific settings for playing and learning, design programming, and risk management.
- The Architectural and Transportation Barriers Compliance Board (U.S. Access Board 2000) is in the process of issuing final accessibility guidelines that are intended to serve as the basis for U.S. Department of Justice standards for new construction and alterations of play areas covered by the ADA. The guidelines include scoping and technical provisions for ground-level and elevated-play components, accessible routes, ramps and transfer systems, ground surfaces, and soft, contained play structures. The guidelines will ensure that newly constructed and altered play areas are readily accessible to and usable by people with disabilities.

Beyond the Conventional Playground

Much progress has already been made in reducing the hazards of playground injury:

- Slide-related injuries have decreased, most likely because of the lowered heights and preventive design features added in recent years. The lowered heights and slower speeds of plastic compared with stainless steel slides are problematic for children, however, in that they may seek more stimulating, unconventional, and therefore potentially hazardous ways of using the equipment.
- Swing-related deaths have been dramatically reduced in the last 15 years, probably because heavy, solid seats are no longer used. However, swing-related falls and other injuries still account for almost one-fourth of play-equipment injuries. Swing-related injuries may be declining because few schools are installing swings, although it is the most popular item of play equipment in the opinion of users (Moore and Young 1978; Moore 1989).
- Installation of shock-absorbing safety surfaces under and around climbing structures has reduced the rates of both serious and fatal head injuries resulting from falls onto concrete or asphalt. However, the major source of playground equipment-related injuries at schools remains falls from climbers, which result mostly in arm injuries.
- Self-imposed design standards for the playground equipment industry have almost eliminated injuries from protrusions, crush points, and sharp edges that were frequent causes of injury 20 years ago.
- Entrapment injuries are rare because the causes have been "designed out" of equipment. Equipment is now more sturdily constructed with higher-grade materials, and moving parts are engineered to higher standards. The longevity of equipment has been increased, and wear-and-tear hazards reduced.

Children's Compensatory Behavior

This progress is confounded by a fundamental, predictable characteristic of children's behavior: If the environment is insufficiently challenging, children will find ways to make it more stimulating by inventing new behaviors. On climbing structures, children commonly balance on the tops of railings or clamber along their outer edges. Children will always experiment with going headfirst down

slides. They need to test every possible combination of tire swing use. Successful "bailouts" on to-and-fro swings remain a childhood rite of passage demonstrating exquisitely timed interactions with gravity. Designers must anticipate these behaviors, try to predict the consequences, and propose design and management responses. Most professional playground designers would probably agree that the guidelines already in place represent the limits of what can be done, with respect to manufactured playground equipment. An additional strategy, which de facto has been in effect for decades, is rooted in what used to be the community-built approach to playgrounds: Widen the range of play choices by providing designed landscape settings in addition to playground equipment settings.

Safe, Health-Promoting Playgrounds and School Grounds

This landscape design strategy is viable in both new construction and playground renovation projects. The approach most directly addresses health promotion criteria by extending the range of options for social, physical, and cognitive behaviors. The following concepts are useful in designing or renovating playgrounds to maximize the benefits of an extensive, health-promoting landscape:

- Provide play opportunities for children who are intimidated by manufactured playground structures because of inadequate physical skills or personality traits that do not match the high-energy behavioral style of play structure users.
- Reduce behavioral pressures, especially on multiuse structures where overcrowded conditions can increase the risk of slipping or tripping incidents that can cause falls.
- Spread out the behavior horizontally across the play area, using the space to better advantage. Playground equipment tends to attract behavior in dense clusters that makes ineffective use of the overall space of the schoolyard.
- Increase levels of moderate and vigorous activity across the population of children by dispersing behavior settings. Children tend to run between settings. More complex landscapes encourage chasing games such as hide-and-seek. School grounds that incorporate topographical variety and are naturalized with

shrubs and shade trees provide increased stimuli for ground level, horizontal active play in addition to the vertical play of manufactured play equipment (thereby also reducing the risk of falls associated with equipment).

