



Health Benefits of Schoolyard Forests

Schoolyard Forests Benefit Physical and Mental Health and Sense of Safety

Investing in tree planting and outdoor learning on school campuses can address the urgent need for environmental and human health solutions for children now and in the future. Research overwhelmingly supports that being in and interacting with nature improves multiple dimensions of well-being. This article explores the wide range of health benefits associated with being outdoors and interacting with nature through learning and play.

Introduction

For more than a century, K-12 schoolyards in the United States have been dominated by asphalt playgrounds, athletic fields, and, more recently, parking lots. Lawns, when they are present, are often either limited to the school perimeter where students don't have access during the school day or are reserved for athletics and unshaded by trees.



Schoolyards covered with asphalt and concrete radiate heat and increase risk of heat-related illnesses.

While asphalt was once seen as a sanitary improvement to keep schoolyards and vacant lots weed- and litter-free, it is now understood to cause a number of human and ecological health issues. Because they absorb and radiate the sun's heat at much higher rates than natural surfaces, asphalt-covered surfaces in schoolyards, parks, and athletic facilities increase the risk of heat-related illnesses. Because they prevent rainwater from soaking into the earth and recharging groundwater aquifers, asphalt-covered surfaces cause high amounts of runoff, which can lead to flooding and poor water quality in addition to health risks.

These impacts are not felt evenly. Lower-income and historically marginalized communities experience higher heat and have less access to trees and parks. Cities and counties now strive to reduce the amount of paved surfaces in order to reduce heat, reduce flooding, and improve water quality to improve health and health equity. Schoolyard forests can support these regional ecological and health goals. They can also provide numerous physical and mental health benefits for the students, teachers, staff, and community members who can use them.

Overview of Benefits

Researchers express growing concern over rising temperatures and a projected increase in the number of dangerously hot days in many California cities and regions. Schoolyard forests can create cool climate oases in warming cities and can provide protection for students from heat- and sun-related illnesses such as heat exhaustion, heat stroke, and skin cancer. The trees and vegetation in a schoolyard forest act as a natural filter for particulates and air pollution, improving air quality and reducing the risk of asthma and pulmonary disease. Schoolyard forests also encourage healthy and fun movement patterns and increase participation in moderate-to-vigorous physical activity. In addition, they contribute to healthy bone development, support motor skill development and function, help maintain healthy weight, and decrease risk for type 2 diabetes by increasing the variety of activities available to students and providing shady areas and natural materials for them to explore, play in, and learn from. Trees and greenness in schools and communities is associated with higher overall health and quality of life.

Decades of evidence points to the mental health and social benefits of trees and nature. Being in and near trees enhances brain development and function, improves vision and sleep, and boosts immune system health, reducing the risk of infectious and chronic disease. Outdoor education is even shown to boost positive body image and self-efficacy for teenage girls.

By prioritizing schools in historically marginalized communities that lack parks and tree canopy and have higher levels of environmental and social stressors, schoolyard forests provide an important resource for reducing health and academic equity gaps. These benefits are multiplied by the mental health outcomes that schoolyard forests provide. Both viewing and being in and viewing trees reduces stress, anxiety,

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Our school went from boring and sad to happy and colorful. I feel much more alive!

Third-grade student after a green schoolyard renovation
LOS ANGELES UNIFIED SCHOOL DISTRICT

and depressive symptoms in people of all ages. The positive effects of access to trees and greenness in childhood and adolescence last into adulthood. Trees and opportunities for being in nature strengthen a sense of belonging, restore a sense of calm and well-being, increase positive social behavior, and promote social-emotional wellness.

Nature-rich environments like schoolyard forests also provide awe-inspiring experiences and increase comfort in nature and sense of place, which help students develop attachment to their school and community and a greater sense of belonging. Trees and gardens also help students feel safer. Primary and secondary schools with schoolyard forests have lower rates of bullying, antisocial behavior, and student crime and misconduct.

Meanwhile, with growing awareness of the high rates of trauma in our school communities, more educators and school districts are turning to trauma-informed education to help support students as they recover and heal. Schoolyard forests support and strengthen such trauma-informed care and education.



Trees can provide shade as they mature, filter air pollution, and intercept, clean, and absorb stormwater runoff.

Perhaps just as important as supporting the mental health and well-being of students is supporting those who teach and care for them. Teachers are experiencing higher rates of work-related stress and leaving their jobs at much higher rates than other adults. Work environments that provide access to nature—places to be in or view natural elements—improve happiness and well-being for those who work there. By bringing trees to schoolyards, we can improve the physical, mental, and social health and well-being of students, teachers, staff, and the greater community.

The Science and Research

Living schoolyards and schoolyard forests promote thermal comfort and lower heat stress. Because children are closer to the ground, they are closer to the radiant heat generated by asphalt. Unfortunately, prepubescent girls have lower sweat rates than boys, and both prepubescent girls and boys have lower sweat rates than adults. Younger children also generate more body heat due to their rapid growth. Children are less likely to perceive increases in body temperature and therefore do not take the appropriate precautions to avoid overheating, such as seeking shade, consuming water, or taking a break from activity. This exacerbates dehydration and overheating, leading to dizziness, nausea, headaches, fatigue, and decreased exercise capacity. When children return to the classroom dehydrated and overheated, they have difficulty concentrating, which leads to poor learning outcomes.

AN INTERVIEW WITH ADOLESCENT GIRLS

The following is an excerpt of interview transcripts from two adolescent girls at an Australian outdoor education camp, reported in publication from Joelle Breault-Hart.

Q: “What did you learn about what your body can do in your outdoor education program?”

A: “I learned that my body can withstand a lot. For example, when I did hiking, I was almost positive I would not reach the top, but I did in the end.”

Q: “Did any part of the outdoor education program influence how you feel about your body? If so, which part?”

A: “Yes. Definitely. I feel so much healthier after these past three days and I feel like it was nice to step back and take a break for a while.”

Q: “Do you believe that your outdoor education program influenced how you think about your body? If so, how?”

A: “At camp, I started not to care about how I looked and more thought about what I would be doing that day.”

A: “Yes. Personally, yes, as it made me feel healthier and alive. In a way it was detox.”



Children who spend more time outdoors in nature at school are more active. Observational studies demonstrate that replacing asphalt with trees and other nature-based features is related to increased engagement in activities such as gymnastics, climbing, jumping, running, and tag. These types of activities allow more children to be active at one time than traditional hardscape ball games such as tetherball and handball. They also tend to be less aggressive than ball games, which appeals to students who spend recess periods sedentary in asphalt spaces. Activity trackers have recorded higher step counts and elevation in heart rate for individual children during free play periods in living schoolyard environments compared to asphalt schoolyards. Although it has been consistently shown that boys are more active than girls when located in asphalt play zones, research suggests that the activity gap between genders disappears in nature-based play zones. Similarly, older elementary school students are more likely to meet the physical activity guidelines if their schoolyard is green.

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My wife and I have been waiting for a project like this for a long time. We believe this project will benefit a lot of children in relation to physical activity.

Parent of a Third Grade Student
LOS ANGELES UNIFIED SCHOOL DISTRICT

Nature-based activity is related to physical growth and development. The U.S. Department of Health and Human Services recommends that children and adolescents engage in 60 minutes of moderate-to-vigorous physical activity on a daily basis for optimal growth and development. At least three of these days should include bone-strengthening physical activity and at least three days should include muscle-strengthening physical activity. Walking, running, and jumping on uneven surfaces and between nature-based obstacles stimulates the activity of bone-forming cells called osteoblasts. It also challenges balance, which subsequently improves reaction time, agility, and coordination and helps with fall prevention. Activities that keep the heart rate elevated improve cardiovascular fitness. Climbing trees and digging in the dirt improves muscular strength as well as fine motor control and hand–eye coordination.