- Offer an extensive landscape with a variety of additional settings and behavioral options to more effectively meet the individual needs of children according to stages of development, personality types, and friendship patterns.
- Encourage spending class time outdoors, enabling students to reap the health benefits of increased physical activity in fresh air and sunlight.
- Provide numerous opportunities for teachers to extend learning processes into the outdoors and thus increase options for meeting state-mandated curricular objectives. This wider range of educational settings will better match the variety of learning styles in an average class of students.
- Help schools move away from curtailing or abandoning recess on the assumption that recess reduces classroom time for academic study.
- Engage children with nature both through play and curricular activity, thus encouraging an emotional attachment to the natural world and increasing their understanding about how the natural world works and how to care for it.
- Offer teachers a break from the intensity of classroom teaching with a move to stimulating natural surroundings. Development of interpersonal relations around cooperative learning activities outdoors offers teachers an opportunity to establish alternative relationships with their students, especially with "difficult" students, who may respond positively to the freedom of hands-on learning beyond the restrictions of classroom space.

School Grounds as Community Resource

Viewing school grounds as potentially health-promoting environments moves the discourse to a higher plane. To meet this potential, all stakeholders must be engaged in a joint educational endeavor. These stakeholders include students, teachers, parents, school administrators (at site and

system level), other sectors of government (e.g., parks and recreation), and organizations with similar goals.

School sites occur in a broad range of socioeconomic, cultural, geographic, and urban contexts. They can be old, renovated, or new, as well as inner city, urban, suburban, or rural. Schools exhibit many degrees of cultural diversity. School grounds can be large, small, and in between, and they are located both north and south of the frost line. They may be spread out over flat or hilly terrains, and they may be situated in the forest or on the plains. A standardized approach to playground provision cannot possibly respond to this diversity of dimensions. Nonetheless, design strategies based on landscape diversification and health promotion

can respond to these opportunities in myriad ways to create environments that offer a sense of place and belonging for students, teachers, and the community (Grant and Littlejohn 2001).

Naturalization also responds to an important issue largely missing from the safety literature: shade. Shade obviously provides comfort, particularly for children in the southern states. Sunlight presents a classic case of the need to balance health protection and health promotion. Too much sun can be harmful and cause serious, life-threatening disease. (See box 8.1 for safety recommendations for sun exposure.) On the other hand, lack of sunlight can cause rickets, a serious disease, as well as other negative health effects such as seasonal affective disorder (SAD) (Rosenthal 1998).

■ 8.1. Safety in the sun

Outdoor play provides exercise and promotes physical fitness. However, cumulative sun exposure over a lifetime increases the risk of the most common skin cancers (basal cell epithelioma and squamous cell epithelioma) and may also increase the risk of the rarer but more life-threatening type of skin cancer called malignant melanoma. Sun exposure increases the risk of skin cancer even when actual sunburn is avoided (Scherschun and Lim 2001). As much as 80% of a person's lifetime sun exposure occurs before the age of 18 years. Reducing sun exposure involves the use of protective clothing (ultraviolet [UV]-blocking sunglasses, hats, and garments made of tightly woven cloth) and sunscreens. Both UVA (315–400 nm) and UVB (290–315 nm) rays from the sun penetrate the atmosphere and pose a threat of sun-induced skin damage. Sunburn can occur even on cloudy days, as the cloud cover blocks only a small part of UVA and UVB rays.

Sunscreens should block both UVA and UVB rays to minimize skin damage from the sun. Products blocking both UVA and UVB rays are described as "broad spectrum." Various ingredients may be blended in a sunscreen to achieve this goal; common constituents include oxybenzone, octyl salicylate, and octyl methoxycinnamate. Some people may find that a particular ingredient irritates the skin or causes an allergic reaction; those people should avoid products containing that ingredient.