Marla Durana, San Francisco Recreation and Parks Department

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The various textures and levels of greening have inspired some of my physical education lessons to include use of them. Thus, the students can use more varied muscle groups

Teacher
LOS ANGELES UNIFIED SCHOOL DISTRICT



Paige Green

Green neighborhoods contribute to healthy brain development. Children growing up in green neighborhoods or attending schools with significant green space square footage, such as that made possible with schoolyard forests, have higher levels of gray and white matter brain volume. This provides students with stronger cognitive and executive function, which helps in decision making, behavior regulation, and learning. Brain development benefits are proportional to the duration of nature exposure.

Nature exposure is one of the most powerful regulators of immune function. Exposure to pollution leads to bronchoconstriction (narrowing of the air passageways), making it difficult to breathe. Research shows that asthma may account for nearly 20 percent of chronic absenteeism in urban school districts. Trees help to remove harmful pollutants from the air. Children living in areas with greater vegetation have lower rates of asthma. Additionally, children who spend time outdoors have higher vitamin D levels, which stimulates immune function. Indeed, children who interact with nature on a daily basis have stronger resistance to infectious disease. Nature-based lessons, including those with school gardens, inspire healthy food choices in children. Fruit and vegetable consumption is also related to better gut health and immune function.

Testimonials

The following quotes from teachers and a parent at Los Angeles Unified School District describe how the renovations of their schoolyards have impacted student and adult behaviors, attitudes, and perceptions.

“No more ‘pack wandering’—students are engaged with each other and their environment in positive ways. Might be exploring a tree; using imagination; talking under a tree; ...With only asphalt the older kids would just walk in a mob and almost seek out trouble. Negative preteen issues are greatly decreased.”

— Teacher, Los Angeles Unified School District

“One of my favorite days of the year by far is the Saturday greening work day before school begins in August. It gives us a chance to reconnect with friends and neighbors we haven’t seen over the summer, and students join in and take pride in beautifying their school for the new year. I find it adds to my children’s excitement while easing any ‘back to school’ anxieties.”

— Parent, Los Angeles Unified School District

“Students mention the beauty of the school often and are proud when visitors and family members come to the grounds. In as much as the school is lovely to look at, the setup is unique and inviting. The addition of trees only serves to make the school a more inviting place to learn and play in, as opposed to the metal and concrete structures so popular today.”

— Teacher, Los Angeles Unified School District

“I find that the adults on campus are more welcoming to students interacting with nature on the yard and are more willing to allow for students’ curiosity....This allows for a more playful and curious culture to prevail.”

— Teacher, Los Angeles Unified School District



Maria D'Amico, San Francisco Recreation and Parks Department

Being outdoors improves vision. Humans evolved to be in sunlight from sunrise to sunset. The incidence of myopia (nearsightedness) is increasing worldwide in part due to humans spending more time indoors. The current prevalence of myopia in 15- to 20-year-olds in the United States is over 50 percent. Increasing the amount of time spent outdoors during the day reduces the incidence of myopia and slows the progression of existing myopia in children. A 2019 meta-analysis concluded that children between the ages of 4 and 14 should be exposed to a minimum of 120 minutes of outdoor sunlight per day to reduce the incidence of myopia.



Spending time in nature improves sleep quality. The 2019 CDC Youth Risk Behavior Survey found that 77 percent of U.S. high school students get fewer than the recommended 8 hours of sleep on school nights. The consequences of chronic sleep deprivation in teenagers are severe and include increased motor vehicle accidents, increased mood disorders, reduced academic performance, and increased risk-taking behaviors. By spending time outdoors, especially in the morning, children, adolescents, and young adults have an easier time getting to bed early and waking up in time for school. Additionally, the more time children and adolescents spend outdoors, the longer their sleep duration. This equates to fewer risks for accidents and better memory development and academic performance.

Living schoolyards and schoolyard forests contribute to a lower risk for chronic disease. According to the CDC, childhood obesity affected approximately 14.7 million children and adolescents aged 2 to 19 between 2017 and 2020. The prevalence is higher for low-income students and BIPOC students. Obesity contributes to high blood pressure, high cholesterol, type 2 diabetes, asthma, and joint problems. In addition to promoting regular physical activity, outdoor education and school garden programs inspire healthier food choices among youth and the maintenance of healthy weight.

Nearby nature buffers stress and reduces anxiety. In urban environments, a significant amount of cognitive function is directed toward avoiding potential hazards and coping with noise and visual stimuli. This contributes to mental fatigue and a decreased ability to concentrate. Research shows that higher levels of greenness on school grounds are associated with an increased sense of restoration among students aged 12 to 18. Simply by looking at trees through a classroom window, students can experience a lowering of stress hormones, heart rate, and perceived stress after a mentally challenging activity. Faster recovery from stress is associated with greater resilience and better ability to focus on the next task. Additionally, children with ADHD are calmer and demonstrate reduced symptoms after spending 20 minutes outdoors.



The green space at our school gives my students with autism an opportunity to engage in sensory motor activities and further develop their collaborating and communication skills with peers

Special Education Teacher
LOS ANGELES UNIFIED SCHOOL DISTRICT

Greater access to green space has long-lasting improvement on psychological well-being. Children living in areas with higher usable green space have better physical activity self-efficacy (confidence in one's ability to successfully execute specific movement patterns and physical skills) and overall self-esteem. The presence of nature features like schoolyard forests on school campuses helps to prevent boredom and stimulates a sense of joy. Adolescents with greater access to green environments are also less likely to express depressive symptoms. Higher levels of residential natural outdoor environments in childhood are associated with lower risks of mental health conditions including depression in adulthood. Research suggests that the benefits of nature exposure on mental health may be due to nature's direct impact on the prefrontal cortex, the part of the brain responsible for emotional regulation. Both nature and physical activity also stimulate the release of beta-endorphins, which decrease the perception of pain and increase the perception of pleasure.

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The greening of the campus, in my opinion, has led to an overall shift in the culture of the school . . . The student body and culture is noticeably more positive, joyful, free, and without bullying.

Fourth Grade Teacher
LOS ANGELES UNIFIED SCHOOL DISTRICT

Social interactions are more positive in outdoor green environments. Collaborative and creative play opportunities in living schoolyards are associated with a stronger sense of belonging in peer groups. High levels of exposure to outdoor green space may improve children's specific prosocial behaviors, such as cooperating, sharing, and comforting. Indeed, children report increased social connectivity and decreased peer conflict after engaging in greened schoolyards. After one large-scale green renovation at an urban elementary school, antisocial/bullying behaviors decreased by 40 percent during free play. Outdoor learning often includes hands-on curricula, which enhances children's social interaction and negotiation skills, builds self-confidence, improves problem solving, encourages independence, and promotes creativity. Additionally, the relationship between teachers and children is more collaborative outdoors, which is further influenced by teachers' own positive childhood experiences with the outdoors.

Time spent in nature is related to pro-environmental behaviors and attitudes. Children who spend more time in nature have a stronger connection to nature and tend to develop values that promote sustainability and biodiversity. Early experiences with school gardening programs are associated with increased prosocial environmental attitudes. Outdoor environmental lessons delivered over the course of 14 weeks resulted in higher environmental knowledge and comfort than indoor lessons for fifth graders. The longer the duration (over the course of multiple years) and the higher the frequency of nature exposure, the more likely students will develop positive attitudes about wildlife and initiate and engage in pro-environmental behaviors such as recycling.



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NATIONAL SCHOOLYARD FOREST SYSTEM

The National Schoolyard Forest System™ seeks to create schoolyard forests on PreK-12 public school grounds across the country to directly shade and protect students from extreme heat and rising temperatures due to climate change. This initiative was founded by Green Schoolyards America, and launched with California as the first state in partnership with the California Department of Education, the California Department of Forestry and Fire Protection, and Ten Strands.

For more information, visit:
greenschoolyards.org/schoolyard-forest-system



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