Products are rated by their ability to prevent sunburn when applied at a uniform thickness. This ability is measured as the sun protection factor (SPF). A product with an SPF of 30 reduces UVB penetration by 97%, whereas a product with an SPF of 15 filters 93% of UVB when applied at the recommended thickness (U.S. EPA 2001). Leading authorities recommend the use of broad-spectrum, water-resistant products with an SPF of 15 or higher (American Academy of Pediatrics 2000; Moloney et al. 2002; Scherschun and Lim 2001). Sunscreen should be reapplied at least every 2 hours during continuous sun exposure (American Academy of Pediatrics 2000; U.S. EPA 2001).

Appropriate sunscreen application involves the use of 30 ml (1 ounce) over the whole body of a typical adolescent or adult. Most people normally apply half of this amount or less, and this thinner application reduces the stated SPF by half or more (Moloney et al. 2002).

(Robert J. Geller) ■

Improvement Models for Playgrounds and School Grounds

Recognition of the potential of school playgrounds and school grounds as educational resources, rather than as just places to let off steam at recess, revived in the late 1960s and early 1970s. Slowly but steadily the school playground development movement has been growing in many countries, including the United States. Most notably in the English-speaking world, Canada (Evergreen Foundation) and the United Kingdom (Learning through Landscapes) have well-established national advocacy, technical assistance, and training organizations with impressive achievements on the ground (details in the list of resources at the end of this chapter).

In the United States, a substantial, dispersed grassroots movement has been gathering momentum for many years. A search of Internet sites under "schoolyards" provides an excellent impression of the many local, state, and national organizations involved. Some of those groups currently most relevant are listed at the end of this chapter in "Resources," including the Schoolyard Habitat listserv.

Citywide Initiatives

Citywide initiatives to rebuild school grounds are under way in many locations across the country, including Berkeley, Boston, Denver, and San Francisco.

Berkeley

Since the late 1960s, Berkeley, California, has had a rich history of improving the grounds of its public schools as a collaborative effort between the schools, parks and recreation agencies, and local groups. Models of success include the Environmental Yard at Washington Elementary School (Moore and Wong 1997) and the Edible Schoolyard at Martin Luther King Junior High School (www.edible.schoolyard.org).

Boston

The Boston Schoolyard Initiative (BSI; <http://www.schoolyards.org/overview.htm>) was launched in 1995 to respond to the condition of Boston's public schoolyards and to encourage public and private sectors to cooperate in revitalizing these neglected

spaces. BSI has since tackled more than 64 projects (Howard 2004).

Denver

The Learning Landscape Alliance (LLA; <http://thunder1.cudenver.edu/cye/lla/home>.) started in 1998 as a collaboration between Denver Public Schools and the Department of Landscape Architecture at the University of Colorado, Denver. The 6-year involvement of parents, students, staff, neighbors, and local businesses produced the first learning landscape at Bromwell Elementary School. The LLA has resulted in the development of more than 50 integrated traditional and nontraditional settings.

San Francisco

The San Francisco Green Schoolyard Alliance (<http://sfgreenschools.org/index.html>) was formed in 2001 to promote inclusive, community-driven processes that create and maintain healthy, environmentally sustainable learning environments in San Francisco schools.

School Parks

In reality, any well-developed schoolyard can be considered a neighborhood park for those families living close by. Official or not, school grounds will be used when school is not in session. However, the term "school parks" usually means that the school grounds are a joint enterprise of the school system and the parks and recreation department. School parks are a well-established method of capturing the full social value of school grounds as a public resource, especially in neighborhoods where community parks are scarce. Implementation requires transparent legal relationships and clearly defined management responsibilities. Although any developed school ground can serve as a neighborhood park, when a local school board agrees to implement a systemwide transformation with a city or county parks system, the impact can be far greater.

Some individual schools have renovated their school grounds to such a high standard that they attract after-school and weekend use by the community and have become de facto neighborhood parks. Blanchie Carter Discovery Park (Southern

Pines Primary School, Southern Pines, NC) and Kids Together Park (a community park in Cary, NC) both demonstrate how manufactured equipment, including low-to-the-ground equipment, can be creatively naturalized to provide a range of community play settings. The American Planning Association Parks Forum publication (2003) contains several case examples.

Participatory Design Programming: A Key to Success

The participation of the school community (children, teachers, administrators, parents, neighbors) in school ground renovation is essential for success. The outcome of this process is a design program and a master plan that together provide the school with both a long-term vision and a detailed description of learning and play settings—their physical content and programmatic objectives (Moore and Wong 1997; Moore et al. 1992).

The master plan offers a guidance system for site development, without which wasteful mistakes are likely to be made. Without a master plan, it is unlikely that the site will be used to the best advantage. Important aspects of the master plan process are circulation (how will users move through the site comfortably?), grounds maintenance (service entrance, storage of materials and tools), and location of the most substantial, popular settings (play equipment, water play, drinking fountains, social gathering spaces).

A master plan, in essence, is a system of learning and play settings. Each setting provides a predictable type of activity. In renovating existing schoolyards and in new construction, any number of play and learning settings can be specified during the design-programming phase and integrated into the master plan for developing the outdoor environment. Setting descriptions also provide a common vocabulary to help the school community develop an implementation strategy in accordance with budget limitations. This approach allows improvements to be implemented in one setting at a time as resources become available. Improvements implemented with local volunteer labor can be differentiated from projects requiring skilled professional assistance. Settings can be ranked according to cost.

A PTO teamed with a college class or student organization can execute naturalization projects

such as the installation of a vegetable garden, perennial flowering plants, shrubs, trees, or a reforestation zone. These costs are low. Projects can be implemented in a single workday or distributed over several workdays. Naturalization projects may be easier to implement in rural towns where people are closer to the soil and where the necessary equipment, expertise, and instruction are at hand. In contrast, installation of play equipment settings requires substantial, "lumpy" up-front costs, skilled professional help, and volunteer assistance spread over several days.

Conclusion

Playgrounds at school are an important part of the learning environment. How playground features are programmed, managed, and maintained inevitably reflects the play values of the adults who manage the institutions they have created to care for and educate our children. Schools designing playground spaces should consider the multiple potential opportunities for learning life skills that can occur in a playground setting.

Playgrounds are also the site of many injuries and occasionally even deaths. Playgrounds should be designed to permit exploration and appropriate risk-taking behavior while also minimizing the risk of injury. Appropriate equipment design and maintenance and careful attention to walking and landing surfaces help minimize the risk of injury.

Resources

- American Association for the Child's Right to Play. The U.S. chapter of the International Play Association promotes children's right to play as guaranteed by the International Convention on the Rights of the Child (United Nations 1989), article 31. IPA-USA launched a national initiative to promote recess and outdoor activity in elementary schools and has advocated strongly against the reduction and abandonment of recess. The organization's web site contains valuable resources on this issue.
<http://www.ipausa.org/>
- Antioch New England Institute, Center for Environmental Education. Publishes guide-

lines that provide a comprehensive definition of what a "green school" can be. The guidelines can also be used as an assessment tool to evaluate individual schools in the greening process.

<http://www.schoolsgogreen.org/>

- Boston Schoolyard Initiative
<http://www.schoolyards.org/overview.htm>
- EE (environmental education) in Georgia has a Green and Healthy Schools program, including schoolground development.
<http://eeingeorgia.org/>
- Evergreen Foundation. EF is a Canadian national advocacy organization that was founded in 1991 with a mandate to bring nature to Canadian cities through naturalization projects. This nonprofit foundation motivates people to create and sustain healthy, natural outdoor spaces and gives them the practical tools to be successful through one of its core programs, Learning Grounds, which is devoted to transforming school grounds. For EF, naturalization is a collective, community effort that includes people from all walks of life in the revitalization of their schools, homes, and communities and ultimately in the environmental, social, and economic functioning of cities. EF has produced a large number of publications (details on their web site) about all aspects of school ground development. See details of the EF video below.
<http://www.evergreen.ca>
- Georgia Native Plant Society. Provides schoolyard gardening resources.
<http://www.gnps.org/SCHOOL2.HTM>
- Georgia Wildlife Federation offers an on-line schoolyard wildlife habitat planning guide.
<http://www.gwf.org/swguide.htm>
- Landscapes for Learning. LFL is based at Clemson University Cooperative Extension Service, South Carolina. LFL sponsors projects at schools across the state and produces a newsletter that presents practical information for school grounds naturalization.
<http://business.clemson.edu/Lflearn/>
- Learning through Landscapes. LTL is a national campaign that promotes the right of children to have decent school grounds and to help make school grounds better places for learning and play. LTL contends that many children and young people in the United

Kingdom do not have access to well-designed school grounds and are therefore not getting the best start in life. For LTL, high-quality school grounds are essential because they provide unique opportunities for healthy exercise, creative play, and socialization. School grounds are places for learning by doing and for putting children in touch with the natural world. Since it was launched in 1990, LTL has developed numerous programs and has worked with 8,000–10,000 schools. Visit the Natural Learning Initiative (<http://www.naturalelearning.org> and link to publications) to download an in-depth 2004 Times Educational Supplement article about the trials and tribulations of school ground development in the United Kingdom.

<http://www.ltl.org.uk>

- Long Term Ecological Research. LTER is a schoolyard program.
<http://schoolyard.lternet.edu/>
- Maryland Association for Environmental Outdoor Education, Green School Program. Uses the environment as an integrating context for instruction, promotes the use of best environmental practices in operation and design of schools, and extends learning into the community to address local environmental issues. Research report on association of green school designation with educational achievement.
www.maeoe.org
- National Playground Safety Institute. This program of the National Parks and Recreation Association (NPRA) offers training courses and playground safety inspector certification for those who pass the exam.
- National Program for Playground Safety. This program was established in 1995 with support from the Centers for Disease Control and Prevention at the School of Health, Physical Education, and Leisure Studies, University of Northern Iowa. The program promotes playground safety, conducts studies, and presents national training events.
<http://www.uni.edu/playground/home.htm>
- National Wildlife Federation Schoolyard Habitat Program. Encourages schools and other educational facilities to build wildlife-friendly school grounds.
<http://www.nwf.org/schoolyardhabitats>
- North American Association for Environmen-

tal Education. NAAEE lists selected schoolyard examples.
<http://eelink.net/eeactivities-schoolyardecology.html>

- Schoolyard Habitat Listserv. To subscribe, send a blank e-mail to syh-exchange-subscribe@igc.topica.com.
- Schoolyard Habitat Network. SHN is a Connecticut-based collaborative effort dedicated to promoting hands-on environmental education on school property. Established in 1998, this group of educators, natural resource professionals, and consultants functions as a central resource for educators and administrators who wish to design and develop outdoor classrooms on school grounds and incorporate multidisciplinary activities into the curriculum. <http://www.ctwoodlands.org/shn.html>
- South Carolina Wildlife Federation. Promotes schoolyard developments. <http://www.scwf.org/about/index.php>
- The central government of the United Kingdom has launched a major program to harness the full potential of the "outdoor classroom" as a teaching and learning resource. <http://www.teachernet.gov.uk/teachingandlearning/resourcematerials/growingschools>
- Wallace Floyd Design Group. Provides examples of projects completed by the Boston Schoolyards Initiative. <http://www.asbj.com/lbd/2003/honors.html>
- Wild Bird Trust of British Columbia. Provides information on its green school grounds program. <http://www.greengrounds.org/guide.html>

Videos

- The Evergreen Foundation has produced a pair of fine videos called "A Crack in the Pavement" in partnership with the National Film Board of Canada (2000). The two programs are "Digging In" (19 min.) and "Growing Dreams" (19 min.). Call 1-800-276-7710; order number C 9100 116.
- The Canadian Biodiversity Institute has released a video about involving children in school ground development, *Asking Children, Listening to Children*, produced by Ann Coffey, coordinator of the CBI School Grounds Transformation Program.

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